UNIVERSITY OF MARMARA
FEN BİLİMLERİ ENSTİTÜSÜ

AN INFORMATION SYSTEM DESIGN FOR QUALITY CONTROL ACTIVITIES

A Study of Master Thesis

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ABSTRACT

The aim of this study is to design an information system of quality control activities starting from receiving inspection of raw materials to the mills to customer complaints handling, to ensure an accurate, just in time data flow among related people and to store precise data where and when necessary.

At this thesis, in a company, an information system design is studied at their own organization structure. For this purpose,

- System concept, meaning of the information system and theoretical methods used while analysis and design of an information system are discussed.

- Quality terminology, then the relation between quality system (quality control functions mainly) and data flow, necessity for design and application of an information system for quality control activities in an organization, meaning of information system for quality control and elements of it are explained. Also, the quality organization and functions of different departments at this organization are put forward.

- The reasons of designing an information system for the company, considered at this study, the particular characteristics of the organization, the aim of such a design and expectations from this study are explained.

- Activities related with the functions under the responsibility of quality control and also processes, which could be considered in the quality system such as handling of customer complaints, purchasing of raw materials, supplier evaluation etc., and related data flows are evaluated and information flow design is carried out accordingly. For any kind of data related to the quality system, different forms are designed. The responsibles of collecting and evaluating data are mentioned for each form and the people to whom data will be sent are chosen accordingly.

ÖZET

Bu çalışmanın amacı ele alınan firmada hammadde girişinden nihai ürün çıkışına ve sonrasında müşteri hizmetleri olarak değerlendirilen şikayetlerin ele alınmasına kadar tüm basamaklarda, kalite fonksiyonları ile ilgili bilgi akışının doğru ve istenir bir şekilde sağlanmasıdır.

Bu çalışmada, bir firmada, kendi organizasyon yapısı çerçevesinde kalite kontrol işlevlerinin uygulanabilmesi için gerekli bir bilgi sistem tasarımı ele alınmıştır. Bu amaca ulaşmak için;

- Sistem kavramı, bilgi sisteminin anlamı, teorik olarak bilgi sistemlerinin analizinde ve tasarımında kullanılan metodlar ele alınmıştır.

- Kalite terminolojisi gözden geçirilmiş, bunun sonucunda kalite sistemi ile data akışının ilintisi, bilgi sisteminin oluşturulması gerekliliği, kalite için bilgi sisteminin anlamı ve elemanları, kalite organizasyonu ve bu yapıdaki bölümlerin işlevleri ortaya çıkarılmıştır.

- Ele alınan firmanın bilgi akış sistemi kurma amacı ve tasarımı yapılacak olan sistemin belli başlı özellikleri ortaya konmuş, oluşturulmak istenen bilgi akış sisteminin amaçları ve beklentileri belirlenmiştir.

- Kalite kontrolun sorumluluğunda olan fonksiyonlara bağlantılı olarak kalite sistemine ilişkin aktiviteler ortaya çıkarılmış, bilgi akışı tasarlanmış, aynı zamanda kalite sistemi içinde düşünülebilecek müşteri şikayetlerinin ele alınması ve değerlendirilmesi, satınalma ve tedarikçi değerlendirmesi gibi fonksiyonlar için de bilgi akışı tasarlanmıştır. Tüm ele alınan aktiviteler için doğru bilgi akışını sağlayacak formlar düzenlenmiş, bu formların ve raporların organizasyonda ulaşacağı birimler belirlenmiştir.

1.0 INTRODUCTION

Quality leadership is the key to business success in 1990s. The lifestyles of consumers and the business effectiveness of companies now depend upon the reliable, consistent performance of products and services with no tolerance for the lost time and costs of any failures. Quality has become the fundamental strategy for competitiveness today.

Moreover quality gone global. It has become the key for effectively focusing any company, anywhere, for market growth and profitability through quality leadership.

The key is recognition that quality is what the customer. That results from strong customer-driven work and teamwork processes throughout all areas of the organization. These are processes which people understand, believe in and are part of, and which must be systematically developed in terms of the best quality practices that are available in the world.

Quality is in essence a way of managing the organization. Like finance and marketing, quality has now become an essential element of modern management and consequently of information systems. The effectiveness in management of quality has become a necessary condition for effectiveness in industrial management itself.

From a point of view, managing quality means practice, analysis and evaluation of data. As any system in an organization,

quality system also needs an information system to assure precise information received by suitable people or department at exact time.

First of all a method will be chosen to analyze and design of the system.

Then according to the chosen method, every part of the system will be studied and design will be carried out by using these analysis results.

At this study, an information system design with structural analysis method will be carried out at a company.

The company subject to this study produces electric resistance welded steel pipes and tubes in compliance with international standards and also customer adapted pipes and casings. At the beginning of the design there exists quality data, but in an unsystematic way.

At the first part of this study, theoretically system approach, system design methods will be explained.

Second part will be like a quality dictionary and a summary of why an information system is needed for quality.

At the third part, system design details will be given especially for quality control.

This study aims to design a simple and accurate system to collect, evaluate and direct data so that every related personnel could reach necessary information for their job at the first stage and also to create a system so that when any part of the organization changes, systems continuously operates.

2.0 SYSTEM ANALYSIS AND DESIGN

2.1 WHAT IS SYSTEM ANALYSIS & DESIGN?

In business, system analysis and design refers to the process of examining a business situation with the intent of improving it through better procedures and methods. System development can generally be thought of as having two major components: systems analysis and systems design. Systems design is the process of planning a new business system or one to replace or complement an existing system. But before design, system analysis, which is the process of gathering and interpreting facts, diagnosing problems, and using the information to recommend improvements to the system, is necessary to make the design more effective in the whole business system.

The word "system" is used very often; that is why a simple and broadsense definition can be done here as "a system is simply a set of components that interact to accomplish some purpose".

A business is also a system. Its components-marketing, production, R&D, quality, personnel etc.- all work together to create a profit that benefits the employees and stockholders of the firm. Each of these components is itself a system.

Every business system depends on a more or less abstract entity called an information system. This system is the means by which data flow from one person or department to another and can encompass everything from interoffice mail and telephone links to a computer system that generates periodic reports for various users. Information systems serve all the systems of a business, linking the different components in such a way that they effectively work toward the same purpose.

The purposes of information systems consists of subsystems, including hardware, software and data storage for files and databases. The particular set of subsystems used-the specific equipment, programs, files, and procedures-constitutes an information systems application. Thus, information systems can have purchasing, accounting, quality or sales applications. At this study quality information system design will be evaluated for a company, like a case study.

Since information systems support other organization systems, analysts must first study the organization system as a whole and then its information systems details. Organization charts are used to describe how the organization's components, such as divisions, departments, offices, and people relate to one another. Although the charts may accurately show the formal relationships between the components, they do not tell how the business system operates, since there are many important details that can not described in the charts. Examples of other system details are like;

Informal channels. What interactions between people and departments exist but are not shown on the organization chart or in prescribed operation procedures?

Interdependencies. On which other departments and components in the organization is a particular element dependent?

Key people and functions. Which individuals and elements in the system are most important for successful existence?

Critical communication links. How do information and instructions pass back and forth between organization components? How do areas interface with each other?[1]

[1] Senn J., "Analysis & Design of Information Systems", second edition, pp. 20-21.

2.2 SYSTEM DEVELOPMENT STRATEGIES

Computer information systems serve many different purposes, ranging from the processing of business transactions-the lifeblood of many organizations-to providing information needed to decide recurring issues, assisting senior officials with difficult strategy formulations, and linking office information and corporate data. In some instances, the factors to be considered in an information systems project, such as the most appropriate aspect of computer or communications technology to be applied, the impact of a new system on the people in a firm, and the specific features the system should have, can be determined in a sequential fashion. In other instances, experience must be gained through experimentation and the staged evolution of a system.

As computers are used more and more by persons who are not computer professionals, the face of the systems development is taking on an additional dimension. Users themselves are undertaking development of some of the systems they use, as the executive in the vignette emphasized.

These different situations are represented by three distinct approaches to the development of computer information systems:

1. Systems Development Life Cycle Method
2. Systems prototype Method
3. Structured Analysis Development Method

2.2.1 Classical Systems Development Life Cycle

Systems development, a process consisting of the two major steps of systems analysis and design, starts when management or

sometimes systems development personnel realize that a particular business system needs improvement.

The systems development life cycle method is classically thought of as the set of activities that analysts, designers, and users carry out to develop and implement an information system. This section examines each of the six activities that makeup the systems development life cycle. In most business situations the activities are closely related, usually inseparable, and even the order of the steps in these activities may be difficult to determine. Different parts of a project can be in various phases at the same time, with some components undergoing analysis while others are at advanced design stages.

The systems development life cycle method consists of the following activities:

1. Preliminary investigation (Request clarification, feasibility study)

2. Determination of system requirements

3. Design of system

4. Development of software

5. Systems testing

6. Implementation and evaluation (operational evaluation, organizational impact, user manager assessment, development performance).

Unfortunately, system evaluation method does not always receive the attention it merits. Where properly managed, however, it provides a great deal of information that can improve the effectiveness of subsequent application efforts.

2.2.2 Systems Prototype Method

The systems prototype method involves the user more directly in the analysis and design experience than does the systems development life cycle or structured analysis method. For this method, what is mentioned as prototype is a working system -not just an idea on paper- that is developed to test ideas and assumptions about the new system. Like any computer based system, it consists of working software that accepts input, performs calculations, produces printed or displayed information, or performs other meaningful activities. It is the first version or iteration of an information system-an original model.

The design and the information produced by the system are evaluated by users. This can be effectively done only if the data are real and the situations live. Changes are expected as the system is used.

Information requirements are not always well defined. Users may know only that certain business areas need improvement or that existing procedures must be changed. Or, they may know that they need better information for managing certain activities but are not sure what that information is. The user's requirements might be too vague to even being formulating a design. In other cases, a well-managed systems investigation may produce a comprehensive set of systems requirements, but building a system that will meet those requirements may require development of new technology. Unique situations, about which developers have neither information nor experience and high-cost and high risk situations, in which the proposed design is new and untested, are often evaluated through prototype. A prototype actually a pilot or test model; the design evolves through use. Although the prototype is a working system,

it is designed to be easily changed. Information gained through its use is applied to a modified design that may again be used as a prototype to reveal still more valuable design information. The process is repeated as many times as necessary to reveal essential design requirements.

System prototyping is an interactive process. It may begin with only a few functions and be expanded to include others that are identified later. It may also start with what both analyst and user believe is a complete set of functions that may expand or contract through use and experience.[2]

2.2.3 Structured Analysis Development Method

When analysts begin work on an information systems project, they often delve into an area of an organization with which they have little familiarity. Yet they must develop a system to assist managers and staff - the prospective users - in that area. Any new system or recommendations for changes in the existing system , whether manual or automated, must lead to improvement. To accomplish this result, systems analysts are expected to do each of the following :

- Learn the details of the system as well as procedures currently in place.

- Develop insight into future demands on the organization as a result of growth, added competition in the marketplace, changing consumer needs, evolving financial structures , the introduction of new technology, government regulatory changes, and other changes.

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[2] Senn J., "Analysis & Design of Information Systems", second edition, pp. 37-38.

- Document details of the current system for discussion and review by others.

- Evaluate the effectiveness and efficiency of the current system and procedures, taking into account the impact of anticipated future demands.

- Recommend any necessary revisions and enhancements to the current system, indicating how they are justified. If appropriate, an entire, new system may be proposed.

- Document the new system features at a level of detail that allows others to understand its components (and their interrelationship), doing so in a manner that will allow the development of the new system to be managed.

- Involve managers and employees in the entire process, both to draw on their expertise and knowledge of the current system as well as to learn their ideas, feelings, and opinions about requirements for the new or changed system. [3]

The word ***structure*** in structured analysis means:

1. The method attempts to structure the requirements determination process, beginning with documentation of the existing system;

2. The process is organized in such a way that it attempts to include all relevant details that describe the current system;

3. It is easy to verify when relevant details have been omitted;

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[3] Senn J., "Analysis & Design of Information Systems", second edition, p. 150.

4. The identification of requirements will be similar among individual analysts and will include the best solutions and strategies for systems development opportunities; and

5. The working papers produced to document the existing and proposed systems are effective communication devices.

2.2.3.1 Components of Structured Analysis

Structured analysis uses the following components:

1. Graphic Symbols

Icons and conventions for identifying and describing the components of a system and the relationships among these components.

2. Data Dictionary

Descriptions of all data used in the system. Can be manual or automated (may be included in a larger project dictionary that also contains descriptions of processes making up the system)

3. Procedure and Process Description

Formal statements using techniques and languages that enable analysts to describe important activities that make up the system.

4. Rules

Standards for describing and documenting the system correctly and completely.

Structured analysis, a method, has become synonymous with data flow analysis, a tool, because the tool is essential for documenting an existing system and determining information requirements using the structured method.

In this study, because of the bulk of independent activities in the quality system, this structured analysis method will be used to evaluate requirements and to develop an information system.

2.2.3.2 Data Flow Analysis

There are four specific questions to be answered in the structured analysis method; What data are used in each process? What data are stored? And, what data enter and leave the system? The emphasis is clearly on data analysis.

Data flow analysis studies the use of data in each activity. It documents these findings in data flow diagrams, which graphically show the relation between processes and data, and in data dictionaries.[4]

2.2.3.3 Advantages of Data Flow Analysis

Data flow analysis permits analysts to isolate areas of interest in the organization and study them by examining the data that enter the process and seeing how they are changed when they leave the process. As analysts gather facts and details their increased understanding of the process leads them to ask questions about specific parts of the process, which leads to still additional investigation. In general, as the area of investigation is broken into successively lower-level details until all the essential components and their interrelations can be understood.

A comprehensive systems investigation produces sets of many data flow diagrams, some providing overviews of major processes and others going into great details to show data

[4] Senn J., "Analysis & Design of Information Systems", second edition,p.154.

elements, data stores, and processing steps for specific components of a larger system. If analysts want to review the overall system later, they use the higher level overview diagrams. However, if they are interested in studying one particular process, they use the data flow diagram for that lower level process.[5]

2.2.3.4 Data Dictionary

A data dictionary is a catalog - a repository - of the elements in a system. As the name suggests, these elements center around data and the way they are structured to meet user requirements and organization needs . In a data dictionary you will find a list of all the elements composing the data flowing through a system. The major elements are data flows, data stores, and processes. The data dictionary stores details and descriptions of these elements.

If analysts want to know how many characters are in a data item, by what other names it is referenced in the system, or where it is used in the system, they should be able to find the answers in a properly developed data dictionary.[6]

Analysts use data dictionaries for five reasons:

1. To manage the detail in large systems
2. To communicate a common meaning for all system elements
3. To document the features of the system
4. To facilitate analysis of the details in order to evaluate characteristics and determine where system changes should be made

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[5] Senn J., "Analysis & Design of Information Systems", second edition,p.159.
[6] Senn J., "Analysis & Design of Information Systems", second edition, p. 184.

5. To locate errors and omissions in the system.[7]

At this study, structured analysis method will be used, except the data flow charts; while there are so many flows which have quite short circulations in the company, explanations are considered enough for setting flow directions.

2.3 SYSTEM DESIGN STEP

2.3.1 Objectives of Designing an Information System

Requirements are translated into design specifications. What does the systems analyst intend to achieve when designing an information system ?

- **Specify the Logical Design Elements.** Systems design involves first logical design and then physical construction of the system. When analysts formulate a logical design, they write the detailed specifications for the new system ; they describe its features : outputs, inputs, files and procedures - all in a manner that meets project requirements. The statement of these features is termed the design specifications of the system.

- **Support Business Activities.** A fundamental objective in the design of an information system to ensure that it supports the business activity for which it is developed. In other words, the computer and communications technology specified in the design should always be secondary to the results the system is intended to produce.

[7] Senn J., "Analysis & Design of Information Systems", second edition, p. 185.

- **Ensure that System Features Meet User Requirements.** User requirements are translated into system characteristics during design. We say that an information system meets user needs if it accomplishes the following:

- Performs the right procedures properly

- Presents information and instructions in an acceptable and effective fashion

- Produces accurate results

- Provides an acceptable interface and method of interaction

- Is perceived by users as a reliable system.

- Provide a System Engineered for Use by People

Human Engineering

After an information system is installed and the analysts are gone, managers and staff members begin interacting with the system on an ongoing basis. As the excitement (and fear) of a new application gives way and its use becomes routine, end users scrutinize and test its features. It is in this context that human engineering features often exceed technical features in importance.

Ergonomic Design

Ergonomics refers to the physical factors of an information system that affect the performance, comfort, and satisfaction of direct users. The design of terminals, chairs, and other equipment influences the amount fatigue and strain involved in using these items. These factors in turn affect such concerns as the introduction of errors during data entry. user efficiency, and even absenteeism.

Provide Detailed Software Development Specifications

Like the features of an information system, software must also be carefully designed. Systems design includes formulating software specifications.

The Specifications state input, output, and the processing functions and algorithms used to perform them. Software modules and routines focusing on what function each performs and procedures for accomplishing them are specified as well. Selection of programming languages, software packages, and software utilities occurs during the logical design process and the recommendations are included in the software specifications.

Conform to Design Standards

Examples of areas included in design standards :

- *Data standards*

Guidelines for data item names, length, and type specifications that are used for all applications developed by the information systems group. Often contained in the data dictionary.

- *Coding standards*

Formal abbreviations and designations to describe activities and entities within the organization (e.g. customer categories and transaction types).

- *Structural standards*

Guidelines on *how* to structure the system and software. Policies on software modularization, structured coding, and the interrelation of system components. May include program length standards and guidelines for reuse software models.

- *Documentation standards*

Descriptions of systems design features, interrelation of components, and operating characteristics that can be reviewed to learn the details of the application.

2.3.2 Elements of the Design

The components of an information system described during requirements analysis are the focal point in systems design. Analysis must design the following elements:

- *Data Flows*

The movement of data into, around, and out of the system.

- *Data Stores*

Temporary or permanent collections of data.

- *Processes*

Activities to accept, manipulate, and deliver data and information. May be manual or computer-based.

- *Controls*

Standards and guidelines for determining whether activities are occurring in the anticipated or accepted manner, that is, 'under control'. Also specify actions to take when problems or unexpected circumstances are detected. May include the reporting of exceptions or procedures for correcting problems.

- *Roles*

The responsibilities of all persons involved with the new system, including end-users, computer, and support personnel. Span the full spectrum of system components, including input of data to distribution of output or results. Roles are often stated in the form of procedures.[8]

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[8] Senn J., "Analysis & Design of Information Systems, second edition, p. 342.

3.0 QUALITY CONTROL & QUALITY ASSURANCE

Quality is a customer determination, not a engineers' determination, not a marketing determination as a general management determination. It's based upon the customer's actual experience with the product or service, measured against his/her requirements-stated or unseated, conscious or merely sensed, technically operational or entirely subjective and always representing a moving target in a competitive market. One definition for the quality is, " totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs"[9]. Another definition for product or service quality is "the total composite product and service characteristics of marketing, engineering manufacture and maintenance through which the product and service in use will meet the expectations of the customer"[10]. The quality of products and services is directly influenced in nine basic areas, or what might be thought of as "9M's": Market, money, management, men, motivation, materials, machines and mechanization, ***modern information methods***, and mounting product requirements.

(The rapid evolution of computer technology has made possible the collection, storage, retrieval, and manipulation of information on a scale never before imaginable. This powerful new information technology has provided the means for an unprecedented level of control of machines and processes during manufacture and of products and services even after they have reached the customer. And the new and constantly improving methods of data processing have made available to management far

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[9] ISO 8402, "Quality management and Quality Assurance-Vocabulary", 1994.
[10] Feigenbaum A.V., "Total Quality Control", 3rd edition, p.7.

more useful, accurate, timely, and predictive information upon which to base the decisions that guide the future of a business.)

The purpose of most quality measurements is to determine and evaluate the degree or level to which the product or service approaches this total composite. Some other terms, such as reliability, serviceability and maintainability, have sometimes been used as definitions for product quality. These terms are of course individual characteristics which make up the composite of product and service quality .

3.1 QUALITY CONTROL

Japanese Industrial Standards (JIS) define quality control as "A system of production methods which economically produces quality goods and services meeting the requirements of consumers. Modern quality control utilizes statistical methods and is often called statistical QC".

Japanese author and quality specialists Kaoru Ishikawa brought another definition; "To practice quality control is to develop, design, produce and service a quality product which is mot economical, most useful and always satisfactory to the customer"[11] .

Explicit as possible identification of all customer requirements is a fundamental initial basing point for effective quality control. When this has not taken place, it can create an inherent problem which none of the subsequent control activities can fully meet.

[11] Ozawa M., "Total Quality Control and Management", first edition, pp. 29-30.

In the phrase "quality control", quality does not have the popular meaning of best in any abstract sense. To industry, it means "best for satisfying certain customer conditions", whether the product is tangible (an automobile, a refrigerator, a microwave oven or a pipe) or intangible (services, like hospital care). Important among these customer conditions are;

i. The actual end use and

ii. The selling price of the product or service. In turn, these two conditions are reflected in ten additional product and service conditions;

1. The specification of dimensions and operating characteristics
2. The life and reliability objectives
3. Safety requirements
4. The relevant standards
5. The engineering, manufacturing and quality costs
6. The production conditions under which the article is manufactured
7. The energy utilization and material conservation factors
8. The field installation and maintenance and service objectives
9. The environmental and other "side" effects considerations
10. The cost of consumer operation, use and product service.

The aim of these conditions is that quality which establishes the proper balance between the cost of the product and service and the customer value, it renders, including essential requirements like safety.

3.2 QUALITY ASSURANCE

Quality Assurance is the arrangement of activities within an organization that ensures customers receive the products and services that they require every time and that they are fit for their stated purposes[12]. This means that organization must have a system of logical and documented control of all resources, materials and procedures throughout the organization, together with proof (where necessary) that customer needs have been met and will continue to be met.

The message is that quality must explicitly designed and built into products and services; can not be inspected in during manufacturing. Inspection can only identify non conforming products and services. It can not prevent failures. The aim is to get it right first time, every time-failure to do so will result in inefficiency, the provision of ineffective products and services and the probability of increased costs.

Assurance contains a future connotation and quality assurance is about products working reliability in the future and about service activities likewise being dependable and consistent in the future.

3.2.1 Quality Assurance Auditing

QA Auditing is a systematic examination of representative aspects of quality systems within an organization, its suppliers, and the third party organizations. The purpose of a QA audit is to ensure understanding of corporate philosophies and adherence to organizational and regulatory requirements.

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[12] R.Parker Asso., "Quality Costs Course", pp. 2-4.

3.3 THE MEANING OF "CONTROL" in INDUSTRY

Control in industrial terminology can be defined as;

"A process for delegating responsibility and authority for a management activity while retaining the means of assuring satisfactory results".[13]

The procedure for meeting the industrial quality goal is therefore termed quality "control", just as the procedures for meeting production and cost goals are termed, respectively, production "control" and cost "control". There are normally four steps in such control:

1. Setting standards. Determining the required cost-quality, performance-quality, safety-quality and reliability-quality standards for the product.

2. Appraising conformance. Comparing the conformance of the manufactured product, or the offered service, to these standards.

3. Acting when necessary. Correcting problems and their causes throughout the full range of those marketing, design, engineering, production and maintenance factors which influence user satisfaction.

4. Planning for improvements. Developing a continuing effort to improve the cost, performance, safety and reliability standards.

Effective control is today a central requirement for successful management. Where this control is failed, it has been a principal cause of increases in company cost reductions in company income. And its failure has also been a principal contributor to the product-

[13] Feigenbaum A.V., "Total Quality Control", third revision, p. 10.

liability, -safety, and -recall developments which have added new dimensions to the problems of management.

The pace of technology is increasing more and more rapidly for many products and services. This places an equally increasing demand for the economic and practical integration of this new technology into the operational practices of a company.

A major planning study stated the conclusion this way: "The significant changes over the next decay will take place in the way operational activities are structured (for control) in companies, as well as in new developments in operational technologies themselves".

This return to control as a central emphasis of management is a major balancing factor to the primary emphasis of the recent past, with its heavy orientation to growth in sales and production. However, for the quality field, it is a reaffirmation of basic principles. These principles are those of controlling the positive, self-steering sense of establishing the preventively oriented control standards; evaluating product performance and conformance results against these standard; and then assuring the necessary adjustment actions throughout the entire marketing, design engineering, production and maintenance cycle. Here comes to the stage a very important concept; ***"Information flow".*** To built the control cycles effectively, first of all information feedback should be perfectly accurate satisfying the needs.

3.4 THE SCOPE OF TOTAL QUALITY CONTROL

The underlying principle of the total quality view, and its basic difference from all other concepts, is that to provide genuine effectiveness, control must start with identification of customer

quality requirements and end only when the product has been placed in the hands of a customer who remains satisfied. Total quality control guides the coordinated actions of people, machines, and information to achieve this goal. Total quality control includes eight steps of industrial cycle; marketing, engineering, purchasing, manufacturing engineering, manufacturing supervision and shop operations, mechanical inspection and functional test, shipping, installation and service. The reason for this breadth of scope is that the quality of any product is affected at many stages of the industrial cycle (Fig.1). [14]

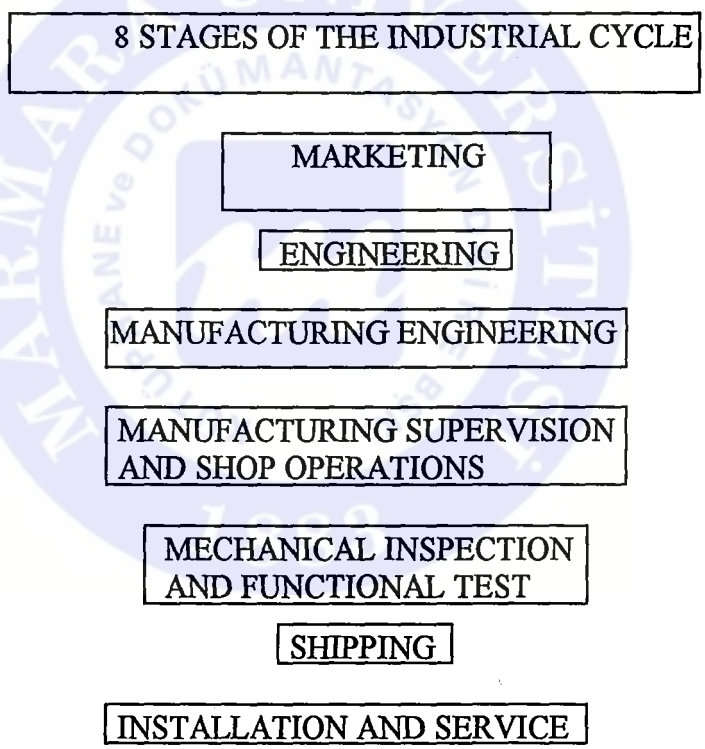


Fig 1.

1. Marketing evaluates the level of quality which customers want and for which they are willing to pay.

[14] Feigenbaum A.V., "Total Quality Control", third edition, p.11.

2. Engineering reduces this marketing evaluation to exact specification.

3. Purchasing chooses, contract with, and retains vendors for parts and materials.

4. Manufacturing engineering selects the jigs, tools, and processes for production.

5. Manufacturing supervision and shop operators exert a major quality influence during parts making, subassembly, and final assembly.

6. Mechanical inspection and functional test check conformance to specifications.

7. Shipping influences the caliber of the packaging and transportation.

8. Installation and product service help ensure proper operation by installing the product according to proper instructions and maintaining it through service.

3.5 TOTAL QUALITY MANAGEMENT

Total quality control includes in depth not only the activities of the quality control function, but most importantly, the interdependent multifunctional quality activities throughout the organization. Or as a definition;

"Total Quality Control's organizationwide impact involves the managerial and technical implementation of customer-oriented quality activities as a prime responsibility of general management and of the main-line operations of marketing, engineering,

production, industrial relations, finance, and service as well as of the quality-control function itself.

The importance of this organizationwide impact is that for many organizations much of the quality-improvement demand today lies outside the work of the traditional inspection-and-test-oriented quality-control function. Traditional quality-control programs have been to limited in the face of some production processes that, in their present form and concept, simply will not produce the need consistency of quality; in the face of some product designs that were created in overly narrow functional engineering terms and are just not sufficiently reliable in actual customer use; and in the face of product service programs that were developed in Band-Aid terms and can not provide the necessary levels of product maintenance.

Truly effective total-quality-control programs enter deeply into the fundamental concept of such product designs, into the basic setup of such production processes, and into the scope of such product service because there is no other way to achieve the necessary levels of quality in today's market.

One essential contribution of total-quality programs today is the establish-ment of customer oriented quality disciplines in the marketing and engineering functions as well as in production. Thus, every employee of an organization from top management to the production-line worker, will be personally involved in quality control.

A powerful total quality control capability is one of the principle managerial and engineering strength for a company today, providing a central hinge for economic viability. The institution of total quality control significantly broadens and deepens the work and the very concept of quality control in a modern company. It

permits what might be called total quality management to cover the full scope of the product and service "life cycle" from product conception through production and customer service.

3.5.1 The Five Drivers of Total Quality

One difficulty sometimes encountered when implementing total quality is communicating what the big picture of total quality means to employees throughout the organization as well as suppliers and customers. The Menasha Corporation, a diverse manufacturing company, uses a simple model called "The Five Drivers of Total Quality". The five drivers are;

1. People quality
2. Entrepreneurial and innovation quality
3. **Information quality**
4. Planning/decision quality
5. Process/execution quality [15]

Information quality is a critical driver of any successful TQ system. Entrepreneurial and innovation quality (Driver 2) has a long term influence on success, but it is strongly influenced by the ways information is gathered and processed. Clearly, people quality (Driver 1) has a strong influence on how information is obtained and used. (Fig 2)[16]

A useful outline that illustrates the importance of information quality is discussed in Peter Senge's book, The 5th Discipline,*(New

[15] Grahn D.P., "Five Drivers of Total Quality", Quality Progress, Jan.1995, pp. 65-70.
[16] Grahn D.P., "Five Drivers of Total Quality", Quality Progress, Jan.1995, pp. 65-70.

York, NY, Bantam,Doubleday,Dell Publishing Group Inc.,1990). A brief summary follows;

- If only raw, ***unorganized data*** that represent pure events are received, then people can only react to individual events.

- ***Information*** that is organized in potentially useful ways can help people visualize patterns of change.

- ***Understanding*** can be achieved by digesting and analyzing information. Although understanding allows people to anticipate or predict what is likely to happen next, not enough is known about what is really happening to reliably effect change.

- ***Knowledge*** can be achieved by using analytical skills, reasoning skills, critical thinking, and experimentation so that there is enough understanding to take action. With knowledge, predetermined action can be taken with a reasonable ability to predict the short-term results. Knowledge, however, is frequently mistaken for wisdom.

-***Wisdom*** can be achieved by understanding the underlying systematic structure (true causal relationships). Wisdom is knowing the long-term consequences of actions. It can take a long time and many mistakes before true wisdom about the behavior of a complex, real life system is achieved. Fortunately, a number of new systems thinking tools have been developed that can dramatically compress this time frame (like brain storming, behavior, structural thinking etc.). These tools help people learn systemic influence and structure by making the system visible and by letting them make mistakes in a "safe environment".

Flexible adaptable information systems that provide enhanced potential for understanding, knowledge, and wisdom by effectively using new concepts, methods and the tools of systems thinking must be developed.

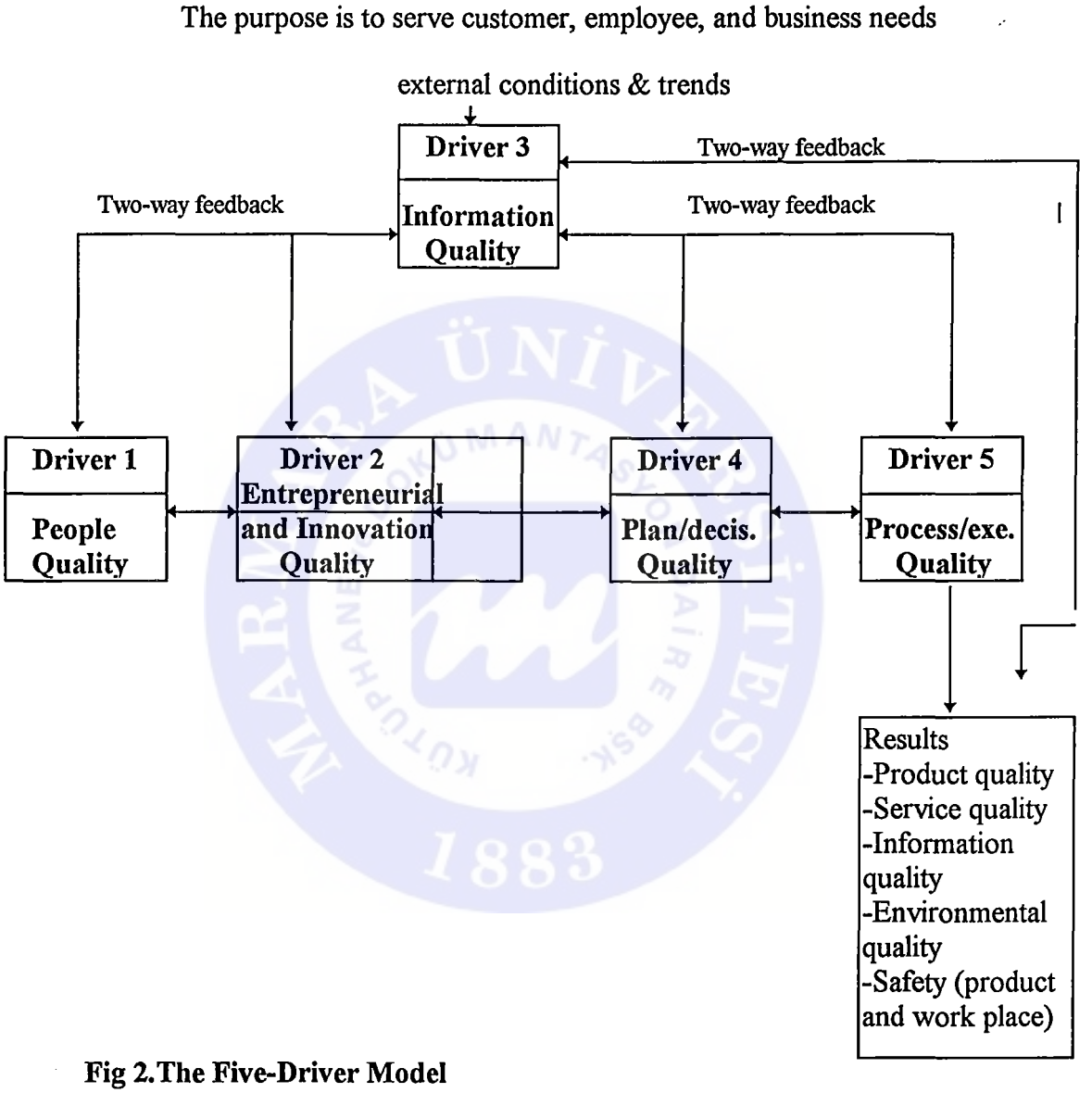


Fig 2.The Five-Driver Model

3.6 THE SYSTEM APPROACH TO QUALITY

The system approach to quality begins with the basic principle of total quality control that customer satisfaction can not be achieved by concentrating upon any one area of the plant or

company alone-design engineering, reliability analysis, inspection quality equipment, reject troubleshooting , operator education, or maintability studies-important as each phase is in its own right. It is achievement depends, instead, both upon how well and how thoroughly these quality actions in the several areas of the business work individually and upon how well and how thoroughly they work together. The creation and control of the proper product and service quality for the plant and company require that the many quality activities in its product and service cycle be integrated and measured-from market identification and product development and design through shipment and product service- on an organized, technically effective, and economically sound basis.

Total quality control work requires effective ways to integrate the efforts of large numbers of ***people*** with large number of ***machines*** and huge quantities of ***information*** . Hence, it involves systems questions of significant proportions, and a systems approach is inherent in total quality control. Effective quality control requires the strong coordination of all the relevant paperwork and software and hardware and handbook activities. It requires the integration of the quality actions of the people, the machines and the information into strong total quality systems; in short "quality system". As a definition;

"Quality system is the agreed on, companywide and plantwide operating work structure, documented in effective, integrated technical and managerial procedures, for guiding the coordinated actions of the people, the machines, and ***the information of the company*** *and plant in the best and most practical*

ways to assure customer quality satisfaction and economical costs of quality".[17]

(A system is a group or work pattern of interacting human and/or machine activities, directed by information, which operate on and/or direct material, information, energy, and/or humans to achieve a common specific purpose or objective.)

The quality system is the foundation of quality control, always providing the proper channels through which the stream of essential product-quality- it makes up the main line flow of the total business system. Quality requirements and product-quality parameters change, but the quality system remains fundamentally the same.

3.6.1 The Total Quality System Principles

There are several principles which are fundamental to quality-systems engineering and which can be readily stated:

1. *Quality-system engineering relates quality technology to quality requirements.* On the one hand, it provides the "feedforward" basis for identifying the total- product- and service-quality requirements that will provide full effectiveness and economy in customer quality satisfaction. On the other hand, it provides the basis for identifying the quality technology that is available to meet these requirements-including quality engineering, process-control engineering, and quality information engineering. This includes what might be termed "hardware" technologies-that is, those bearing upon quality information equipment-in relevant areas such as electronic and electrical, mechanical, nuclear, chemical, and metallurgical subjects. It also includes what might be termed planning and control technologies-that is, those bearing upon

[17] Feigenbaum A.V., "Total Quality Control", third edition, p.78.

human and procedural quality engineering and process control engineering matters-in such relevant areas as quality research, design review, process control audit, training and similar subjects.

2. *Quality systems engineering relates this quality technology to quality requirements in an organized form of necessary specific procedures and controls*. Moreover, because there is always a constant influx both of new requirements and new technology which bear upon system activities, the work of quality systems engineering is the basis for this balancing-off of requirements and technology by guiding the introduction of practical improvements in the system as well.

3. *Quality systems engineering considers the total range of relevant human informational, and equipment factors needed for these procedures and controls.* It considers and integrates a spectrum of human, material, procedural, equipment, information and financial factors. This type of many-factor consideration is in sharp contrast to the almost exclusive concentration upon one or another of these factors that has been typical of other, narrower approaches to quality work-such as emphasis upon either purely paperwork procedures or purely technical product designing.

4. *Quality-systems engineering specifically establishes the "feedback" measurements against which the quality system will be evaluated when in operation.* It explicitly establishes the several, overall quality economic and effectiveness measurements which will be used.

5. *Quality-systems engineering then structures the necessary quality system objectively and provides for audits of the system.*

6. *Quality-systems engineering and management provides for the ongoing control of the quality system in use.*

Thus, quality-systems engineering process involves technical effort of the most rigorous sort.

3.7 KEY TERM ACTIVITIES FOR TOTAL QUALITY CONTROL

A quality system that has been engineered and is being managed-as compared to one that has merely casually grown-is structured to meet such objectives as the following:

- Defined and specific quality policies and objectives
- Strong customer orientation
- All the activities necessary to achieve these quality policies and objectives
- Organizationwide integration of the activities
- Clear personnel assignments for quality achievement
- Specific vendor control activities
- Thorough quality-equipment identification
- *Defined and effective quality information flow, processing and control*
- Strong quality-mindedness and organizationwide positive quality motivation and training
- Quality cost and other measurements and standards of quality performance
- Positive corrective action effectiveness
- ***Continuous control of the system, including the feedforward and feedback of information and the analysis of the results, and comparison with the present standards***
- Periodic audit of the system activities

The key systems activities which will best meet the objectives of a specific company will, of course, be tailored to that company's requirements, resources and goals. The systems engineering task for

the company will involve documentation of the various systems and subsystems that make up the total quality system which works for the particular company. While the activity emphasis in portions of specific company quality systems vary, certain subsystems can be basic in programs for total quality control. Some examples of the systems could be as follows;

1. Preproduction quality evaluation
2. Product and process quality planning
3. Purchased material quality planning, evaluation and control
4. Product and process quality evaluation and control
5. ***Quality information feedback***
6. ***Quality information equipment***
7. Quality training, orientation and work force development
8. Post production quality service
9. Management of the quality control function
10. Special quality studies etc.

Figure 3[18] illustrates the contribution made by each subsystem to implementation of the four basic jobs of total quality control.

TOTAL QUALITY CONTROL

NEW DESIGN PROCESS CONTROL	INCOMING MATERIAL CONTROL	PRODUCT CONTROL	SPECIAL CONTROL
PREPRODUCTION QUALITY EVALUATION		PRODUCT AND PROCESS QUALITY EVALUATION AND CONTROL	
PRODUCT AND PROCESS QUALITY PLANNING			SPECIAL QUALITY STUDIES
PURCHASED MATERIAL QUALITY PLANNING EVALUATION AND CONTROL			

[18] Feigenbaum A.V., "Total Quality Control", third edition, p.95.

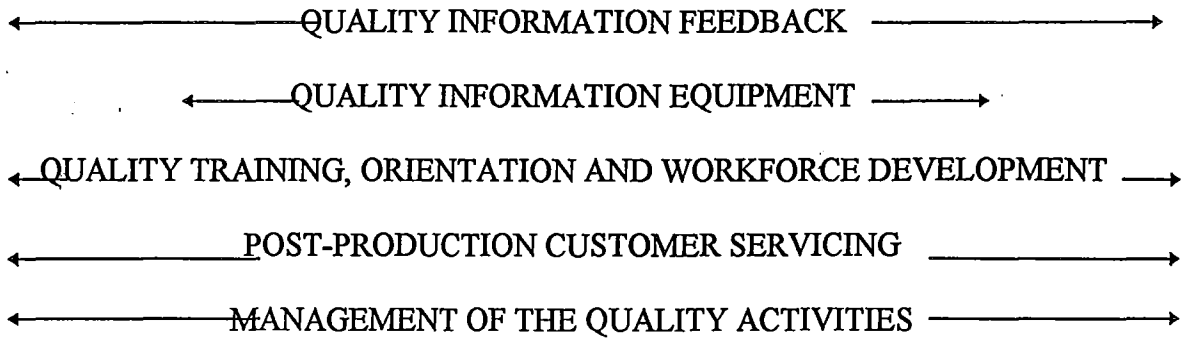


Fig.3.

3.7.1 Quality Information Feedback

This is the information system which forms a part of the quality system. It supplies the quality information needs of key personnel in the various functional areas. [19]

Procedures are established to analyze the quality information needs of all positions: vendors, purchasers, production-control people, shop supervisors, shop personnel, manufacturing planners and engineers, quality-control engineers and equipment designers, quality assurance supervisors, quality-assurance personnel, product-design engineers, product planners, sales-people, product-service supervisors and personnel, customers, and general and functional managers. When analyzing needs, criteria are established for content, frequency, and permissible time delay. This is done for each position to provide timely decisions for effective action in quality areas.

Specific procedures are established which implement data collection, tabulation, analysis and distribution. Included here are

[19] Feigenbaum A.V., "Total Quality Control", third edition, p.99.

formats that will be concise with respect to responsibility for corrective action and sound with respect to measurements and their comparison bases. Formats for the following kinds of reports should be developed: incoming-material quality evaluations, in-process quality evaluations, end-of-line quality evaluations, product reliability and life evaluations, manufacturing losses, in-process quality audits, outgoing product-quality audits, field failure, and service-call rates, complaint expenditures, special studies reports, various quality costs, and quality system measurements reports.

Periodic review of the quality information system is necessary to keep it current in meeting the changing needs of the company. Besides identifying new positions that require certain quality information, attention should be given to eliminating distributions currently serving no useful purpose.

The development and use of automatic quality-level-indicating devices are also considered factors in the quality information system. The past few years have seen a rapid growth of instrumentation which provides the means for communicating quality information to a control center.

3.7.2 Quality Information Equipment

Quality measurements that are necessary for the control of quality are identified during product- and process-quality planning. Planning also includes identification of measurement methods and the type of measuring and control equipment that is to be used. The quality information equipment subsystem provides the procedures for procuring this measuring and control equipment. Such activities has advanced development aspects, which include study of the long-

range needs of the company's business with respect to measuring equipment based upon new products, new processes, and improvements in product quality, flow, and costs. Special studies are made to develop new basic measuring techniques and their adaptation and integration into mechanized and automated manufacturing equipment's. Procedures for programming advanced information equipment development are included in the system.

Procedures for equipment design and application include development of design requirements; analysis of the quality system to determine most effective and economic measurements, required precision, and accuracy and to determine the best method for measuring each quality characteristics; development of specifications for quality information equipment and cost estimates covering design development, construction, and initial application costs; execution of such work, keeping the quality information equipment updated to meet new needs arising as a result of design changes, process revision and application experience in the field; provision for proper maintenance and calibration, origination and maintenance of schematics, blueprints, layouts, replacement part lists, and operating and maintenance instructions, including safety precautions; and means for measuring overall effectiveness of the quality information equipment area.

As manufacturing operations become more mechanized and automated, the quality information equipment activity gains increasing importance. As a matter of fact, a proper degree of development in automated measurements is often a prerequisite to automated manufacture.

3.8 TOTAL QUALITY ORGANIZATION STRUCTURE (from the subfunctions' point of view)

Since total quality control guides and coordinates the actions of people, machines, and information across the whole range of key company activities, it is essential that quality be organized effectively and economically companywide.

There are there considerations in the development and operation of this total quality organization. The first is the identification and confirmation of the specific quality work and teamwork -including the responsibility, authority, accountability and relationships for quality- of each of the key individuals and groups in the company and the plant.

The second consideration is the identification and confirmation of these same areas for the quality-control function itself so that it may help the company achieve its quality objectives.

The third consideration is the leadership of company and plant management itself in the establishment and ongoing maintenance of quality organization.

The basic managerial and technological foundation for the work and interrelationships of this organization is provided by the total quality system of the company and the plant.

Several modern marketplace, technological, and economic factors have established major requirements upon organizing for quality. Four of these factors are particularly important;

1. Traditional quality programs, were in the past, thought of as a single function in the company. Today, instead, they must be recognized as a systematic group of quality disciplines, be applied

on a coordinated basis by all functions throughout the company and plant.

2. Traditional quality programs were, in the past, several organization layers removed from satisfactory direct, ongoing contact with the buyers and customers of the company's products and services. Today, instead, they must be continuously coupled with the buyer and customer on both a feedforward and feedback basis.

3. Quality problems transcend and do not respect individual functional organizational boundaries within companies. Today, the quality program must be organized accordingly, if it is to be realistic.

4. Quality related operations in companies have become so extended, intricate, and involved today that the need for integrated, high-level controls of primary rather than secondary importance, as in the past. This is necessary to assure orientation to the real facts of the quality of new products under development, to receive "early warning" of impending production-quality problems, and to permit management to run its quality operations rather that be run by them.

Together, these four factors represent the forces that are placing the establishment of strong total quality organization at the primary level of general management attention.

The task of quality organization is operation and integration, in the framework of the total quality system, of the activities of the persons and groups who work within the technological framework represented by the quality-control jobs.

Establishing an adequate quality organization for a company is a job of human relations. Guides to the structural patterns that are useful may be found in industry's experience during past several years. This experience may be gaged against the backdrop of the organization planning methods which are widely and effectively used. The patterns emerging as most successful may be readily summarized regarding their essentials:

Basic quality responsibility rests in the hands of company top management. Over the past decades, top management, as part of the general industrial trend toward specialization, had delegated portions of its quality responsibility to such functional groups as engineering, manufacturing, marketing, product service, and quality control. In addition, the all-important responsibility of each worker for producing quality products has, if anything, increased over this period of years with the increasing complexity both of products and production machinery.

Fundamental to building the organization structure which puts this process to work, and thereby brings the four quality-control jobs (new design control, incoming material control, product control & special process control) to effective use, are two quality organizational principles; the first principle is that quality is everybody's job in a business.

Total quality programs require, as an initial step, top management's reemphasis of the respective quality responsibilities and accountabilities of all company employees in new design control, in incoming-material control, in product control, and in special process studies.

The second principle of total quality control organization is a corollary to the first one: because quality is everybody's job in a business, it may become nobody's job. Thus, the second step required in total quality programs becomes clear. Top management must recognize that the many individual responsibilities for quality will be exercised most effectively when they are buttressed and serviced by a well organized, modern management function whose only area of specialization is product quality, whose area of operation is in the quality-control jobs, and whose only responsibilities are to be sure that the products shipped are right- and at the right quality cost.

3.8.1 Key Organizationwide Quality Responsibilities and Authorities

In the determination and confirmation of key quality responsibilities, organizationwide, a typical breakdown of some of the major functional groups which have key responsibilities and authorities for product and service quality is as follows:

1. Product planning, marketing, and sales, for the product description that will best fulfill the customer's wants and needs in use, the presentation of product quality data to the customer, and the determination of quality standards with the customer.

2. Product engineering, for the original product design, the writing of specifications, establishment of guarantees, and the selection of materials, tolerances, and operating characteristics.

3. Manufacturing engineering, for the selection of machining and processing equipments; the design of appropriate jigs and fixtures; analysis of certain types of manufacturing difficulties which may arise in producing quality of the desired standard; and the selection of methods, development of work places, and provision of satisfactory working conditions.

4. Purchasing, for choosing vendors and the quality guarantees demanded from vendors.

5. Laboratory, for the quality standards set for materials and processes; the approval of the quality of critical materials, either purchased or processes; and recommendations on the use of special processing techniques.

6. Production supervision, for operator education; proper attention to, and care for, manufacturing facilities; proper interpretation of drawing and specifications; and for actual control over the manufactured parts as they are being produced.

7. Production employees, for skill, care, and quality of workmanship

8. Inspection and testing, for judging the quality of incoming parts and materials and appraising the conformance of manufactured parts and assemblies to specifications.

9. Packaging and shipping, for the adequacy of the container into which the product is placed and for the shipment of the product.

10. Product service, for providing the customer with the means for fully realizing the intended function of the product during its expected life: for example, maintenance and repair instructions and replacement parts.

Other groups like production control, wage rate, personnel share in these quality responsibilities. Some specialized activities motivational research, for example, have product quality as one of the major reasons for their existence.

3.8.2 Key Quality-Control Responsibilities and Authorities

To help general management and the heads of these several functions meet their own quality responsibilities so as to obtain the necessary business quality results, the two basic authorities of a modern quality-control function may be formally stated as first, to provide quality assurance for the business's products, and second, to assist in assuring optimum quality costs for those products.

To exercise these authorities, three principal responsibilities must be assigned to the quality-control function:

First, the modern quality-control component has a business responsibility, whereby quality control provides a primary and direct contribution to the business planning and business implementation actions of the firm's market growth, its cost control, and its product planning in customer life cycle quality terms. This is in direct contrast to the quality component being asked to react to business quality problems only after they are occurred.

Second, the quality-control component has a systems responsibility, whereby quality control provides the primary leadership in the company for the engineering and management of a strong total quality system that assures quality and quality cost from marketing and engineering through production and service.

Third, the quality-control component has a technical responsibility, whereby quality control provides for the major operating control and assurance activities. These three responsibilities represent the necessary work that modern quality control must accomplish to provide the positive quality contribution that is so essential to business health.

To make clear and concrete the work, authorities, and responsibilities involved in implementing the two basic principles of modern quality organization, general management must clearly and specifically document and communicate to all employees- the quality structure of the company and the plant in the necessary organizational detail. This structure, covering companywide quality responsibilities throughout all four jobs of total quality control,

represents the organizational realization of the formal published quality policy of the company.

Authorities, responsibilities, accountabilities, and relationships of the modern quality control component itself are fulfilled through its three subfunctions, which are quality engineering, process control engineering (including also inspection and testing), and quality information equipment engineering.

In general;

Quality engineering develops the detailed quality planning, which contributes to and implements the quality system for the company. Also, when the information flow is taken into consideration, quality engineering analyzes quality information and feedback analyses and recommendations for adjustment to product design, manufacturing process and equipment, and the quality system; ascertains the specific quality information feedback needs of general management and all key personnel in manufacturing, engineering, marketing and other quality related departments in the organization, ensures timely delivery of action-centered data and reports which make for optimum quality related decision making. Quality engineering is also responsible from quality control communication; develops and initiates efficient methods for regularly reporting to managers and other interested personnel the current status of product quality improvement and continued quality efforts, keeps management regularly informed on status and progress made on quality control programs and plans.

Quality information equipment engineering designs and develops the inspection and testing equipment for obtaining the necessary measurements, controls, and information flow for quality. Where justified, This equipment is combined with production to provide automatic feedback of results for control of the process. All pertinent results are then analyzed as a basis for adjustment and corrective action on the process.

FIXED AND VARIABLE WORK ELEMENTS

FIXED

Quality Engineering	Quality Information Equipment Engineering	Process Control Engineering
. Quality objectives	. Design and provide quality information equipment	. Interpret and implement quality control plan
. Pre production quality definition,including reliability safety&related quality characteristics.	. Mechanization&automation of quality measuring equipment	. Quality audits
. Prescribe quality control plan;where,when,who, how&how much to inspect	. Measurement development	. Process capability studies
Maintenance&quality &test for example. equipment		. control
. Quality cost analysis		. Receiving inspection
. Quality control training		and test . Final inspection and test
. Quality information feedback		
. Diagnosis of quality problem		

VARIABLE

		. In process inspection
		and test . Data recording . Operational planning

Fig 4.

Process control engineering monitors the applications of quality control on the factory floor and thus gradually supplants the older policing inspection activity. (Fig 4)[20]

3.9 QUALITY INFORMATION FEEDBACK

Quality information may be thought of as the intelligence of the total quality control program. The effectiveness through which this intelligence is structured, transmitted and used is one of the principal parameters of the effectiveness of the program.

In principle, this quality engineering technique can be looked upon as the establishment of communications among positions generating information and positions receiving and using information.

The objective is to structure in the form of the necessary procedures the actual, physical information feedback loops. Through these loops, the specific quality results are measured, analyzed, and then fed back for use in replanning. This quality information is the factual basis upon which the correct and timely quality decisions can be made and action taken. The following are three primary aspects of emphasis in this activity, two of which concentrate in individual quality areas and one of which is oriented to the overall plant and company (Fig5).

Primary Aspects of Quality Information Feedback

1. Identification of the explicit information
2. Establishment of information flow
3. Integration of quality information

[20] Feigenbaum A.V., "Total Quality Control", third edition, p.176.

1. Identification of the explicit information, as appropriate, in all existing quality plans- whether in customer quality determination, design review, process capability analysis, and similar areas.

2. Establishment of essential quality information flow procedures, in such areas as inspection as test reporting, customer complaints, and vendor performance.

3. Determination of the overall plant and company quality information flow requirements, evaluation of the effectiveness of the existing flow pattern, establishment of the overall plan for evolving the existing information flow to that which is needed, creation or adaptation of the necessary quality information procedures and integration of overall quality information flow pattern.

Fig5.

In each of these areas, the most through possible use must be made of modern information processing approaches and technology- including data flow analysis and planning- which have been developed with great success throughout industry. Today, this represents an essential discipline in the development of quality information requirements.

However, experience over years has made very clear that the quality information requirements must be first be developed for the need of the user- whether in management, production, marketing , engineering, or quality control itself-and second, in terms of the data processing patterns and equipment that are the most efficient. The quality control function has a primary information handling leadership role in this first area; it must work closely with the data processing function of the company, wherein the expertise will most likely reside concerning the second area.

There are several important areas in the needs of the user. One is the explicit establishment of these needs for all key positions

in the plant and company. A second area is standardization of reporting throughout the plant and company so that there are common understanding and clear communications, ranging from defect definition in quality levels and scrap listing in quality costing to reliability assessment in vendor performance reporting on electronic components. A third is establishing the reporting formats, routines and time frequency as well as the functions to receive the reports and the types of quality engineering analysis that will be performed.

There are also several important areas in establishing the most efficient handling of quality information. One is to standardize and correlate the measurements of parts and components when the same measurements are made by different methods or equipment at different points in the design and production cycle. A second is to provide that there will consistently be, in quality plans, analysis of measurement data to seek out relationships between like process operations or like parts. For instance, it may be discovered upon examination that while cost or quality data from a given line or process area show no tendency to indicate an out-of-control condition, the same data when rearranged and looked at in respect to a single part may show a definite trend toward an out-of-control condition. A third is to distinguish between short loop information flowing within a single work station or process line- which will require almost immediate or real time feedback and longer loop information flowing throughout the plant or business, which may be handled in batch or off-line fashion.

In structuring the information for quality plans and procedures, quality control, data processing, and other key functions of the plant

or company must determine the answers to such questions as the following:

. What kind of information are essential?

. How much information is needed?

. What are the sources of the information?

. How should the information be transmitted-manually, by computer, by some combination of two?

. To what positions should information be sent?

. How frequently should be sent?

. How fast must it be received to be effective?

. In what form should it be presented to be immediately usable as a basis for decision and action?

. How can the existing plant and company data base be used as a quality data input and for quality data output?

The effectiveness of the quality information system that is planned for the answers to these questions should, in turn, be measured periodically to ensure that it remains efficient. Such measurements must determine that

. Hard copy paper work is kept to a minimum

. Only usable data are being transmitted

. Data are going to positions whose responsibilities call for its use

. Data are adequate and being properly applied

. The information flow is being adequately maintained

. The information is producing effective and timely decisions for corrective action

. Quality information processing takes place in the most cost-effective operation-equipment-work force-data utilization.

For on-going operation of quality information feedback, the two major methods for collection and transmission of quality data are manually and by computer. In any increasing number of total quality programs, quality information is an integration of manual and computer methodology to furnish timely and accurate information.

The extent of computerization is fundamentally an economic determination and generally depends on the type, size and needs of the plant and company.

However, to assure most efficient computer use for the actual user applications, the original planning of information feedback will typically be manual, to prove adequacy of information, to assure the clarification of user needs, and to confirm the quality requirements of the business.

A major quality engineering technique is the use of modern data processing equipment and computers, integrated into all relevant areas of quality control. This not only can speed up the timeliness of quality information-frequency today can be fractions of a second, if needed, to minutes or hours as compared to days or even weeks as in the past-but in some cases can make possible information flow that could not otherwise exist.

Computer application, integrated within careful quality-engineering, planning, can be a very useful tool in dealing with the basic demands of quality information flow, which are that;

. Effectiveness of quality information is dependent upon the promptness of the report.

. Time lags that discourage prompt corrective action must be eliminated.

. Trouble spots must be quickly brought to the attention of those who can do something about it.

Good reporting formats must be established which indicate responsibility for action, type of action and follow-up with a measure of the effectiveness of action.

Computer hardware-that equipment and software-that is, programs to drive the hardware- are today available for, are used in, a very wide range of quality-control applications, from customer quality data and prototype testing through incoming-material and production-quality-level results to field testing and service reports. Hardware availability for quality control today includes mainframe computers, on which certain forms of quality data can be run; PCs which can be directly dedicated to such quality control operations as product testing; microprocessors, which can be integrated with inspection devices to provide control-limit evaluation as part of the meteorological work. Software ability for quality control today includes a variety of programming languages through high-level languages and others-which have application to particular quality-control usages.

Next chapter, quality system and data flow in this system will be evaluated. Mostly, computer applications are nor used in the company. After an information system will be designed, this system might be transferred to the computer environment as the time being.

4.0 INFORMATION SYSTEM DESIGN FOR QUALITY CONTROL ACTIVITIES

4.1 INTRODUCTION OF THE COMPANY

The company produces electric resistance welded steel pipes and tubes in compliance with technical international standards such as API, ASTM, BS, JIS, DIN, ISO, NFA & TSE. Customer adapted pipes and casing, industrial & structural pipes, boiler and cylinder tubes, greenhouse and precision tubing are produced using know how accumulated over three decay of pipe manufacturing, R&D, state of art technology. The company has two main mills, also two others operating independently, one is set up on an area of 58.000sqm., 20.000sqm. of which are covered, with an annual capacity of 70.000 tones, the other occupies a total area of 614.000sqm., 70.000sqm. of it covered with an annual capacity of 300.000 tones. The first, namely plant A, manufactures industrial pipes & tubes, open sections for the construction industry, refrigerator tubings, textile tubes, pneumatic & hydraulic tubes, high quality cold-rolled precision tubing. The plant also has a cold rolling mill with an annual capacity of 25.000 tones that includes pickling, strip annealing and skin pass units. Plant B incorporates a stretch reducing mill, conventional lines, galvanizing section, finishing unit, complete slitting & cut to length lines, steel coupling and bitumen coating units cold drawing & annealing installations and machinery, manufacturing workshops. The product range includes block, galvanized and varnished water, gas & petroleum pipes and hollow sections.

The company management is of a general manager, two assistant general managers, one is sales and marketing, the other is purchasing and planning. There exists also an executive committee of general manager, assistant general managers, factory managers and finance manager. The Quality Department is a staff function in the organization like R&D Department. (For the organization of the company see Appendix 1)

4.2 THE HIGH FREQUENCY INDUCTION WELDING PIPE & TUBE PRODUCTION PROCESS

The starting material for such kind of pipe production is hot or cold rolled strip. The coils are unwound at the start of the pipe welding plant and to enable continuos operation, the trailing and leading ends of the coils are welded together, thus forming an endless skelp, which is then fed via a loop pit into the forming section of the pipe welding machine.

In the edge trimming machine the skelp is machined to the exact width required for the pipe diameter. It is then fed to a multiple-stand forming section, where at first both edges are slightly crimped and then, as the skelp passes through a variety of forming rolls, it is continuously bent to an open pipe. Highest accuracy during this operation is a vital pre-condition for the quality of the weld. In the welding section of the plat, the open pipe passes through an inductor by which it is totally enclosed. The voltage induced in the pipe generates an alternating current which via pipe back, welding edges and welding point forms a circuit. In a narrow zone along the edges, this high frequency current immediately

generates the welding temperature required at the welding point. The welding pressure can be adjusted according to the relevant pipe size and material. It is created by means of pressure rollers, which firmly press and weld the heated skelp edges together. This means that the weld is formed from the pipe material without using any filler metal.

With the welding pressure already being pre-set, it is the welding temperature which mainly determines the quality of the weld.

The internal and external flash which has formed during pressure welding is removed by special equipment. In this way, truly effective non-destructive testing of the weld seam be carried out.

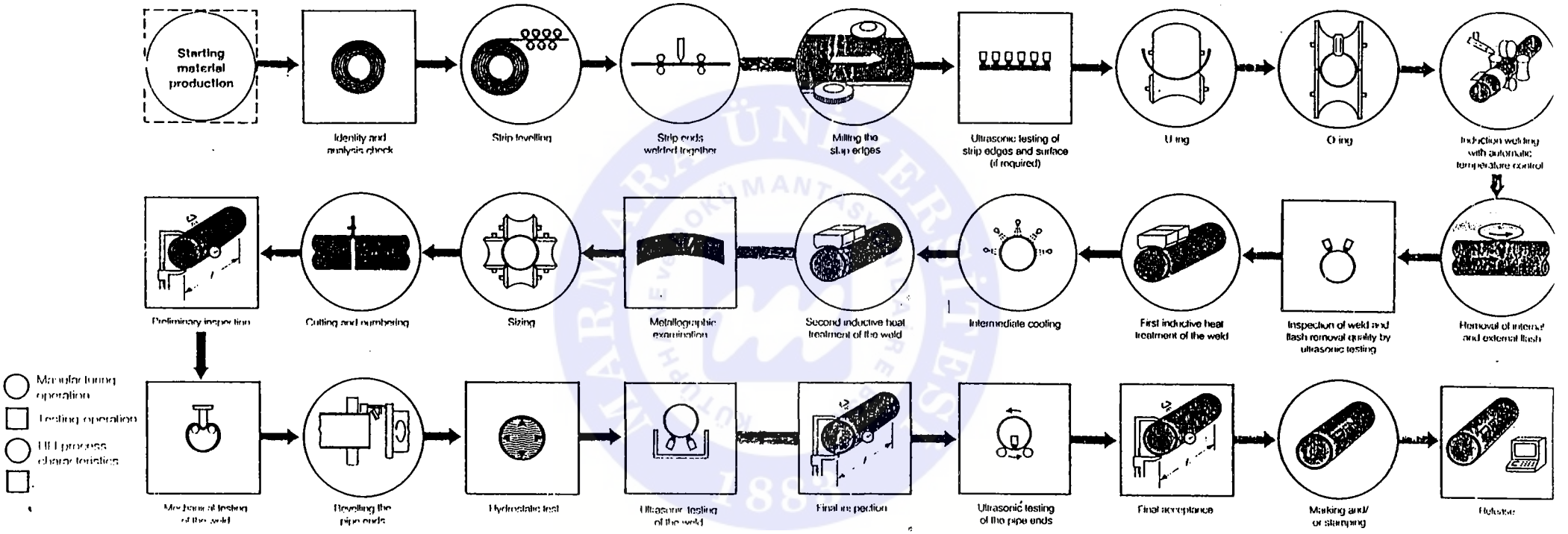
The required annealing treatment of the weld is carried out in an induction annealing plant.

In a sizing and straitening mill, the pipe string receives its exact outside diameter and is straightened. By means of flying saws, the pipe string is cut to the desired lengths.

Welded pipe with outside diameters greater than 168mm and precision steel tubing with outside diameters up to 168mm are already welded to size. With outside diameter of 168mm and smaller, pass through a hot reducing mill, to achieve the desired finished size. For drawn precision steel tubing, this is effected through cold drawing.

Following non-destructive and mechano-technological testing, the pipes are released for shipment.

The flow chart of the production is shown in Fig. 6


Starting material production
Identity and analysis check
Strip levelling
Strip ends welded together
Milling the strip edges
Ultrasonic testing of strip edges and surface (if required)
U ing
O ing
Induction welding with automatic temperature control
Removal of intern and external flash
Inspection of weld and flash removal quality by ultrasonic testing
First inductive heat treatment of the weld
Intermediate cooling
Second inductive heat treatment of the weld
Metallographic examination
Sizing
Cutting and numbering
Preliminary inspection
Mechanical testing of the weld
Bevelling the pipe ends
Hydrostatic test
Ultrasonic testing of the weld
Final inspection
Ultrasonic testing of the pipe ends
Final acceptance
Marking and/or stamping
Release
Manufacturing operation
Testing operation
NDT process characteristics

4.3 REQUIREMENTS FOR THE DESIGN OF THE INFORMATION SYSTEM

The analysis of requirements for designing an information system was conducted in steps. The strategies followed for determining information requirements are;

1. Interviewing with the related people

2. Sampling documents and records of information used by personnel for order approval and entry, purchasing, QC activities and other quality system activities and also customer complaint handling

3. Determining necessary and suitable reports and forms for the processes by discussing with the related departments

4. Observing actual processes and procedures of quality related topics

5. Studying any existing standard or documented procedures and manuals.

4.4 OBJECTIVES OF DESIGNING INFORMATION SYSTEM FOR QUALITY CONTROL ACTIVITIES

The rapid growth of the company production volume at recent years, especially export productions and sales has brought about a need to examine current quality system and quality control data flows. The quality control procedures and other activities, which could be evaluated in the quality system, seem to be satisfactory from company and customers point of view, to ensure product quality, but lack of information flow among departments, more than

this through customers and the insufficient data storage are very obvious.

The objectives of such a system design and hence the aims of this study are;

1. To describe all quality control activities, order processing, purchasing and customer complaint activities, including formal and informal communication requirements,

2. To identify and specify all critical data elements used to process QC* activities, to maintain customer orders and purchasing data, which is very closely related with the quality concept, while all raw material purchasings are done according to the company's standards prepared by Quality Department, and to handle customer complaints,

3. To store necessary QC data ensuring the tracebility of the product,

4. To ensure related QC data received by related personnel / or people for the continuation of the quality system,

5. To design necessary forms to contain all data in circulation / or should be in circulation related with the process

6. To determine current strategies for record retention, access control, storage

7. To redesign all the QC forms and quality system related forms to allow them contain all the related information, including the responsable personnel and controller's approvals.

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* QC denotes Quality Control.

5.0 QUALITY CONTROL ACTIVITIES

Two Quality Control Departments in the plants carry out their operations under the management of Quality Manager.

QC Department controls all the receiving raw materials used directly at the production, ensures the product quality by directly product controls at the different steps of the production or by process control.

At the production, especially at the production machines product quality is checked by both QC personnel of the shift and operator, responsible from manufacturing.

At the production machines, operators control the following items;

Dimensional check (external diameter, thickness, length)

Cutting quality for the pipe

Surface quality

Welding tests (widening and flattening)

Linearity

At hollow sections and rectangular & square tubes;

Welding line positioning

Eccentricity

All work instructions are coded as A or BQCI 00, reports are coded as A or BQC 00. All the reports, forms and a copy of the shift reports are sent to the QC Departments. QC forms are of two copies. One is sent to the related Production Chief. The second is

for the QC for the evaluation and decision when necessary. Factory Manager looks at the QC copy whenever necessary. Every day by using this data, QC decides on scrapsand second quality products. Results are sent to Production and materials and products are classified according these results by Production. QC Department evaluates results and reports the results monthly to the management as activity report. Also this evaluation is used by the Planning Department to show scraps and second quality products at the monthly Technical Report.

QC activities are discussed at Management Review and Quality Meetings too.

QC departments also prepare the company's raw material specs which have tighter limitations than international standards to guarantee more accuracy in quality. These specs are revised yearly or whenever deemed necessary.

QC Departments control the shipment and transportation for the export sales, take photographs of products and write down an shipment report. A copy of this report is sent to the Export Sales Department. Original is stored at QC in the file of related customer.

5.1 TESTING OF STEEL PIPE AND TUBE

A basic requirement for quality assurance is the continuous monitoring of the individual production stages and uninterrupted quality control. Company's quality assurance system covers the entire production process from steel melting to the specified final acceptance inspection. The scope and type of the testing depends on the intended application, i.e. the degree, duration and type of

stress the pipe must be able to withstand under service conditions. This concerns e.g. the operating pressure and temperature and the manner in which the stress acts upon the pipe, which may be static, pulsating, or even in the form of recurring shocks.

Basically, there are destructive and non-destructive tests. The former compromise mechanical and technological tests, carried out on specimens taken from the relevant products. Tensile tests and notched bar impact bend tests serve to establish the mechanical properties of a material: yield strength, tensile strength, elongation, and impact energy.

Yield strength and tensile strength are the decisive criteria when calculating the dimensions of a component. Elongation and impact energy values classify the toughness behavior of a steel.

Technological tests are mainly concerned with the processing and working properties of the pipe. The mechanical and technological tests are complemented by various non-destructive tests. The great advantage of these methods lies in the possibility of testing the entire cross section of the test piece for material flaws without having to destroy it.

The weld is tested using one or several specific non-destructive methods or a combination of methods.

Mechanical and technological tests serve to verify the mechanical properties of the material and the general quality of the product. For steel pipe and tubing used, as structural elements under high stresses in the as-supplied condition, these tests have acquired particular importance.

Most of these test are carried out according to worldwide acknowledged standards or recommendations. In this way, an internationally comparable evaluation basis is created for the quality properties of tubular products made from steel.

The technological tests are aimed at determining the suitability of pipes for further processing in the form of bending, flanging, expanding etc. For certain fields of application, e.g. power station engineering, technological tests are stipulated, to verify absence of flaws in the pipe ends.

All tests are carried our by blue collar lab. personnel, reviewed by head of the lab. and signed by quality assurance engineer. QA engineer differentiate rejects and OKs.

All QC test forms have two copies; one is for Quality Control Department to evaluate the results and afterwards for archiving, the other is for Production Department (evaluated accordingly and then sent to production planning. All these record are collected to be used as data for monthly technical report).

The specimen shapes for all the tests are specified in The Plant Quality Instructions according to international standards or mentioned in production letter as a technical delivery condition by the customer, if any other conditions are necessary for specimens.

Also the working procedures for all tests are specified in the Quality Work Instructions of the plants.

Quality Control Inspectors or Laboratory Workers mention on QC forms whether the results are OK or reject and also put labels of green for OK, Red for rejection and yellow when further examination is necessary. All the raw materials and semi products with yellow

label are out of production till green or red labels are put on them, which means a final decision is made on them according to the further inspections.

At the production department all the rejections whether they are raw material or product/semi-product, are entered to MRP II.

The quality tests carried out in the plants are as follows:

5.1.1 Tensile Test

The tensile test specimens taken from the pipes to be tested serve to determine the strength and ductility values; yield strength , tensile strength and elongation.

Tensile tests are generally carried out at room temperature; however, the testing temperature is increased for structural elements which are subjected to high service temperatures. Apart from standard tests, other methods have been developed which involve constant tensile loads under increased temperatures for verification of the steel's creep behavior.

For tensile test specimen preparation, quality instruction PQCI 01.

The results are recorded on PCQ 20.

5.1.2 Notched Bar Impact Bend Tests

Apart from the strength values established in the tensile test, the impact energy absorbed by the specimen during the notched bar impact bend test is used as a reference value for the toughness of the steel.

During the notched bar impact test, the steel is simultaneously exposed to a high rate of strain and multi-axial stress (constraint).

For specimen taking PQCI 03 is written.

All the results, as body and notch, are recorded on the form PQC 21.

5.1.3 Drop-Weight Tear Test

As a safe guard against brittle fracture, the drop-weight tear test is carried out in addition to the notched bar impact bend test on pipe with outside diameters above 508 mm intended for long distance gas transmission lines.

For specimen preparation PQCI 02 is valid.

Results are recorded on PQC 20.

5.1.4 Crack Opening Displacement Test

COD test serves for determining the plastic deformation properties of materials and weld joints in the vicinity of flaws. The measured values indicate the material resistance to sudden failure caused by instable crack propagation.

Sampling is done according to the related norms or customer requirements.

Results are recorded on PQC 20.

5.1.5 Hydrostatic Test

Depending on the intended application, the hydrostatic test is carried out for testing the leak resistance or the strength properties of a pipe. Hydrostatic test is carried out using water as the pressure medium.

Pipes are subject to the hydrostatic test according to the related norms or the contract done by the customer.

The results are written on PQC 12.

5.1.6 Flattening Test

Sampling and examination is done according to PQCI 12 which is written according to DIN 17172, DIN 1626 and DIN 17177. Operator of the machine takes the specimens from pipes, two for every coil and QC workers do the experiment.

Results are recorded on PQC 20.

During production flattening tests for pipes and tubes are carried out by the machine operators according to PQCI 12 and results are written on PQC 28.

On the shift reports only the rejected ones are written. (All the shift reports are sent to QC Departments to be evaluated in terms of tests, rejects and scraps etc).

5.1.7 Hardness Test

Sampling is defined at PQCI 14, instructions are on PQCI 13; the experiment results are recorded on PQC 22.

5.1.8 Magnetic Test

Results are written on PQC 06 and magnetic tests are carried out according to the instructions which are in the operation book of OME prepared by The Production Department. Machine operators do the tests on-line.

5.2 RECEIVING INSPECTION

5.2.1 Receiving Inspection for Raw Materials

Identified hot or cold rolled mother coils are taken into receiving inspection according to PQCI 15 while they are almost gone to the slitting. During identification, coils are checked for corrosion, surface defects etc. visually. Thickness, width, weight and label data are controlled if they are matched with data written on delivery documents.

According to "material utility plan" which is prepared by the Planning Office coils are taken into examination in four categories:

1. Materials from the first grade suppliers (A grade) stated at the "Approved Suppliers List"

If the material is of a quality beforehand known, then it is given to the production directly.

If it is of a new quality (not a commercial quality) with MTC, specimen is taken per heat. For coils without MTC, 100% specimen (from every coil) is taken.

2. Materials from the second grade suppliers (B grade)

For commercial qualities, specimen is taken per heat.

For the new kinds, MTC is a must and 100% specimen is taken.

3. Overrolling materials from the suppliers mentioned at the approved suppliers list.

An preinspection of mill QC personnel or an independent third party is necessary for the approval of admittance of the material. Then 100% receiving inspection is carried out.

4. Materials from a totally new supplier

Audit is necessary at the supplier's premises by QC personnel or an independent third party. Then for sample production, a lot (weight of the lot is chosen according to the quality to be bought from material utility plan) is ordered and from this lot 100% specimen is taken.

Samples are taken and test are done according to different quality instructions above stated. Test results are written on PQC 20.

If the test results are O.K., then coils are coded according to identification and tracebility procedures and listed on PQC 01. A copy of this form is sent to the Planning Department. Planning enters these coils as stocks to the system.

If coils are taken to quarantine, QC decides if it could be used in some other applications or should be rejected. (The company does the customer complaints and takes all coils from the same ingot or delivery of the same kind into quarantine). quarantine form

is written, factory manager signs it and it is sent to the Purchasing Department.

If there exists a question mark about the commercial qualities, same test can be done after slitting. Results are recorded on PQC 20, but the state of process is mentioned on the PQC 20 too.

QC Department decides whether material should be totally rejected or not. If there is a hesitation about material or any lack of material due to the production schedule Factory Manager decides if coils could be given to the production under control. If it is happen to use them at the production, then coils are given conditionally and marked with yellow labels. At every stage of the production sub-coils and semi-products are controlled one by one with applicable test methods.

For the rejection of any raw material QC Department fills PQC 02 and informs Production Planning and Purchasing. PP Department changes the production accordingly. Purchasing Dept. informs the supplier or request reimbursement.

5.2.2 Muff Receiving Inspection Control

Muffs' receiving inspection is done according to PQCI 19. Measurements are done with samples. Rejects are recorded on a list.

Depending on these results rejected muffs are identified with red labels. Rejected ones are sent back to the supplier. If they are accepted then entered to the stocks; that's why rejected ones are not included to the stock transactions. Only for the ASTM muffs, which are imported, all the muffs are entered to the system, then

rejected ones are excluded afterwards. These system transactions are carried out by the Production Planning Department. QC workers write down the shift reports for the passes and fails, responsible at the stock hole enters the quantity and quality of muffs to the system by the feedback of Production Planning.

5.2.3 Signode Receiving Inspection

Sampling and tests are to be done according to PQCI 20. Rejected ones are marked with red labels.

5.3 WELDING MACHINE CONTROLS

All the semi-finished products entering the welding machines and SRM are involved in QC controls with the sampling size of minimum what is required at the related standard. Results are written on PQC 04 or PQC 05 checked with the ideal range values, out of range products are taken into quarantine and written on the shift report.

5.4 SLITTING TEST FOR GALVANIZED PIPES

Instructions are written on PQCI 10 and results are on PQC 26.

5.5 PEELING TEST FOR GALVANIZED PIPES

PQCI 11 for instructions

PQC 26 for the results.

5.6 VARNISH CONTROL

Surface quality control according to PQCI 25.

Results are on PQC 29.

5.7 MARKING CONTROL

Marking details are given in instructions;

PQCI 200 Finishing, marking acc. to TS 301/3 - TS 914 for all pipes

PQCI 201 acc. TS 416

PQCI 202 acc. TS 11004

PQCI 203 acc. TS 6047 for BS 320 machine

PQCI 204 acc. TS 6047 for SRM

PQCI 205 acc. TS 301/3

PQCI 206 acc: TS 301/3 - TS 914

PQCI 207 acc. TS 416

Control results are written on PQC 29.

5.8 GALVANIZED PIPE CONTROL

At the finishing hole, galvanize coated pipes are passes from visual inspection; rejected ones are labeled with red marks and coated ones more if possible or treated as scrap. (Visual control of galvanized pipes is explained at PQCI 26 and rejected ones are written on shift report).

5.9 EDDY CURRENT

There are on line eddy current devices which are used by the machine operators. If the results are O.K. then pipes pass through. If a pipe is rejected, it is written on shift E/C report, PQC 05. These rejected ones are sent directly to the hydrostatic test. Fails are scrap; OKs are to be sold as second quality. This hydra-test results are written on PQC 12.

5.10 METALLOGRAPHIC INSPECTION

Specimen preparation and inspection of the macro-structure are carried out according to PQCI 05. Photographs are taken for macro structure as evidence.

For the micro-structure (chemical analysis) observation spectrometer is used. For this aid, instructions of PQCI 21 are valid. Results are written on PQC 20.

5.11 SPECIMEN IDENTIFICATION AND TRACEBILITY

Procedure for specimen identification and Tracebility are documented at PQCI 28.

File name & number, heat number, line number, standard name, dimensions and date are written on the specimen. These data is written on "specimen tracebility form" and this form is signed by QC worker.

Every sample taken, is registered at QC lab. by writing on sample notebook and given a queue number. These above stated

data is also written on the test form necessary for the tests to be applied.

The test records are stored for ten years, and specimens are kept minimum six months for export pipes. For domestic sales there exists no obligation.

5.12 COIL THICKNESS MEASUREMENTS

To control whether the thickness is uniform all over the coil and in the range of related norms. PQCI 09 is valid for sampling and measurement instructions. The results are recorded on PQC 03.

5.13 NEUTRALIZATION SYSTEM CONTROL

Controls are done according to PQCI 30, results are recorded on PQC 30 per shift.

5.14 HEATING SYSTEM CONTROL FOR HOT WATER AND STEAM

Control instructions are at PQCI 31.

Results for control of the water are recorded on PQC 31 per shift.

Once a day, pH control and Cl^- control are done at the lab and recorded on PQC 32.

5.15 DELIVERY AND TRANSPORTATION CONTROL

Before packing a visual inspection is achieved by QC personnel at the Finishing Hole. Any rejected or troublesome are recorded on PQC 17, Visual Inspection Report which is evaluated by QC and Production. This report is sent to Planning Department to be used at monthly technical report.

It is the final control during loading. Photos are taken to show the final status of the lot. Delivery papers, certificates are checked by the QC personnel. Also, cartoon labels used for identification in the mill are taken out by QC worker at that moment.

All the details about the loading with the photographs are stored at QC Department.

For every quantitative control, the company has its own specifications as reference. When any production out of these standards are to be considered, then international norms become reference.

5.16 VISUAL INSPECTION

The results of visual inspections are recorded on PQC 17.

Rejected ones after visual control are manipulated as any scrap is treated.

5.17 PRODUCT CERTIFICATION

Export Department gives a number to an order accepted by the mill. QC Department does all controls and reporting of them under this number and file. All the test results are recorded on PQC

20 finally and QC Chief Engineer evaluates the results and approves them. Pipes are packed; afterwards delivery status and control results are included to the file. All these control results are entered to PC with heat numbers, coil numbers and documented as Mill Test Certificate. MTC is signed by QC chief engineer, QC manager and sent to the export department. A copy of MTC is stored at QC department.

5.18 BATHS

DKP Bath Control Report: PQC 32

Oil Cleaning Bath Report: PQC 33

Activation Bath Control Report: PQC 34

P Bath Control Report: PQC 35

Soap (Cleaning) Bath Control Report: PQC 36.

5.19 COIL SLITTING

Identification and tracebility controls are recorded on PQC 07.

Dimension control are recorded on PQC 08.

(For the reports see the Appendix 2)

6.0 INFORMATION SYSTEM DESIGN FOR QUALITY SYSTEM ACTIVITIES

6.1 CONTRACT REVIEW / ORDER APPROVAL

6.1.1 Domestic Sales / Standard Pipe and Tubes

According to the sales conditions and the price lists beforehand circulated to the agents, orders are accepted. Orders are all written. Then production and stocks are checked if the ordered amount will be available at the given date. If it is impossible to accept the order, then rejected with a letter.

Accepted orders are entered to the system; at the same time at the mills planning departments receive data about the orders and put it on the schedule. Concurrently, an order form is filled. A copy of it is left in the Sales Department, two other copies are sent to the related mill, one is signed and sent back as an acceptance proof that the order is acquired.

After this, at the mills transportation options are discussed and set forward. Transportation times and lot (whether it will be done at once or partially) are entered to the system. As the transportation is done a copy of transportation document is sent to the Sales Department. Sales Department approves it and sends to the Accounting Department for the invoice.

6.1.2 Domestic Sales / Special Productions and Contract

All the out of stock type pipes and tubes for special usages are called "special pipes and tubes".

For the continuous orders, Sales Department matches the orders with the production plan and capacity of the mills and write down a production letter. This document is reviewed with the Factory Manager, Planning and Production Department. If the order is O.K. then Sales Department informs the customer about the delivery terms.

When the order is a new type, not regularly produced or never produced beforehand, then production matrix of the mills are checked. If the order is in the range than a production letter is written. This document is reviewed with the Factory Manager, Planning and Production Department. If the order is O.K., then Sales Department informs the customer about the delivery terms.

For the ones, out of matrix, a technical production capability speculation form is filled in, sent to the Factory Manager. Also a speculation form is filled and sent to the Raw Material Planning Department at the central office to check if the necessary raw material could be purchased for the production. He signs it and passes to Research & Development Department. Asking comments from Special pipes Production Department, Quality Control Department and Production Planning for the schedule, R&D prepares an offer including deadline and sends it to Sales. Sales gets a price quotation from the Accounting Department and forwards a complete offer to the customer. If the offer is accepted by the customer, then

the procedure is the same as above starting a written production letter.

For the new products, quality control sampling is as the customer emphasis in the contract. Otherwise, QC Manager decides the sample size, whether the standard procedure will be followed or tighter QC will be applied and informs the QC personnel about the case with a written memorandum. After the production, quality records are evaluated by both the Quality Department and Production Department. If they agree on the manufacturing quality, then the product is taken into the Production Matrix by R&D Department.

For the contracts (contract offers), same procedure is valid. An offer is prepared by Sales if it is standard pipe or by R&D if it is special pipe.

Production letter is of four copies. One copy is stored at Sales Department. One is sent to Raw Material Planning Department and they check if the raw material is available or will be available at that production time. Two copies are sent to the factory. Factory manager signs it and hands them to the Production Planning Department. Production Planning reviews and sends one copy back to Sales with the comments on it.

All points are discussed to verify the capability of producing the product to the specified requirements stated in the tender/purchase order and the contractual delivery time.

Any technical points, or requirements within the tender/purchase order which can not be resolved during the initial

review are returned back to sales and the client is notified to clarify the points before the product is finally planned.

In some cases the client may request Preproduction meeting, this meeting would be performed at the factory or the client's premises.

When all points of the tender/purchase order have been clarified the material is ordered and a production plan is formulated.

All the orders are entered to the Domestic Orders / Delivery Report List and checked daily.

6.1.3 Export Sales

For all pipes, procedure is the same as above except the production letters are sent to the Planning Department at the central office and there production schedules are checked for the availability for the standard pipes. If the order is O.K. for the Planning Department, the order is entered to the Export Order / Delivery Report and followed at the weekly Sales Delivery Meetings. Every detail is set O.K., a sales contact is done. On the contract, customer name, address, raw material type, weight, quality, pipe type, dimensions, weight, marking details, packaging, price, payment terms and all the shipping details (delivery times and types) are mentioned. (See the Appendix 3 for the related forms)

6.2 PURCHASING

All raw materials manufactured in the mills have internal specifications prepared by the Quality Department and approved by the Assistant General Manager of Purchasing.

Raw materials and spare parts are purchased both from domestic suppliers and/or from foreign producers. Raw material purchases are initiated with a written request from Planning Department or R&D Department as part of the planned production or pilot R&D Department as part of the planned production or pilot R&D production or directly by the Import Department in lieu of the yearly planned import budget.

Raw materials from domestic producer* which are in the Approved Supplier List* are purchased according to their specification and technical guidelines set forth in their production catalogue. Orders to domestic mill are given and purchase orders are issued on quarterly basis signed by the Planning&Purchasing Manager.

Raw materials from foreign sources are purchased after evaluating technical and commercial requirements, offers made and possibilities investigated from producers listed in Approved Suppliers List. Materials offered in an alternative specification and/or from a source that is not in the Approved Supplier List are only purchased on the basis of a initial trial lot, which is taken under control roll by roll at

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* There exists only one domestic supplier for the company.

* Approved Supplier List is revised in six months interval according the performances of the suppliers and released to Planning, Purchasing, Quality Control Departments, Factory Managers, Production Managers and internal quality auditors. Performances are recorded on the history sheets opened under the name of each supplier. If any supplier fail to supply any kind of product to the company, its history sheet is closed and stored for five years.

the factory. From this trial lot, a pilot production is carried out to see the results of the production.

Also for overrolling material or any kind of new material from an approved supplier is observed in suppliers premises by the company quality control personnel or an independent observation agent.

The results for these two cases are evaluated by the Quality Manager, Purchasing Manager and Factory Manager and a decision is made if the lot will be purchased or not.

For imported materials the import department issues a valid "Purchase Order" signed by the import manager. Original of this purchase order is sent ensuring that it is received by the correct department in the supplying company.

In order to acknowledge receipt a "Sales Confirmation" or a "Proforma Invoice" is provided from the supplying company.

The technical specifications and commercial conditions set forth on this supplier's sales confirmation/proforma invoice is reviews by import manager in order to attest that it is identical to the order given in the purchase order.

Spare parts to be supplied from domestic source or foreign producers are requested from Purchasing Department directly from production units with a written purchasing request signed by the factory manager or section chiefs. Offers are obtained from foreign producers listed in the approved supplier list and these are presented to production units' managers fro technical and commercial approvals. Written order confirmations signed by mill managers or

section Chiefs received are then ordered to chosen eligible producers. Spare parts and auxiliary supportive products required by production units which must be supplied from domestic suppliers are also requested by a written "Request Form" signed by the respective "Mill Managers" or "Section Chiefs" from the purchasing department. Evaluating alternatives, technical and commercial aspects of these requirements with producers listed in the "Approved Supplier Lists" spare parts are ordered to chosen and eligible supplier/s.

Raw materials are purchased in accordance to international steel norms related to raw materials used in manufacturing. These norms are associated with materials that are used by production units previously which the mills have past experience. Details of specification and relative norms are clearly indicated on purchase orders in order to ensure that materials are purchased in accordance to these norms set forth.

Following information is included in the purchase orders.

- Name of the supplier

- Purchase order number

- General description of the material, size and dimensions, technical requirements, specifications, material grade, name and reference number of the international norm in which the material is required to produced according to.

- Chemical composition and physical properties if other then stipulated in the international norm.

- Other specific requirements in connection with the production of material ordered.

- Final surface conditions, tolerances etc.

- Quantity/item ordered and minimum acceptable quantity to dispatch (i.e. shipment tolerance)

- Price and payment conditions

- Material readiness date ex works for dispatch

- Loading conditions and port of shipment

- If applicable, inspection requirement before shipment

- Type of packing

- Marking details

- Type and number of documents required to accompany the delivery of the material

- If applicable, special technical conditions required where non-fulfillment will cause rejection of the material

If the purchase request is new and non-standard, its technical specification is determined by "Technical Committee" at the "Technical Committee Meetings" or by R&D Department.

To ensure and maintain the quality of the products raw materials and spare parts are purchased from approved suppliers listed in the approved supplier list which can provide the required quality standards.

In general supplier appraisal is based on the past experience of the company in lieu of the quality of the material purchased from

this supplier before. Also producing mills/suppliers from West European countries are appraised as approved suppliers.

When a new supplier is to be introduced or a material with new specification is to be purchased, supplier appraisal is performed as follows: The material arriving from a non approved supplier or material with new specification, is treated as quarantine material. Both the incoming inspection and the inspection of finished product is more severe than in the case of other materials. The results are evaluated and if the material conforms to quality standards and specified requirements, then the new supplier's name is added to approved supplier list. If the evaluation results are negative, then the material is rejected and sold to a trader.

Purchased materials are regularly inspected by Quality Control Department before they are used in production. This is performed in order to attest that they are in technical conformity to the original specification ordered.

Occasionally; when a material with new specification or standard quality material from a new supplier is to be purchased, special quality and quantity inspection requirements are made from suppliers. These inspections can be either by the third party organization representatives or by the companies technicians which are to be performed at producers works or at port before shipment or at mills.

Purchasing Department sends a memo to QC when a purchasing contract is settled about qualities, quantities of the materials, shipment details and expected arrival times. If Purchasing

D. has any doubt about the material, they fill a quarantine form and send to QC to warn (For the quarantine form see the Appendix 4).

When the materials arrives to the mills, Transportation Department informs QC again with a memo at the same day. QC treats materials according to the receiving inspection procedure of the mill. If there exists a quarantine form, QC filled the related parts, QC manager signs, if the material is caught during the production, then production chief also signs, factory manager approves the form. The form is sent back to the Purchasing Department. The results are evaluated there. Also factory decides to use or not to use the materials there.

6.3 PRODUCT IDENTIFICATION AND TRACEABILITY

Whenever required by international standards and customer specifications, traceability is maintained throughout the manufacturing process by means of the material/product identification marking and the manufacturing process control forms. Through these forms the material/product can be traced back to subcoil, mother-coil, heat number, lot number, mechanical tests, chemical tests and each individual manufacturing and examination process.

When the traceability of the product is lost, a non-conformance report is raised.

Raw materials, mother coils, are identified with unflamed chalk with their heat number (10 digits), origin and dimensions. It is

also entered to the Planning Department data and QC entering raw material list.

Semi finished coils are identified with stickers containing following information;

1. Sub-coils (Coils that are slitted) are directly sent to pipe forming machines:

Coil number	Width	Operator
Origin	Thickness	
Quality	Date	

2. DKP in/out:

Coil number	Operator
Origin	Width
Quality	Weight
Thickness	Date

3. Sub-coils from heat treatment:

With unflamed chalk with their heat number, origin and dimensions

4. Sub-coils from SKP:

Coil	Operator

Origin	Width
Quality	Weight
Thickness	Date

The information written on these labels are all taken from the production work orders and shift reports. Operators are fill the labels and at QC controls also the information on the labels are checked (QC personnel have the work orders).

5. Manufactured pipes and tubes: Identified with different labels showing the status of the product or semi-product. The information on the labels consists of order number, customer name (if commercial purposes only commercial is written), dimensions, process status, shift code. When the production is fully completed with QC controls, then final labels are put at each end of bundles with data of order number, customer, origin of the customer, dimensions and quality status.

The information written on these labels are all taken from the production work orders and shift reports. Operators are fill the labels and at QC controls also the information on the labels are checked (QC personnel have the work orders).

6.4 PROCESS CONTROL

For every department in the production, planned production shift reports are prepared at the beginning of very shift by production chief engineers and/or shift foremen. At shift changes, operator gets the data flow sheets showing all the productions

planned for that day, gets the information about where the production is stopped at the previous shift and starts from that point to the production. The shift foremen gives new data flow sheets as the previous one is over, so operator starts for a new production.

Documents to be used to ensure that production goes on according to the quality system and customer specifications in the mills, are;

1. Work Instructions: To explain how production machines and equipments can be operated, prepared by Production Department, formatted and revised by R&D Department, approved by Factory Manager.

An operation number is given as initial of the plant A or BWI 000; first digit for the department*, other two are for the instruction number.

* 1 Slitting	5 OME	9 Heat treatment
2 Conventional machines	6 SRM0 SKP	
3 Mechanical workshops	7 Quality Control	
4 Electrical workshop	8 Special processes	

2. Adjustment Instructions: To explain adjustment of production machines and equipments, prepared by Production Department, formatted and revised by R&D Department, approved by Factory Manager.

Coded as A / BWAI

3. Control Instructions: Control of equipments and machines prepared by Quality Control Department, formatted and revised by R&D Department, approved by Factory Manager.

Department and operation names, date, revision number, prepared by and approved by is also written on the above formats.

4. Shift Report: At the end of every shift, a shift report is filled for every production machine showing the expected and unexpected brakes, brake reasons, scraps (as meter for the plant A, as tones for the plant B), finished productions (stating the number given by the Planning Department). There is also a place for the comments, for the operator to write down any unexpected condition.

5. Control Report: For the new products, to check whether quality controls, stated at the related norms, are carried out according to the periods mentioned at the Quality Plan. These forms are filled by QC personnel and sent directly to R&D as it is sample production. R&D evaluates results with the factory manager or the production manager to check the design.

6. Production Order: For the new productions, R&D writes a production order to explain details of the production and product. Production department follows the prototype production with this report, not with the data flow sheet.

All these forms, types, numbers, names, revisions and the departments receiving these are shown on a table and followed from this table.

6.5 CORRECTIVE AND PREVENTIVE ACTION

The quality manager is authorized to initiate corrective and preventive actions whenever trends of recurring nonconformances are identified.

The cause of repetitive nonconformances, recommended corrective action, implementation and close out of the corrective action are documented on corrective action reports or minutes of regular Quality Meetings or Continuous Production Improvement Meetings.

Relevant information on actions taken is submitted for Management Review.

6.5.1 FMEA (Failure Mode Effect Analysis)

That is a new study for the company; R&D Department prepared a sheet and procedure for this application. Production engineers apply FMEA to the different process steps, results are evaluated With R&D engineers. These forms and related reports by R&D are submitted to Continuous Production Improvement or Quality Meetings. There necessary preventive action is initiated with improvement teams.

6.5.2 Internal Quality Assurance Audits

QA Auditing is a systematic examination of representative aspects of quality systems within an organization, its suppliers, and the third party organizations. The purpose of a QA audit is to ensure

understanding of corporate philosophies and adherence to organizational and regulatory requirements.[1]

It is the responsibility of the Quality Manager to allocate qualified personnel from any department who do not have the responsibility or the direct control of the area or department to be audited.

Scheduled audits will be performed to a documented audit schedule ensuring that all areas are audited on a regular time basis, as a minimum once per year.

On completion of each audit the auditor will document his/her report and discuss the findings with the relevant department head.

If corrective actions are needed these will be discussed or recorded on a corrective action report, with a close out date for the completion of the agreed corrective action. Close out is completed during follow-up audits or the next scheduled audit if it is within six months.

All department are subject to unscheduled audits at the discretion of the Quality Manager.

All scheduled and unscheduled audits are reviewed by the Factory Manager and are documented in the Quality System Department. These audits form the basis of management review of the quality program.

[1] Quality Progress, Dec.1994, "A Systematic approach to quality assurance auditing", p.67-69.

6.5.3 Unscheduled Process Audits

Process audits are done by R&D personnel. The audits are scheduled beforehand, but related departments are not informed. Results and recommended corrective actions are reported monthly, sent to the involved departments and factory manager.

Initiation and completion of the corrective actions are followed up by the Quality Department.

6.5.4 Continuous Production Improvement Meetings

Improvement teams are assigned and controlled by these meetings to deal with any problem requiring preventive action.

6.5.5 Management Review

Review of the Quality System implemented is performed to ensure its continuing suitability and effectiveness.

- Plant level monthly meetings of VIM (continual improvement) are conducted where technical matters are discussed and resolved to ensure productivity and conformity to standards and specifications.

- Plant level monthly quality meetings are conducted to review internal audit actions, customer complaints, non-confirming products and control the implementation of corrective actions.

- Executive committee of the company meet at least monthly to analyze Technical Reports, production planning/procurements, resources, concessions and system adjustments.

6.5.6 Quality Meetings

They are the monthly meetings and their contents are prepared by Quality Department, calls for meetings, minutes and follow-up of preventive and corrective actions are in the responsibility of the Quality Department. Plant managers, general manager, QC responsibles and other related personnel according to the subjects of the meetings are invited and minutes are sent to these attendants.

6.6 CUSTOMER COMPLAINTS

Handling of field non-conformance (customer complaints) is the responsibility of the Customer Relations Department, a division of Sales Department.

For the technical clarification of a field non-conformance, Quality Department is responsible. Quality Control Managers clarify whether the non-conformance is justified, recommend solutions and initiate action to prevent the recurrence of similar non-conformities.

The sales department prepares a complaint report. A copy of this report is presented to the Quality Department, who in return investigate the non-conformance to determine justification or not. This investigation could be performed at the customers site if deemed necessary.

The quality department report the results of the investigation with the necessary corrective action. This report is reviewed by the

Factory Manager and Sales Department. The Factory Manager is responsible for providing solutions.

All field non-conformance reports are documented in the sales office (Customer complaints department) with the copies filed in Quality Department.

Customer complaints, as written or oral manner, receive Export or Domestic Sales Department directly. All the customer complaints received by any department in the company are handed to the Customer Relations Department.

Claims are evaluated under three different categories: Mill, Transportation & Handling, Sales. All the complaints resulting from material, production defects or from any characteristics of the product rather than written on the contract signed by both the customer and the company are "mill" complaints. Transportation and handling complaints are the quality complaints emerging after the product given under the responsibility of the transportation company. The rest is appraised as "sales" complaints.

Responsibles at the Customer Relations Department fill in a Customer Complaints/ Information form as soon as they receive the complaint. A number is given to the complaint according to the following table for the Accounting Department to follow quality costs under this file:

Plant B Domestic Customer Complaints	890 99; from 100 to 299
Plant B Export Customer Complaints	890 99; from 300 to 599
Plant A Domestic Customer Complaints	890 99; from 600 to 899
Plant A Export Customer Complaints	890 99; from 900 to 999

Also, codes showing the type of defect/defects subject to the claim are mentioned at this information form.

A work order is also sent to the Accounting Department to inform them about the new complaint and the number of the file. When the case is over again a work order is sent to Accounting Department to let them know.

In two days after following the acceptance of the written complaint by The Customer Relations Department, this department do the necessary research to collect all the items to be used during investigation, like samples of defected product or material, then fill in the Information Form and send it to the related Plant Manager, Assistant of General Manager Sales/Marketing, Assistant General Manager Purchasing and the related Sales Manager in the Sales Department. The Plant Manager passes the form to the Quality Department for the investigation after examining the complaint and giving his own comments on the subject if necessary.

For the "mill" claims responsibility is at the plant manager mainly. For the "transportation" claims is at the transportation company which is a sister company indeed.

Meanwhile, The Customer Relations Department gets samples from the claim origin, if not given with the written claim beforehand, to send then to the mill.

In three days time, Quality Department prepares a pre-technical report containing the information about existence of a complaint, the reasons of the complaint, the comments of related departments, the category of the complaint and the cautions to be taken. If the investigation will last more, due date and related people

should be mentioned also. This report is sent to the same personnel as the Information Form is sent.

By using this report sales department discuss the case with the customer in two days terminate the claim or set a closing date. Accordingly The Customer Relations Department fill in a Complaint/Result Report. If reimbursement of the claim is subject to the complaint, in the form this is stated and the way of payment (e.i. it may be a price reduction, a new lot delivery or money transfer directly) is stated too.

As a rule, the payment should be done when an invoice from the customer is got. With the invoice Result Form is approved by the Assistant General Manager Sales/Marketing and General Manager and sent to the Accounting Department to be paid.

For the "sales" complaint all the procedure is carried out internally; forms are sent to the related sales manager.

Customer Relations Department handles all the claim data, customer feed-back and do the statistical trend observations, revises the data in six monthly periods and reported to General Manager, Assistant General Managers and Quality Manager. This trends are overlooked at monthly Quality Meetings.

All the records about the claim is stored for five years at the Customer Relations Department and all the quality records related are kept stored for ten years in Quality Department. (For the forms see Appendix 5)

7.0 DESIGN OF DATA FLOW CHARTS FOR QUALITY CONTROL ACTIVITIES

There are four main activities at the data flows when Quality Control activities are considered. First, the order comes to the company, a chain of processes are followed accordingly, then the order is approved and sent to the mills afterwards. The production order is prepared by the Production Planning Department and sent to the Production. During production data about the production and product and control data are evaluated at different places and stored as well. Ready to ship details are prepared and related data is sent to the related departments and also to the customer.

At The First Level Data Flow Diagram 1, process 1.0 is the entrance of order. Second is the order process. The third is the production and control and the last one is the shipment of the product and related controls. (See the appendix 6 for "first level data flow diagram, process descriptions and data dictionaries)

At the four second level data flow diagrams, the details of these four processes are given. (See the appendix 7 for "first level data flow diagram, process descriptions and data dictionaries)

Latterly, processes are identified included in the systems-level data flow diagram. Each data flow is briefly described afterwards so that any one examining the data gathered during the analysis can quickly see what each data flow does.

The data flows explained in the previous chapters with the related activities are all designed ones. Analysis of the present system is explained very briefly, while existing data flows and information system are not worthwhile to evaluate very deeply at this study.

6.0 CONCLUSION

The aim of this study is to design an information system to fulfill the company's needs in a quality system without any information leakage out of the system.

At first chapters, meaning of information system, system design methods for information, quality system terms, why an information system is needed for the quality are discussed. Also relations of quality and accurate information flow are assessed. Then company conditions and production are explained briefly. At the other parts of the study information flows in the quality system are evaluated.

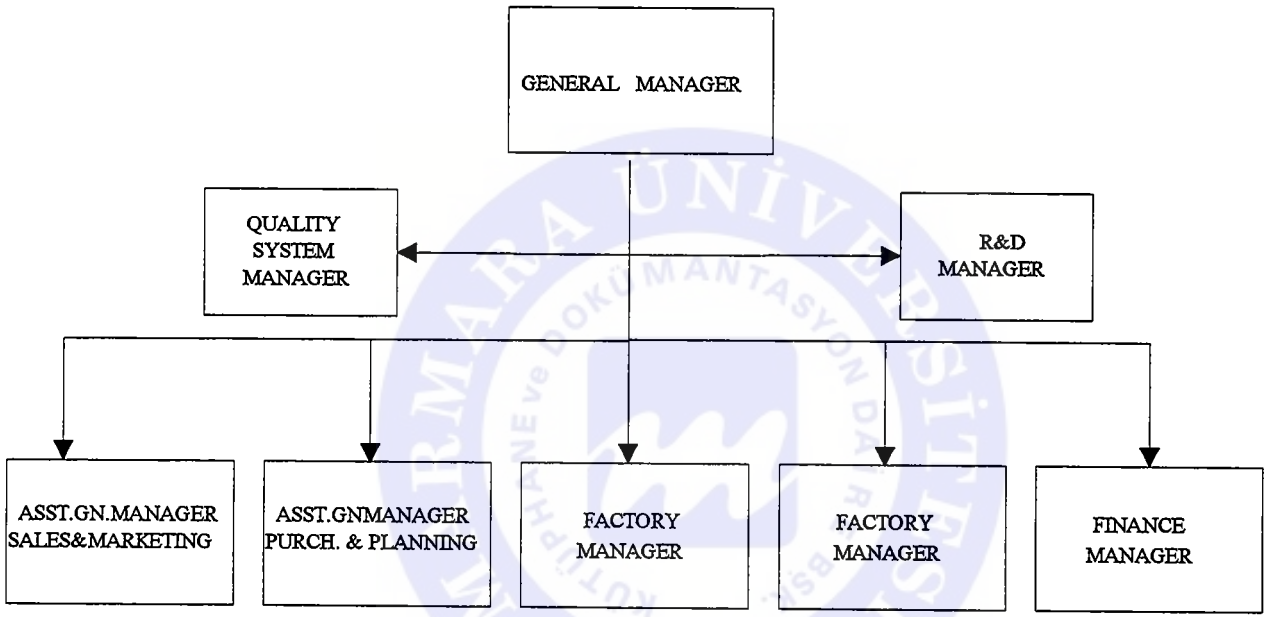
At this survey, what is tried to be done, to put forward the main activities of the quality system and to design the information flow in an organized manner in this system. At the company, almost all the quality activities are out of computer application because of different reasons arising from the characteristics of the company itself.

When information flows occur with aid of papers, lots of misleading situations presumably will happen. To avoid this, a complex computer applion for information system should be handled.

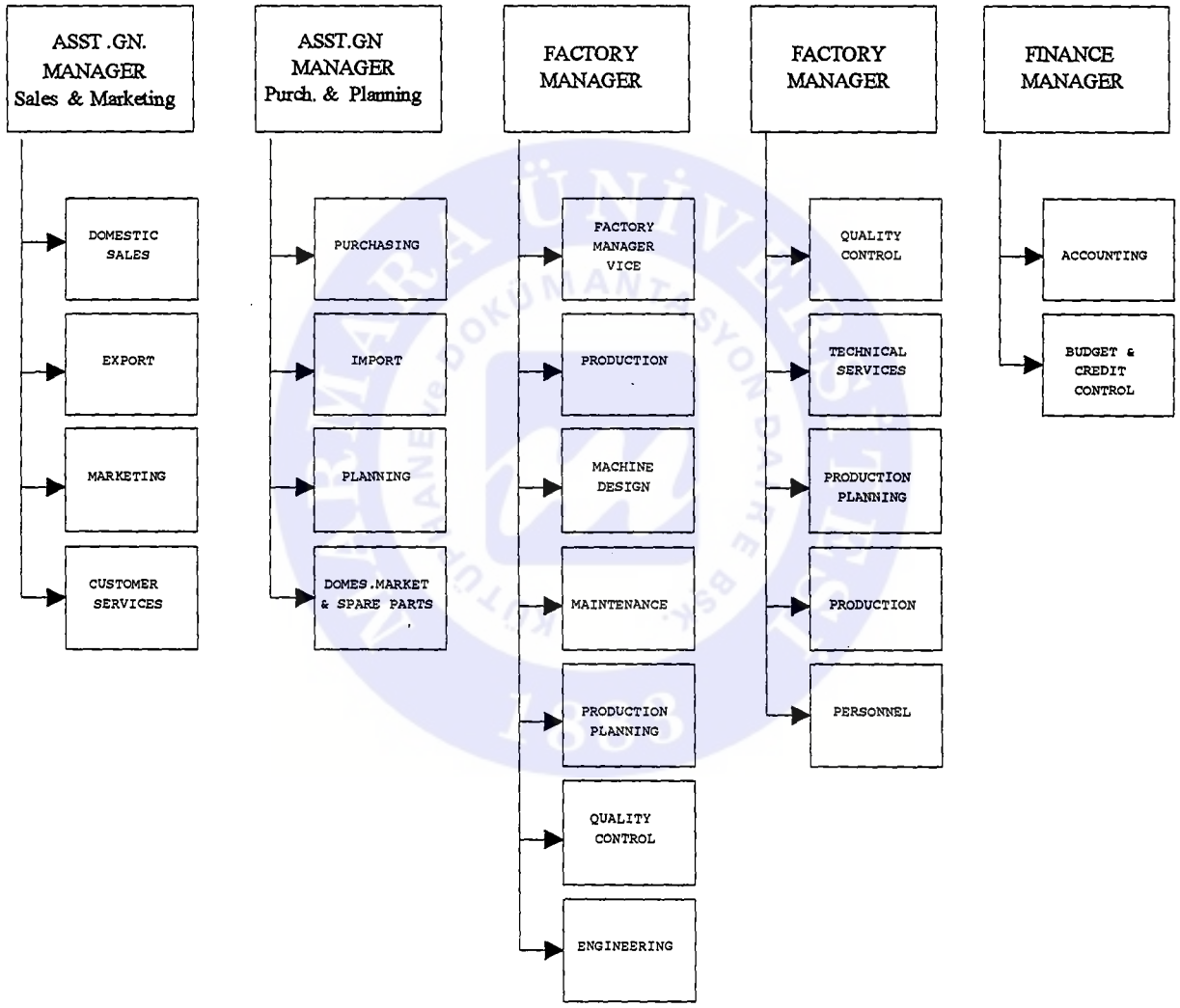
Next step at such a system might be applying computer utilization to the system to make all the activities much more easier to handle, reach and evaluate in a shorter period of time.

APPENDIX 1
QUALITY ORGANIZATION CHARTS

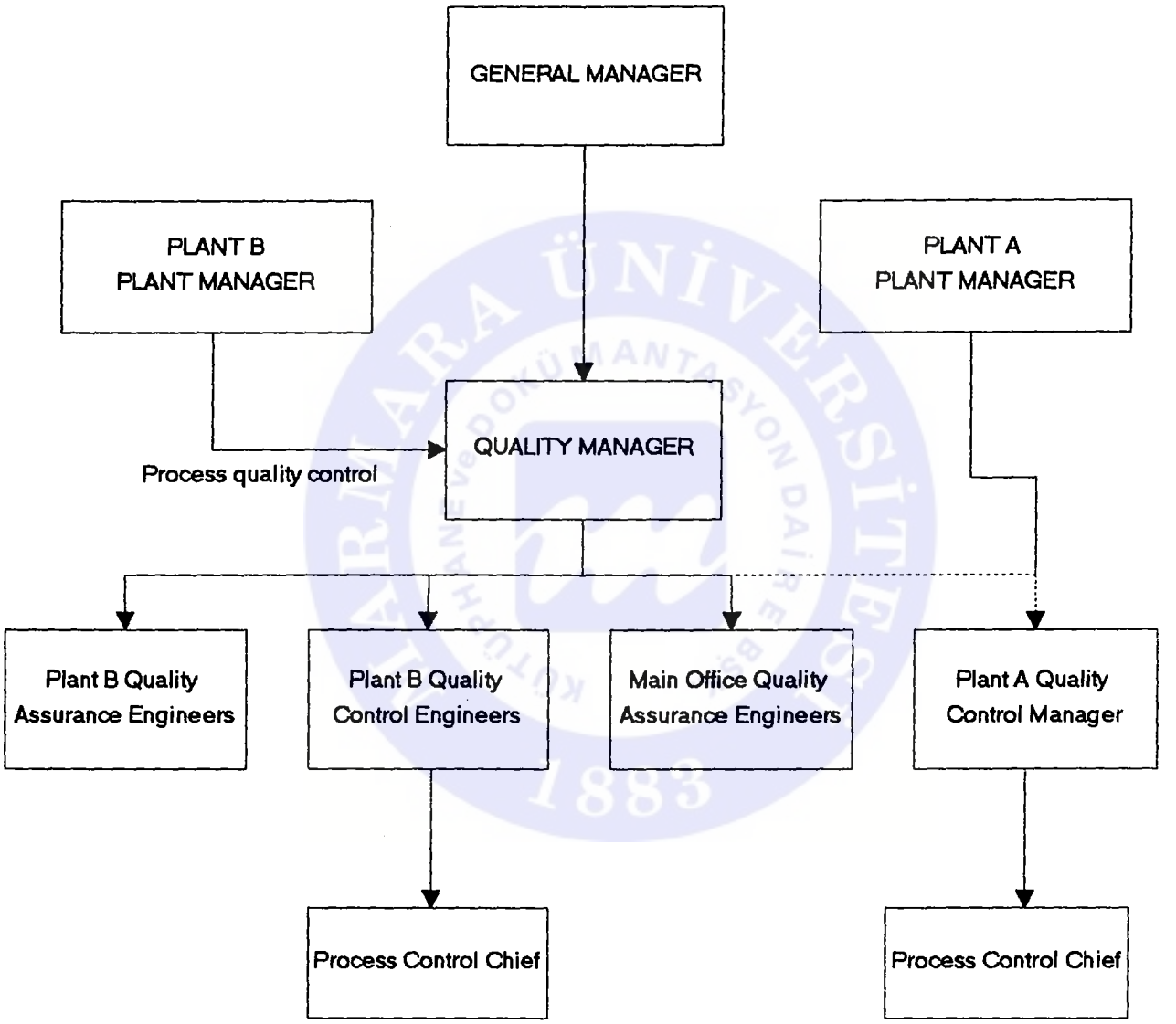
QUALITY ORGANIZATION CHART



QUALITY ORGANIZATION CHART



QUALITY DEPARTMENT ORGANIZATION CHART



APPENDIX 2
ORDER SPECULATION FORMS AND PRODUCTION LETTERS

SATIŞ - PLANLAMA TEYİD FORMU İÇ PİYASA	TARİH : REF NO : MÜŞTERİ ADI :

SATIŞ	PLANLAMA

ÜRETİM STANDARDI: HAMMADDE KALİTESİ: EBAT: ☐ Detaylar ekte sunulmuştur. Toplam ..... sayfa	ÜRETİM TARİH YORUM

SEVKİYAT TARİHİ: CEVAP VERME SÜRESİ:	ÜRETİM TARİHİ: OPSİYON:

SATIŞ SORUMLUSU Adı-Soyadı İmza	PLANLAMA SORUMLUSU Adı-Soyadı İmza

SATIŞ - PLANLAMA TEYİD FORMU	TARİH :
İHRACAT	REF NO :
ÜLKE:	MÜŞTERİ ADI :

SATIŞ	PLANLAMA

DURUM	TARİH	DURUM	TARİH
__ YENİ	.....	__ YENİ CEVAP	.....
__ DEĞİŞİKLİK	.....	__ DEĞİŞİKLİK CEVAP	.....
__ EK	.....		
__ İPTAL	.....		

ÜRETİM STANDARDI:	ÜRETİM TARİHİ:
HAMMADDE KALİTESİ:	OPSİYON:
FATURALAMA:	YORUM:
SEVKİYAT TARİHİ: CEVAP SÜRESİ:	

EBAT:	KULLANILAN HAMMADDE	ÜRETİM TARİHİ

SATIŞ SORUMLUSU Adı-Soyadı İmza	PLANLAMA SORUMLUSU Adı-Soyadı İmza

İÇ PİYASA İMALAT MEKTUBU

---------- MÜDÜRLÜĞÜ

SİPARİŞ No: .....

Aşağıda cins, miktar ve nitelikleri yazılı malların imalini rica ederiz.
Saygılarımızla,

Siparişi Veren Bayi	Kullanıcı Firma
Teslim Tarihi	

Nitelikleri

Sipariş alınmıştır/Fabrika Müdürü

İMALAT MEKTUBU
İHRACAT

DOSYA NO : BBF.....

İMALATÇI : BBBF.....

İLGİ : SN.....

BİLGİ : SN...../SN...../SN.....

MÜŞTERİ FİRMA :

ÜLKE :

BİRİM FİYAT :

ÖDEME TUTARI :

ÖDEME ŞEKLİ :

KOMİSYONLAR :

VARIŞ YERİ :

NAVLUN :

GÜMRÜKLEME YERİ :

YÜKLEME VADESİ SONU :

YÜKLEME ŞEKLİ VE YERİ:

İHR.TEŞVİK BELGESİ :

FATURALAMA : DM(USD)/METER

İHRACAT DEPARTMEN SORUMLUSU :

İMZA

İHRACAT MÜDÜRÜ :

İMZA

* Spesifikasyonlar ekte belirtilmiştir.

İHRACAT İMALAT SPESİFİKASYONLARI

CİNSİ :

NORM :

MALZEME KALİTESİ :

MALZEME TEMİNİ :

( ) FABRİKA TARAFINDAN

( ) PLANLAMA TARAFINDAN

SPESİFİKASYON :

EBAT	BOY	TEO.AĞI.	FİYAT(DM/M)	MİKTAR
LOT 1:				
. . . X . . .mm	. . . . mm	. . . . . .kg/m	. . . . .	. . . . . kg
. . . X . . .mm	. . . . mm	. . . . . .kg/m	. . . . .	. . . . . kg
LOT 2:				
. . . X . . .mm	. . . . mm	. . . . . .kg/m	. . . . .	. . . . . kg
. . . X . . .mm	. . . . mm	. . . . . .kg/m	. . . . .	. . . . . kg

TOPLAM MİKTAR : . . . mton

BOY TOLERANSI : . . . metrelik borularda : -0 / + . . %

MİKTAR TOLERANSI : a. Ebat bazında -/+ . . %

b. Toplam bazında -/+ . .%

MARKALAMA :

( ) STENSİL :

( ) BOYDAN BOYA ( ) TEK

. . . . . .

( ) SOĞUK DAMGA : . . . . . .

( ) BOYDAN BOYA ( ) TEK

FINISHING : ( ) DRY ( ) VERNISHED

( ) PAINTED ( ) LIGHTLY OILED

( ) DIGER ( ) CHROMATED (ONLY FOR GALV)

PAKETLEME : ( ) BARE

( ) P.E. KAPLAMA

( ) JÜT KAPLAMA

ÇEMBER SAYISI : 6

ÇEMBER CİNSİ : SIGNODE

PAKET AĞIRLIĞI : MAX 2.0 ton

PAKET ŞEKLİ ( ) HEXAGON standart norm

( ) DİĞER belirtilecek

MILL TEST SERTİFİKASI :

ETİKET : ( ) NEUTRAL ( ) STANDART

İLAVE BİLGİLER : HER BAĞDA . . . . . OLMAK ÜZERE

WEIGHT

LENGHT

GÖZETİM : ( ) YOKTUR ( ) ÜRETİM SIRASINDA

( ) YÜKLEME SIRASINDA

GÖZETİM ŞİRKETİ :

ÖZEL ŞARTLAR:

YENİ ÜRÜN TALEP FORMU

TARİH:

NO:

ÜRÜN ADI: EBAT :

MÜŞTERİ: SON KULLANICI :

İMALAT NORMU:

MALZEME NORMU: MALZEME CİNSİ :

KİMYASAL ANALİZ:	C	Si	Mn	P	S	Al	Nb	N
	...	...	...	...	...	...	...	...

ÜRÜN TESLİM ŞEKLİ:

( ) ERW	( ) TAVLI	( ) ÇEKME	( )NORMALİZE
( )GALVANİZ YAĞLI	( ) VERNİKLİ	( ) BOY KESME	

ÜRÜN MEKANİK ÖZELLİKLERİ:

ÇEKME DAYANIMI (N/mm^2)	AKMA DAYANIMI (N/mm^2)	
UZAMA (%)	AKMA ORANI(%)	SERTLİK (HBR)
ÇENTİK-DARBE DAYANIMI (JOULE)		

TALEP MİKTARI:

SÜREKLİ (ton)	SPOT (ton)	DİĞER (ton)

FİYAT VE KARLILIK YÜZDESİ:

PİYASA FİYATI: %:	TEKLİF EDİLEN FİYAT:	KARLILIK

TEKLİF DEADLINE: TESLİMAT DEADLINE:

HAZIRLAYAN:

DAĞITIM: FABRİKA MÜDÜRÜ, AR-GE

APPENDIX 3
PURCHASING DEPARTMENT
QUARANTINE FORM

SATINALMA DEPARTMANI	MALZEME KARANTİNA TAKİP RAPORU	TARİH : SIRA NO :

(Satın alınan mallarda kalitenin şüpheli olduğu durumlarda bu kısım Satınalma Md. tarafından doldurulur ve Kalite Kontrol Md.'ne yollanır.)

MALIN CİNSİ / KALİTESİ :

DÖKÜM NO / DOSYA NO:

EBAT :

MENŞEİ :

MİKTARI :

KALİTESİ HAKKINDA

DÜŞÜNCELER :

BEKLENEN VARIŞ YERİ:

ZAMANI :

YÜKLENDİĞİ VASITA :

İMZA:

(Bu kısım Kalite Kontrol Md. tarafından doldurulur ve Satınalma Md.'üne geri gönderilir.)

KALİTE İNCELEME SONUÇLARI:

İMZA (İmalat Şefi)	İMZA Kalite Kontrol Md.

APPENDIX 4
QUALITY CONTROL FORMS

PQC 01
BANT KODLAMA RAPORU *(Coil Coding Report)*

Tarih:

Kod.No.	Menşei	Bant Et Kalınlığı	Bant Genişliği	Bant Ağırlığı	Döküm No.	Bant No.	Etiket No.	Çelik cinsi

Düşünceler

Düzenleyen	**Kontrol**

PQC 02
BANT RED RAPORU
Tarih:

Kod.No.	Menşei	Bant Et Kalınlığı	Bant Genişliği	Döküm No.	Bant No.	Etiket No.	MTC No.	Mekanik Test	Kimyasal Analiz	Red Nedeni

Düzenleyen	Kontrol

PQC 03
BANT KALINLIK ÖLÇME RAPORU

Kalite	**Tarih**
Menşei	**Takip No.**
Nominal Genişlik(mm)	**Döküm No.**
Nominal Kalınlık(mm)	**Bant No.**

Ölçümler				
Ölçüm No.	**Bant Kenarı**	**Bant Ekseni**	**Bant Kenarı**	**Genişlik(mm)**

Düzenleyen	**Kontrol**

PQC 04
BANT AKÜMÜLASYON RAPORU

Tarih	Vardiya

Makina Adı

Bant Ebatı			
Müşteri			
Norm			
Malzeme Kalitesi			

Döküm No.	Et Kalınlığı	Bant No.	Verilen Kod	Ağırlık

Düzenleyen	Kontrol

PQC 05
EDDY CURRENT TEST REPORT (E/C Test Report)

Tarih	**Ebat x Et Kalınlığı**
Dept.No.	**Boy**
Makina Adı	**Dosya No.**
Vardiya	**Müşteri**
İmalat Miktarı	**Norm**

Saat	Kalibrasyon Kontrol	Lot No.	Toplam Boru	Sağlam Boru	Iskarta Boru	Açıklamalar Boru

Düzenleyen	**Kontrol**

PQC 06

MANYETİK TEST RAPORU (Magnetic Test Report)

Tarih	**Ebat x Et Kalınlığı**
Dept.No.	**Boy**
Makina Adı	**Dosya No.**
Vardiya	**Müşteri**
İmalat Miktarı	**Norm**

Saat	Kalibrasyon Kontrol	Lot No.	Toplam Boru	Sağlam Boru	Iskarta Boru	Açıklamalar Boru

Düzenleyen	**Kontrol**

PQC 07

DİLME HATTI KONTROL RAPORU

Tarih:

Dilme Makina No.	Operatör	Vardiya

Ebat Kalınlık x Genişlik(mm)	Bant Takip No.	Genişlik (mm)	Kesitte Kesim Kalitesi	Damga Çizgi	Etiket	Saat	Açıklamalar

Düzenleyen	Kontrol

PQC 08
BANT DİLME BOYUT KONTROL FORMU

Dilme Makinası	Tarih
Vardiya	Operatör

Dilme Sıra No.	Bant Takip	Giren Bant Ölçüsü	Bant Kalitesi ve Cinsi	Ölçülen	
				Kalınlık	Genişlik

Düzenleyen	Kontrol

PQC 012 (İşletme için)
BORU HİDRO-TEST RAPORU

Tarih		Makina Adı	
Ebat Et Kalınlığı		Müşteri Adı	
Boy		Dosya No.	
Norm		Test Basıncı	
Drift Test	( ) Yapıldı	Bekleme	5sn. ( ) Yazıcı

Sıra No.	Boru Kodu	Sıra No.	Boru Kodu	Sıra No.	Boru Kodu	Sıra No.	Boru Kodu

Iskarta Borular				Uzun-Kısa Borular			
Sıra No.	Boru Kodu	Sıra No.	Boru Kodu	Sıra No.	Boru Kodu	Sıra No.	Boru Kodu

Düzenleyen	Kontrol

PQC 16 (İşletme için)
GÖZLE MUAYENE HATALI BORU RAPORU

Norm	Ebat	Tarih
Müşteri/Dosya No.	Makina	Vardiya

Hata Cinsi	Adet	Boru No./Lot No.	Düşünceler
Dış çapaklı			
İç çapaklı			
Bindirme kaynak			
Laminasyon			
Havşa			
Uzun			
Kısa			
İzli			
Ezik			
Oval			
Tavsız			
Patlak			
Çatlak			
U/S ıskartası			
E/C ıskartası			
Eğri			
FT			
İçi tıkalı(GVN)			
İçi tıkalı(çapak)			
Kaplama bozuk			
Yamuk			
Ekli boru			
Et kalınlığı +;-			
Toplam ıskarta			
Toplam sağlam			
Toplam			
Açıklamalar:			

Düzenleyen: **Kontrol:**

PQC 17

GÖZLE MUAYENE RAPORU (Final Visual Inspection Report)

Norm	Ebat	Tarih
Müşteri/Dosya No.	Makina	Vardiya

Hata Cinsi	Adet	Boru No./Lot No.	Düşünceler
Dış çapaklı			
İç çapaklı			
Bindirme kaynak			
Laminasyon			
Havşa			
Uzun			
Kısa			
İzli			
Ezik			
Oval			
Tavsız			
Patlak			
Çatlak			
U/S ıskartası			
E/C ıskartası			
Eğri			
FT			
İçi tıkalı(GVN)			
İçi tıkalı(çapak)			
Kaplama bozuk			
Yamuk			
Ekli boru			
Et kalınlığı +;-			
Toplam ıskarta			
Toplam sağlam			
Toplam			
Açıklamalar:			

Düzenleyen: **Kontrol:**

PQC 20

MEKANİK KİMYASAL TEST RAPORU (Mechanical & Chemical Test Report)

Dosya No:	Norm:	Kalite:	Ebat:	Tarih:

Lab.No.	Döküm No.	Kod No.	Dikdörtgen/yuvarlak		Kesit	L_o	P	P	Akma	Çekme	Uzama	Sertlik	Darbe	Katlama
			Kalınlık/çap mm.	Genişlik mm.	mm^2	mm	Akma Kg	Çekme Kg	Dayanımı Kgf/mm^2	Dayanımı Kgf/mm^2	%			

Testi Yapan	Onaylayan

PQC 21
DARBE DENEYİ RAPORU (Impact test report)
Tarih :
Dosya No :

Çentik Tipi	Darbe Enerjisi (Kgf.m)	Darbe Hızı (m/s)	Sürtünme Kaybı (Kgf.m)

Menşei	Döküm No.	Bobin No.	Deney Sıcaklığı

Numune No.	Numune Kesidi (cmxcm)	Kırma Enerjisi (Kgf.m)	Çentik Darbe Dayanımı ($Kgf.m/cm^2$)
1			
2			
3			
4			
5			
Ortalama			

Testi Yapan	Onaylayan

PQC 22

SERTLİK TEST RAPORU (Hardness Test Report)

Tarih :

Dosya No :

Kod No.	Döküm No.	Bant No.	Verilen Harf	Kullanılan Uç	Yük	Sertlik Değerleri						Ortalama

Düzenleyen	Kontrol

PQC 26

GALVANİZ SOYMA TEST RAPORU

Tarih:

					Düzenleyen:			Kontrol:				
ÖLÇÜMLER	Dış çap (mm)	İç çap (mm)	Boy (mm)	Dış yüzey Alanı(m^2)	İç yüzey Alanı(m^2)	Galvanizli Ağırlık(gr)	İçi galvanizli Ağırlık(gr)	Çıplak Ağırlık(gr)	Kaplama Kal. (gr/m^2)		Ezme Testi	İç Yüzey
									İç	dış		
Galvaniz 1 Vardiya: Ebat : Müşteri :												
Galvaniz 2 Vardiya: Ebat : Müşteri :												
Galvaniz 3 Vardiya: Ebat : Müşteri :												

PQC 28 (İşletme için)
EZME VE GENİŞLETME TEST RAPORU

Departman No.	**Norm**
Makina Adı	**Ebat**
Müşteri	**Bant Menşei**
Dosya No.	**Bant Kalitesi**

Bant No. **Boru No.**	**Heat No.** **Lot No.**	**Ezme Testi**						**Genişletme Testi**		**Açıklama**
		Kaynak 90°		**Malzeme 0°**		**Kaynak 90**				
		Sonuç (+,-)	**Açma (mm)**	**Sonuç(+,-)**		**Sonuç (+,-)**	**Açma (mm)**	**Sonuç (+,-)**	**Açma (mm)**	

Düzenleyen	**Kontrol**

PQC 29
PAKETLEME BİLGİ AKIŞ FORMU

Firma	Vardiya	Tarih
Ebat	Başlama Tarihi	Bitiş Tarihi
Dosya No.	Norm	
Cinsi	Paket Sayısı	
Boy Toleransı		

Yapılacak Stensil
Etiket Detayı
Sıra No. ☐ ☐ ☐ ☐
İş Tamamlandı ☐

Düzenleyen	Kontrol

PQC 30
ARITMA SİSTEMİ KONTROL FORMU

Tarih	pH		Düşünceler	İmza
	Reaksiyon Havuzu	Çıkış		

Düşünceler	Kontrol

PQC 31
KAZAN DAİRESİ
DEİYONİZE CİHAZI
KONTROL FORMU

Tarih	İletkenlik	pH	İmza

PQC 32
DKP BANYO KONTROL FORMU

Tarih	Asit	Fe	Sıcaklık	Düşünceler	İmza

PQC 33
YAĞ ALMA BANYOSU KONTROL FORMU

Tarih	Konsantrasyon	Düşünceler	İmza

PQC 34
AKTİVASYON BANYOSU KONTROL FORMU

Tarih	pH	Düşünceler	İmza

PQC 35
FOSFATLAMA BANYOSU KONTROL FORMU

Tarih	Konsantrasyon	Hızlandırıcı Noktası	Fosfat Noktası	Asit N./ Fosfat N.	Düşünceler	İmza

PQC 36
SABUN BANYOSU KONTROL FORMU

Tarih	pH	Yağ Konsant.	Düşünceler	İmza

APPENDIX 5
TABLE OF PRODUCT DEFECTS and CUSTOMER COMPLAINTS HANDLING FORMS

MÜŞTERİ ŞİKAYETLERİNE SEBEP OLAN HATA TÜRLERİ VE KODLARI

KAYNAK HATALARI		MEKANİK ÖZELLİK HATALARI	
Zayıf, kötü kaynak	A1	Akma,çekme	D1
Üst çapak&bindirme	A2	Uzama	D2
İç çapak	A3	Sertlik	D3
Tıkalı	A4	Diğer	D0
Diğer	A0		

BOYUT HATALARI		SEVKİYAT HATALARI	
Dış çap	B1	Eksik,fazla boru	F1
İç çap	B2	Yanlış sevkiyat	F2
Et kalınlığı	B3	Etiket	F3
Boy	B4	Ambalaj	F4
Köşe açıları	B5	Ekli,delik boru sevk	F5
Dönüklük	B6	Yükleme hataları	F6
Eğrilik	B7	Diğer	F0
Manşon hatası	B8		
Diş	B9		
Diğer	B0		

YÜZEY HATALARI		MÜŞTERİ HATALARI	
Portakallaşma	C1	Galvanizli borunun	
Potluk	C2	çürümesi	G1
Galvaniz bozukluğu	C3	Hatalı bükme	G2
Pas,korozyon	C4	Eksik/yanlış spec.	G3
İç cidar bozukluğu	C5	Müşteri ölçüm hatası	G4
Yağ	C6	Diğer	G0
Malzeme kalkması	C7		
Diğer	C0		

DİĞER HATALAR			
Ölçüm hatası	H1	Satış servis hatası	H3
Markalama	H2	Diğer	H0

SATIŞ MÜŞTERİ ŞİKAYET FORMU

SIRA NO: TARİH:

Şikayette bulunan müşteri	ADI	:
	ADRESİ	:
	ŞİKAYET TARİHİ	:
Nihai Alıcı/Satın alınan bayi	ADI	:
	ADRESİ	:

Tanımlayıcı Bilgi	DOSYA/LOT No	:
	GEMİ ADI	:
	SEVKİYAT TARİHİ	:
	KULLANIM YERİ	:
	SEVKEDİLEN MİKTAR	:
	ŞİKAYET MİKTARI	:
	NUMUNE DURUMU	:

ŞİKAYET KONUSU VE KODU:

YAPILAN İNCELEMELER/SONUÇ:

ALINACAK/ALINAN TEDBİRLER:

HAZIRLAYAN: KONTROL EDEN: ONAYLAYAN:

İADE EDİLEN BORU MİKTARI: TAZMİNAT TUTARI:

ÖDEME ŞEKLİ: ÖDEME DETAYI:

SONLANDIRMA TARİHİ:

DAĞITIM: GN.MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD. SATINALMA

FABRİKA MÜŞTERİ ŞİKAYET İHBAR FORMU

SIRA NO: TARİH:

Şikayette bulunan müşteri	ADI	:
	ADRESİ	:
	ŞİKAYET TARİHİ	:
Nihai Alıcı/Satın alınan bayi	ADI	:
	ADRESİ	:
Tanımlayıcı Bilgi	DOSYA/LOT No	:
	GEMİ ADI	:
	SEVKİYAT TARİHİ	:
	KULLANIM YERİ	:
	SEVKEDİLEN MİKTAR	:
	ŞİKAYET MİKTARI	:
	NUMUNE DURUMU	:

ŞİKAYET KONUSU VE KODU:

YAPILAN/YAPILMASI ÖNERİLEN İNCELEMELER:

HAZIRLAYAN: KONTROL EDEN:

DAĞITIM: GN.MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD. SATINALMA,FABRİKA MÜDÜRÜ

NAKLİYE MÜŞTERİ ŞİKAYET İHBAR FORMU

SIRA NO: TARİH:

Şikayette bulunan müşteri	ADI	:
	ADRESİ	:
	ŞİKAYET TARİHİ	:
Nihai Alıcı/Satın alınan bayi	ADI	:
	ADRESİ	:
Tanımlayıcı Bilgi	DOSYA/LOT No	:
	GEMİ ADI	:
	SEVKİYAT TARİHİ	:
	KULLANIM YERİ	:
	SEVKEDİLEN MİKTAR	:
	ŞİKAYET MİKTARI	:
	NUMUNE DURUMU	:

ŞİKAYET KONUSU VE KODU:

YAPILAN/YAPILMASI ÖNERİLEN İNCELEMELER:

HAZIRLAYAN: KONTROL EDEN:

DAĞITIM: GN.MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD. SATINALMA, NAKLİYE FİRMASI

FABRİKA ÖN TEKNİK RAPORU

SIRA NO: TARİH:

Şikayette bulunan müşteri ADI :

ADRESİ :

ŞİKAYET TARİHİ :

MAMUL TANIMI :

MÜŞTERİ ZİYARETİ :

ŞİKAYET NEDENİ :

HATA TÜRÜ :

ŞİKAYETİN HAKLILIĞI HAKLI ( ) HAKSIZ ( )

ÇÖZÜM ÖNERİSİ :

HAZIRLAYAN : KONTROL EDEN:

DAĞITIM:

GN. MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD.SATINALMA, ilgili SATIŞ MÜDÜRÜ

NAKLİYE ÖN TEKNİK RAPORU

SIRA NO: TARİH:

Şikayette bulunan müşteri ADI :

ADRESİ :

ŞİKAYET TARİHİ :

MAMUL TANIMI :

MÜŞTERİ ZİYARETİ :

ŞİKAYET NEDENİ :

HATA TÜRÜ :

ŞİKAYETİN HAKLILIĞI HAKLI ( ) HAKSIZ ( )

ÇÖZÜM ÖNERİSİ :

HAZIRLAYAN : KONTROL EDEN:

DAĞITIM:

GN. MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD.SATINALMA, ilgili SATIŞ MÜDÜRÜ

FABRİKA MÜŞTERİ ŞİKAYET SONUÇ FORMU

SIRA NO: TARİH:

Şikayette bulunan müşteri ADI :

ADRESİ :

ŞİKAYET TARİHİ :

YAPILAN İNCELEMELER/SONUÇ:

ALINAN / ALINACAK TEDBİRLER:

İADE EDİLEN BORU MİKTARI:

TAZMİNAT TUTARI:

ÖDEME ŞEKLİ:

ÖDEME DETAYI:

HAZIRLAYAN:	KONTROL EDEN:	ONAYLAYAN:
	GN.MD.YRD.PAZARLAMA	GN.MÜDÜR

TARİH:

DAĞITIM: GN.MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD. SATINALMA, FABRİKA MÜDÜRÜ

NAKLİYE MÜŞTERİ ŞİKAYET SONUÇ FORMU

SIRA NO: TARİH:

Şikayette bulunan müşteri ADI :

ADRESİ :

ŞİKAYET TARİHİ :

YAPILAN İNCELEMELER/SONUÇ:

ALINAN / ALINACAK TEDBİRLER:

İADE EDİLEN BORU MİKTARI:

TAZMİNAT TUTARI:

ÖDEME ŞEKLİ:

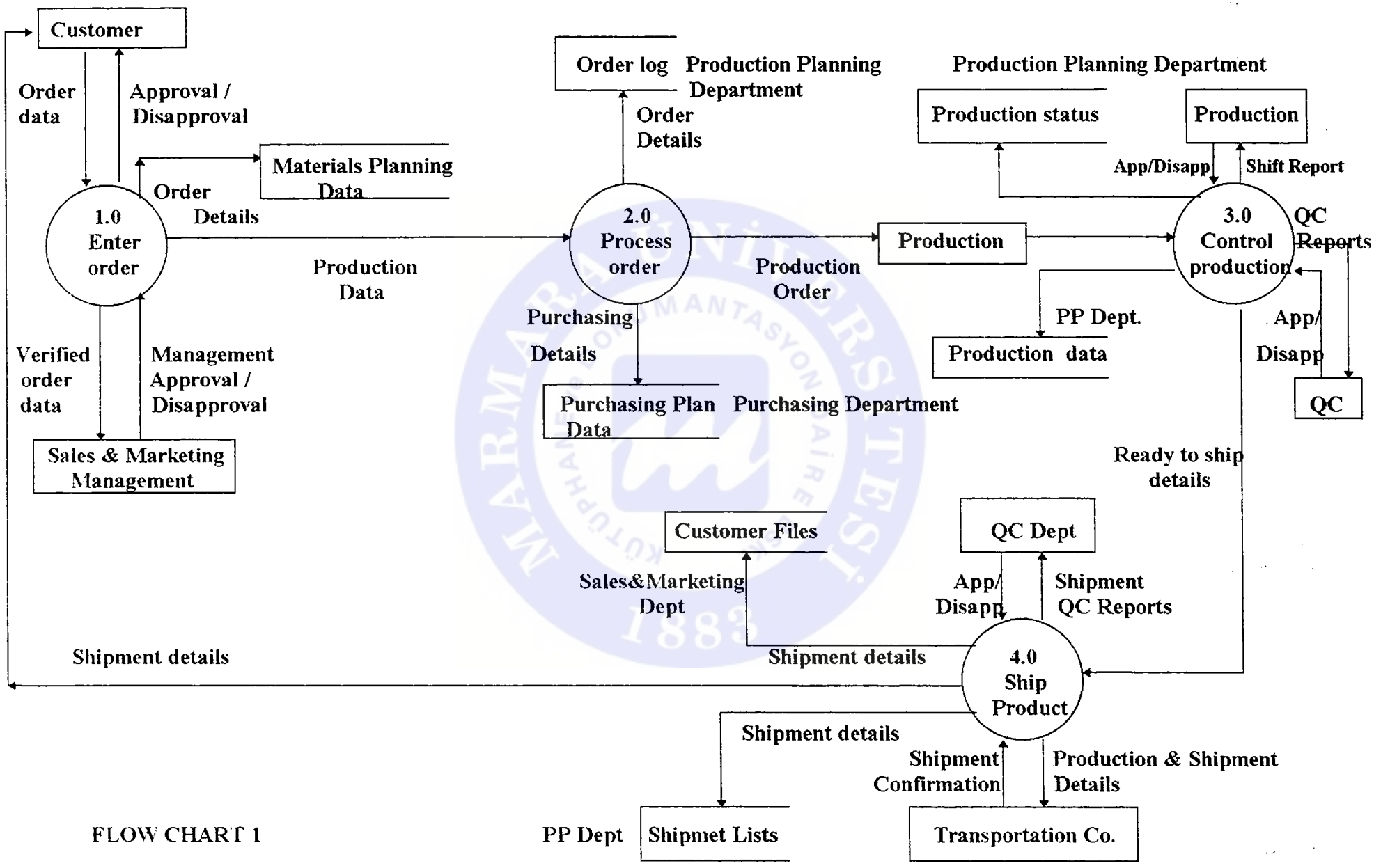
ÖDEME DETAYI:

HAZIRLAYAN:	KONTROL EDEN:	ONAYLAYAN:
	GN.MD.YRD.PAZARLAMA	GN.MÜDÜR

TARİH:

DAĞITIM: GN.MÜDÜR, GN.MD.YRD. PAZARLAMA, GN.MD.YRD. SATINALMA, FABRİKA MÜDÜRÜ

APPENDIX 6
FIRST LEVEL DATA FLOW CHART, PROCESS AND DATA DESCRIPTIONS


Customer
Order data
Approval / Disapproval
Order log
Production Planning Department
Order Details
Production Planning Department
Production status
Production
App/Disapp
Shift Report
Materials Planning Data
Order Details
1.0 Enter order
2.0 Process order
3.0 Control production
QC Reports
Production Data
Production Order
Production
PP Dept.
Production data
App/ Disapp
QC
Purchasing Details
Purchasing Plan Data
Purchasing Department
Verified order data
Management Approval / Disapproval
Sales & Marketing Management
Ready to ship details
Customer Files
QC Dept
Sales&Marketing Dept
App/ Disapp
Shipment QC Reports
Shipment details
Shipment details
4.0 Ship Product
Shipment details
Shipment Confirmation
Production & Shipment Details
PP Dept
Shipmet Lists
Transportation Co.

FLOW CHART 1

First Level Process Descriptions

PROCESS NAME : 1.0 Enter order

DESCRIPTON : Customer order is received and is approved for further processing.

INBOUND DATA FLOWS : Order data, management approval / disapproval (including long term production plans)

OUTBOUND DATA FLOWS : Verified order data, order details, customer approval / disapproval

PROCESS NAME : 2.0 Process order

DESCRIPTON : Accepted customer order is logged to provide a record of all received orders.

INBOUND DATA FLOWS : Approved order details

OUTBOUND DATA FLOWS : Order details, purchasing details, production order

PROCESS NAME : 3.0 Control production

DESCRIPTION : When the production order received to the factory, production status starts, during production until the product batch is ready to shipment, different QC are carried out. Some of the controls are done by the Production Department itself.

INBOUND DATA FLOWS : Production order, QC Department approval to product batches, Production Department approval to the production process or product

OUTBOUND DATA FLOWS : Ready to ship details, QC reports, Shift reports, production data details

PROCESS NAME : 4.0 Ship product

DESCRIPTION : Shipment is done in correlation with a transportation company. During shipment, QC controls are done simultaneously.

INBOUND DATA FLOWS : Ready to ship details, QC Department approval / disapproval, shipment confirmation

OUTBOUND DATA FLOWS : Shipment QC reports, shipment details, production and shipment details

7.1.2 Data Dictionary Entries for Data Flows

DATA FLOW NAME : Order data

DESCRIPTION : Order details received from customer

FROM PROCESSES :

TO PROCESSES : 1.0 Enter order

DATA STRUCTURES : Order details

DATA FLOW NAME : Approval / disapproval

DESCRIPTION : Acknowledgement of customer's order reflecting approval or disapproval of the order

FROM PROCESSES : 1.0 Enter order

TO PROCESSES :

DATA STRUCTURES : Order details-management approval / disapproval

DATA FLOW NAME : Management approval /disapproval

DESCRIPTION : Management app/disapp of verified order data

FROM PROCESSES :

TO PROCESSES : 1.0 Enter order

DATA STRUCTURES : Order details

DATA FLOW NAME : Order details

DESCRIPTION : Order details to put forward the material requirements within a certain period of time

FROM PROCESSES : 1.0 Enter order

TO PROCESSES :

DATA STRUCTURES : Order details

DATA FLOW NAME : Production data

DESCRIPTION : All the details of the order concerning production

FROM PROCESSES : 1.0 Enter order

TO PROCESSES : 2.0 Process order

DATA STRUCTURES : Production details

DATA FLOW NAME : Order data

DESCRIPTION : All the details of the order concerning production planning

FROM PROCESSES : 2.0 Process order

TO PROCESSES :

DATA STRUCTURES : Production planning details

DATA FLOW NAME : Purchasing details

DESCRIPTION : All the details of the order concerning purchasing related materials

FROM PROCESSES : 2.0 Process order

TO PROCESSES :

DATA STRUCTURES : Purchasing details

DATA FLOW NAME : Production order

DESCRIPTION : All the details of the order concerning production which are absolutely accurate

FROM PROCESSES : 2.0 Process order

TO PROCESSES : 3.0 Control production

DATA STRUCTURES : Exact production details

DATA FLOW NAME : Production control data

DESCRIPTION : All the details of product and process controls carried out by QC or production men

FROM PROCESSES : 3.0 Control production

TO PROCESSES :

DATA STRUCTURES : Production control details

DATA FLOW NAME : Production data

DESCRIPTION : All the production data including all the evaluations about the quality of the product

FROM PROCESSES : 3.0 Control production

TO PROCESSES :

DATA STRUCTURES : Production and product details

DATA FLOW NAME : Shift report

DESCRIPTION : Details of the shift concerning a particular production order from operator point of view

FROM PROCESSES : 3.0 Control production

TO PROCESSES :

DATA STRUCTURES : Production details at a particular shift

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : According to the shift reports approval or disapproval of the production managers

FROM PROCESSES :

TO PROCESSES : 3.0 Control production

DATA STRUCTURES : Management approval/disapproval

DATA FLOW NAME : QC reports

DESCRIPTION : All the details of the control data taken by the QC personnel

FROM PROCESSES : 3.0 Control production

TO PROCESSES :

DATA STRUCTURES : QC tests and observation details

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : After evaluation of the QC reports by QC department production batch or a part of the production is approved or disapproved

FROM PROCESSES :

TO PROCESSES : 3.0 Control production

DATA STRUCTURES : Quality Control approval/disapproval

DATA FLOW NAME : Ready to ship details

DESCRIPTION : Product release from the Production Department and all the details about the finished product

FROM PROCESSES : 3.0 Control production

TO PROCESSES :

DATA STRUCTURES : Ready to ship product and batch details

DATA FLOW NAME : Production and shipment details

DESCRIPTION : All the details of the order concerning transportation sent to the transportation company

FROM PROCESSES : 4.0 Ship product

TO PROCESSES :

DATA STRUCTURES : Product and shipment data from the customer and the mills

DATA FLOW NAME : Shipment confirmation

DESCRIPTION : After evaluation of the shipment and product details confirmation given by the transportation company

FROM PROCESSES :

TO PROCESSES : 4.0 Ship product

DATA STRUCTURES : Transportation company confirmation to shipment

DATA FLOW NAME : Shipment QC reports

DESCRIPTION : Reports prepared by the QC blue collars during and after shipment

FROM PROCESSES : 4.0 Ship product

TO PROCESSES :

DATA STRUCTURES : Shipment quality control data

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : After evaluation of data on QC reports, QC department approves or disapproves shipment and writes a report accordingly

FROM PROCESSES :

TO PROCESSES : 4.0 Ship product

DATA STRUCTURES : QC management approval or disapproval

DATA FLOW NAME : Shipment details

DESCRIPTION : After the shipment is completed all the details are sent to customers to Sales and Marketing Department to be stored in the related customer files

FROM PROCESSES : 4.0 Ship product

TO PROCESSES :

DATA STRUCTURES : All information about shipment concerning Sales & Marketing Department

DATA FLOW NAME : Shipment details

DESCRIPTION : All the details of the shipment and shipment reports by QC for the Production Plannning Department to be stored

FROM PROCESSES : 4.0 Ship product

TO PROCESSES :

DATA STRUCTURES : All shipment data and reports for the file of production

DATA FLOW NAME : Shipment details

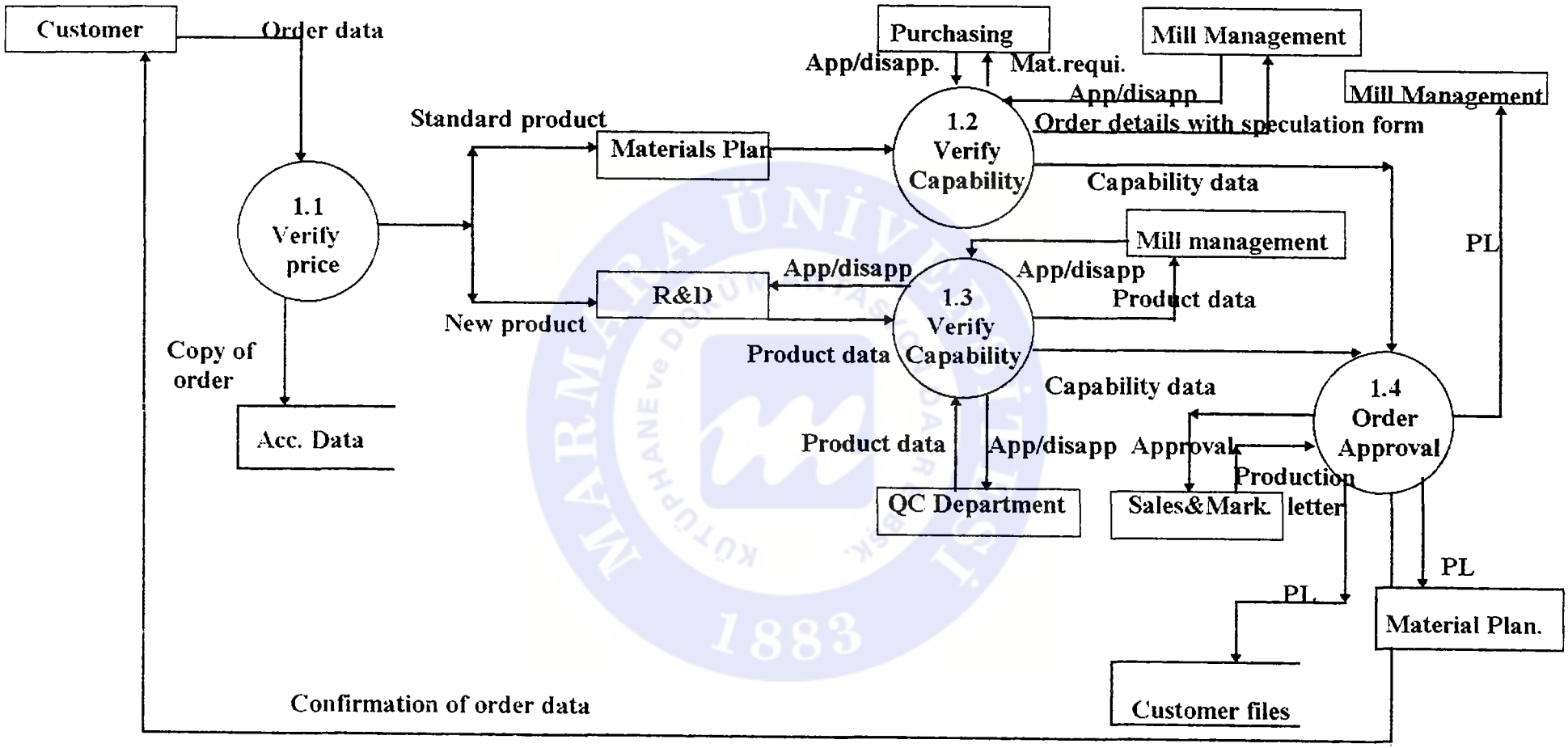
DESCRIPTION : All the details of the shipment and shipment reports by QC for customers to be informed

FROM PROCESSES : 4.0 Ship product

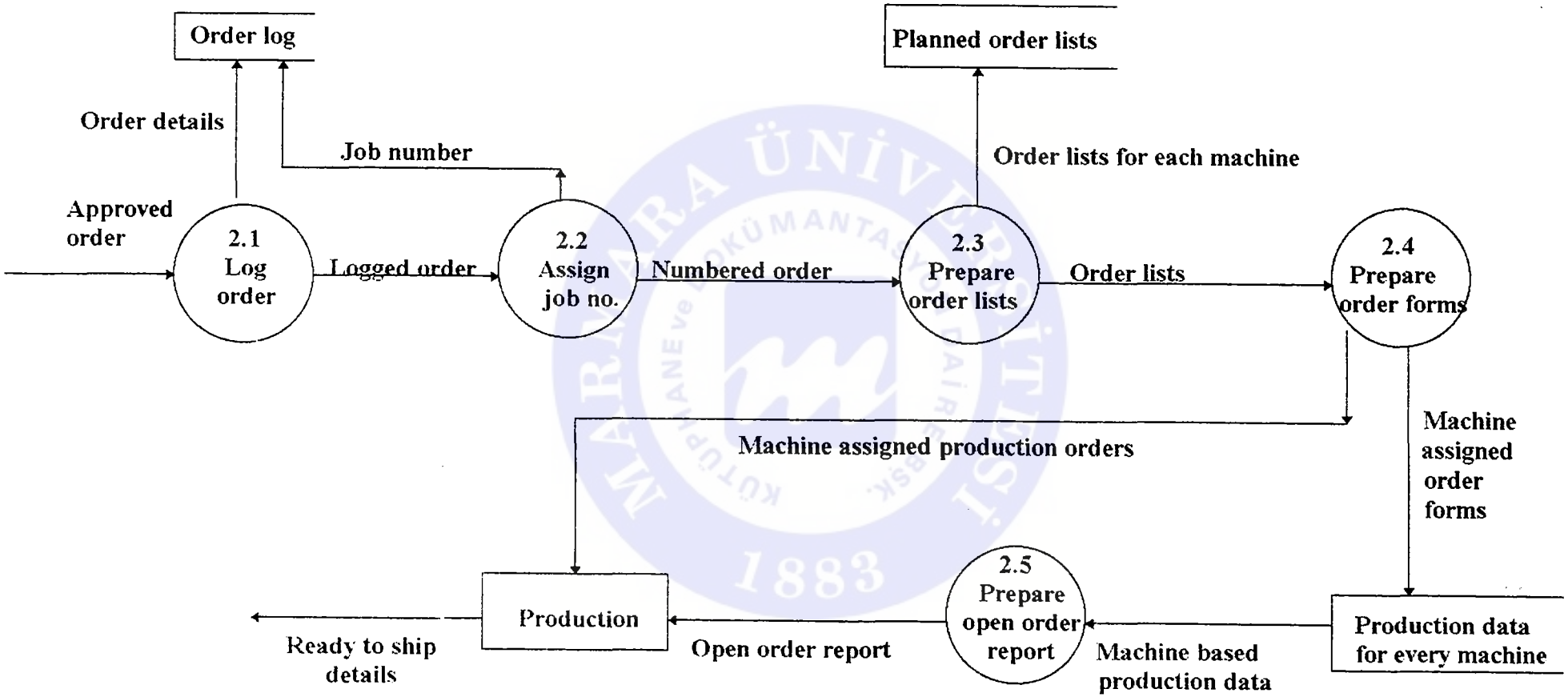
TO PROCESSES :

DATA STRUCTURES : All shipment data

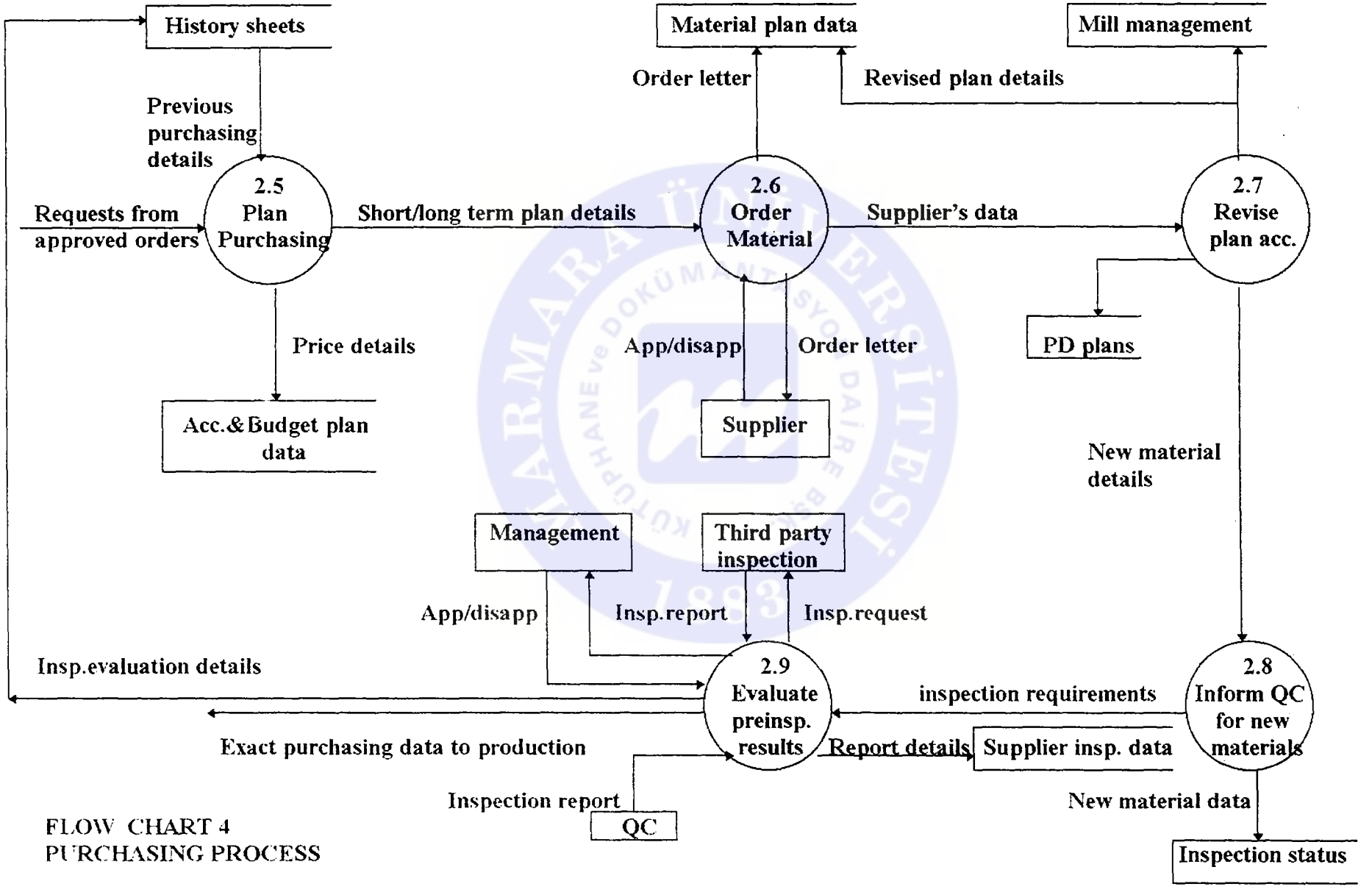
APPENDIX 7
SECOND LEVEL DATA FLOW CHARTS AND DATA DESCRIPTIONS



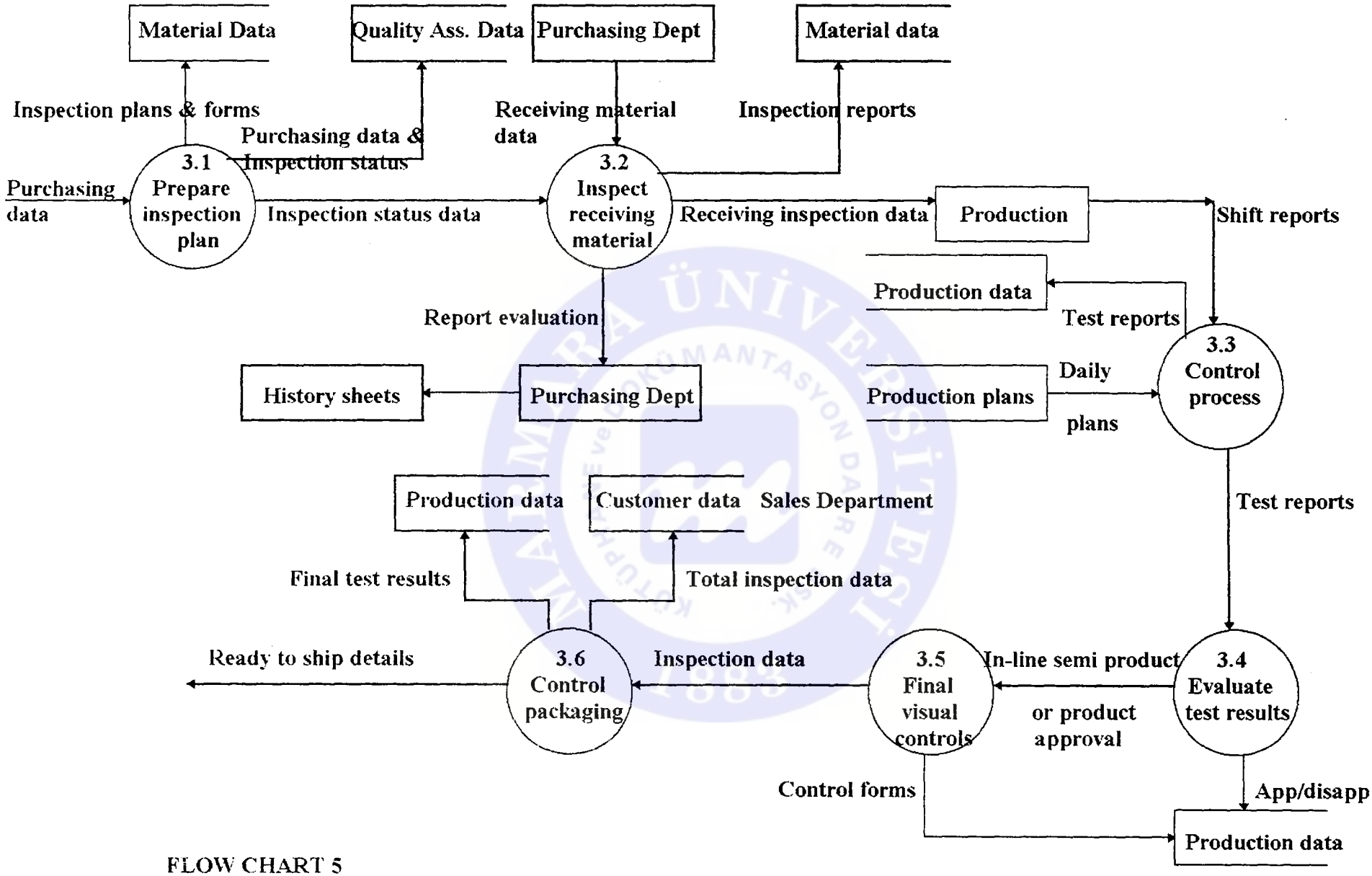
FLOW CHART 2 ENTER ORDER



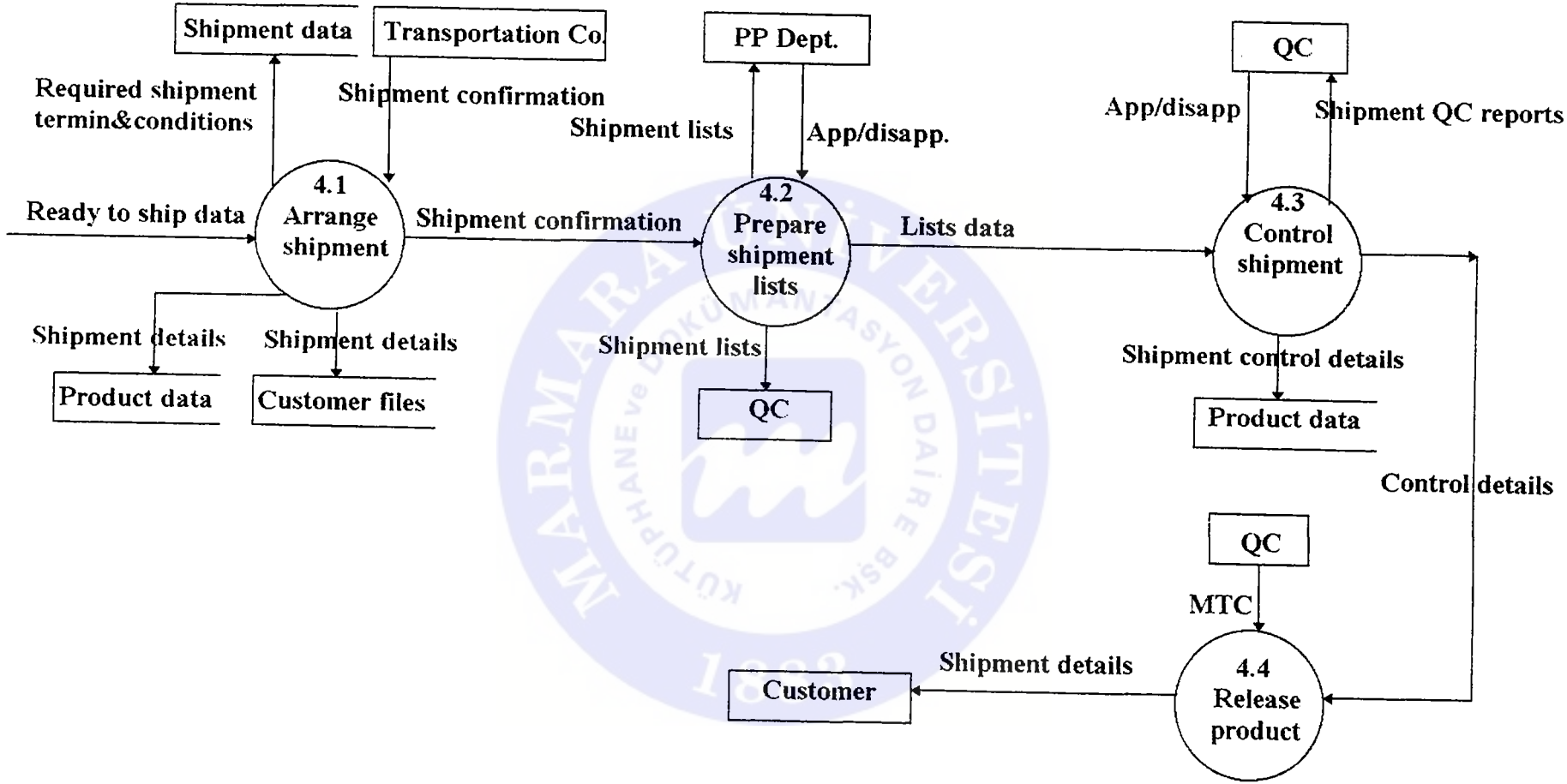
FLOW CHART 3
PROCESS ORDER



FLOW CHART 4
PURCHASING PROCESS



FLOW CHART 5
QUALITY CONTROL PROCESS



FLOW CHART 6
SHIPMENT PROCEDURE

Data Dictionary Entries for Data Flows

DATA FLOW NAME : Order data

DESCRIPTION : Order details received from customer

FROM PROCESSES :

TO PROCESSES : 1.1 Verify price

DATA STRUCTURES : Order details

DATA FLOW NAME : Order data

DESCRIPTION : Order details received from customer

FROM PROCESSES : 1.1 Verify price

TO PROCESSES :

DATA STRUCTURES : Order details

DATA FLOW NAME : Standard product data

DESCRIPTION : If the product is a standard one, only material and production availability are checked; so related data is sent to the planning department.

FROM PROCESSES : 1.1 Verify price

TO PROCESSES : 1.2 Verify capability

DATA STRUCTURES : Order details

DATA FLOW NAME : Order data

DESCRIPTION : Order details received from customer

FROM PROCESSES :

TO PROCESSES : 1.0 Enter order

DATA STRUCTURES : Product details

DATA FLOW NAME : New product data

DESCRIPTION : If the product is out of production range, which means a new product, then all details about it are prepared and sent to different departments to negotiate the capability of the mill to produce this. Also, the price is discussed afterwards again.

FROM PROCESSES : 1.1 Verify price

TO PROCESSES : 1.3 Verify capability

DATA STRUCTURES : Product details

DATA FLOW NAME : Material requirement

DESCRIPTION : Material requirements prepared according to the order details

FROM PROCESSES : 1.2 Verify capability

TO PROCESSES :

DATA STRUCTURES : Required material details

DATA FLOW NAME : Purchasing Department Approval / Disapproval

DESCRIPTION : According to the material requirements Purchasing Department checks the availability and gives app. or disapp for the order conditions

FROM PROCESSES : 1.2 Verify capability

TO PROCESSES : 1.0 Enter order

DATA STRUCTURES : Management app/disapp.

DATA FLOW NAME : Order details

DESCRIPTION : Order details are written on speculation form to be sent to Mill Management by the Material Planning Department.

FROM PROCESSES : 1.2 Verify capability

TO PROCESSES :

DATA STRUCTURES : Order speculation form

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : Decision of the mill about the order, whether it could be produced or not.

FROM PROCESSES :

TO PROCESSES : 1.2 Verify capability

DATA STRUCTURES : Order details

DATA FLOW NAME : Capability data

DESCRIPTION : Capability of production details and timing for the product

FROM PROCESSES : 1.2 Verify capability

TO PROCESSES : 1.4 Order approval

DATA STRUCTURES : Capability details

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : R&D management approval or disapproval according to the results of the feasibility study of the new product.

FROM PROCESSES : 1.3 Verify capability

TO PROCESSES :

DATA STRUCTURES : Management approval or disapproval

DATA FLOW NAME : Product data

DESCRIPTION : Product details according to the order forms are sent the Mill Management to evaluate the capability of the new product with R&D Department.

FROM PROCESSES : 1.3 Verify capability

TO PROCESSES :

DATA STRUCTURES : Product details

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : Mill Management approval or disapproval for the production which is the final decision on order

FROM PROCESSES :

TO PROCESSES : 1.3 Verify capability

DATA STRUCTURES : Management app/disapp.

DATA FLOW NAME : Product data

DESCRIPTION : Product details according to the order forms are sent QC to evaluate the capability of the new product with R&D Department.

FROM PROCESSES : 1.3 Verify capability

TO PROCESSES :

DATA STRUCTURES : Product details

DATA FLOW NAME : Approval / Disapproval

DESCRIPTION : QC Department approval or disapproval for the production which is the final decision on order

FROM PROCESSES :

TO PROCESSES : 1.3 Verify capability

DATA STRUCTURES : QC Management app/disapp.

DATA FLOW NAME : Capability data

DESCRIPTION : Capability of production details and timing for the product

FROM PROCESSES : 1.3 Verify capability

TO PROCESSES : 1.4 Order approval

DATA STRUCTURES : Capability details

DATA FLOW NAME : Production letter

DESCRIPTION : Production letter prepared by the Sales and Marketing Department. With this letter order and speculation on order is realized and put forward in production plan.

FROM PROCESSES :

TO PROCESSES : 1.4 Order approval

DATA STRUCTURES : Production details

DATA FLOW NAME : Approval

DESCRIPTION : Approval coming from the mill as the final consensus on production capacity

FROM PROCESSES : 1.4 Order approval

TO PROCESSES :

DATA STRUCTURES : Management app/disapp.

DATA FLOW NAME : Production letter

DESCRIPTION : Production letter prepared by the Sales and Marketing Department. With this letter order and speculation on order is realized and put forward in production plan and sent to Mill Management, Material Planning and stored in Customer Files in Sales and Marketing Department.

FROM PROCESSES : 1.4 Order approval

TO PROCESSES :

DATA STRUCTURES : Production details

DATA FLOW NAME : Confirmation of order data

DESCRIPTION : Confirmation sent to customer stating that order is accepted and put into the production schedule by Sales and Marketing Department.

FROM PROCESSES : 1.4 Order approval

TO PROCESSES :

DATA STRUCTURES : Confirmation of order

DATA FLOW NAME : Material request

DESCRIPTION : Suitable material request from approved order

FROM PROCESSES : 1.0 Verify order

TO PROCESSES : 2.5 Plan Purchasing

DATA STRUCTURES : Request details

DATA FLOW NAME : Previous purchasing details

DESCRIPTION : Ex-purchasing details about the same supplier by evaluating the history sheets and approved supplier lists: especially when the supplier is at category B.

FROM PROCESSES :

TO PROCESSES : 2.5 Plan purchasing

DATA STRUCTURES : Supplier assessment details

DATA FLOW NAME : Price details

DESCRIPTION : Quotations and all the price details related with presumed supplier/s.

FROM PROCESSES : 2.5 Plan purchasing

TO PROCESSES :

DATA STRUCTURES : Price, payment & shipping details

DATA FLOW NAME : Short/long term plan details

DESCRIPTION : Short term and long term purchasing plan details to be used both in purchasing policy and production planning

FROM PROCESSES : 2.5 Plan purchasing

TO PROCESSES : 2.6 Order material

DATA STRUCTURES : Purchasing plan

DATA FLOW NAME : Order letter

DESCRIPTION : Order letter is prepared to be sent to the supplier and original of the letter stored to be used at material planning and to follow purchasing procedure under the same file

FROM PROCESSES : 2.6 Order material

TO PROCESSES :

DATA STRUCTURES : Order details

DATA FLOW NAME : Approval/disapproval

DESCRIPTION : Supplier accepts or rejects order and informs customer accordingly

FROM PROCESSES :

TO PROCESSES : 2.6 Order material

DATA STRUCTURES : Supplier approval/disapproval

DATA FLOW NAME : Supplier's data

DESCRIPTION : Suppliers data coming from supplier about order and order terms like material details, shipping details, terms of delivery etc., which are almost exact.

FROM PROCESSES : 2.6 Order material

TO PROCESSES : 2.7 Revise plan accordingly

DATA STRUCTURES : Acceptance details coming from supplier

DATA FLOW NAME : Revised plan details

DESCRIPTION : Plans are revised according to information sent by supplier and stored at Mill Management, Material Planning Department and also the information is sent to Production departments to revise their plans accordingly

FROM PROCESSES : 2.7 Revise plan accordingly

TO PROCESSES :

DATA STRUCTURES : Revised plans

DATA FLOW NAME : New material details

DESCRIPTION : All the material details include. shipment terms to let QC know about material and take necessary actions in time

FROM PROCESSES : 2.7 Revise plan accordingly

TO PROCESSES : 2.8 Inform QC for new materials

DATA STRUCTURES : All the details about the materials

DATA FLOW NAME : New material details

DESCRIPTION : All the material details include. shipment terms to let QC know about material and take necessary actions in time and QC stores data in inspection status data sink

FROM PROCESSES : 2.8 Inform QC for new materials

TO PROCESSES :

DATA STRUCTURES : All the details about the materials

DATA FLOW NAME : Inspection requirements

DESCRIPTION : All the inspections to be carried out for the material are recorded beforehand by evaluating material details coming from supplier and from related international standards

FROM PROCESSES : 2.8 Inform QC for new materials

TO PROCESSES : 2.9 Evaluate preinspection results

DATA STRUCTURES : All the details about inspection status

DATA FLOW NAME : Inspection request

DESCRIPTION : Some inspections are carried out by the third parties. For this kind of inspections an inspection request is prepared

FROM PROCESSES : 2.9 Evaluate preinspection results

TO PROCESSES :

DATA STRUCTURES : Inspection status details to third parties

DATA FLOW NAME : Inspection report

DESCRIPTION : The results of QC inspections including approval or disapproval of the department

FROM PROCESSES :

TO PROCESSES : 2.9 Evaluate preinspection results

DATA STRUCTURES : Inspection details by QC

DATA FLOW NAME : Inspection report

DESCRIPTION : The results of the third party inspections as an independent report.

FROM PROCESSES : 2.9 Evaluate preinspection results

TO PROCESSES :

DATA STRUCTURES : Inspection status details

DATA FLOW NAME : Approval/disapproval

DESCRIPTION : Approval or disapproval of the management for the materials by evaluating the results of the inspections

FROM PROCESSES :

TO PROCESSES : 2.9 Evaluate preinspection results

DATA STRUCTURES : Management approval or disapproval

DATA FLOW NAME : Inspection evaluation details

DESCRIPTION : Evaluation details of inspection stored at history sheets attached with related files

FROM PROCESSES : 2.9 Evaluate preinspection results

TO PROCESSES :

DATA STRUCTURES : History sheet update data

DATA FLOW NAME : Exact purchasing data

DESCRIPTION : Exact purchasing data and details are sent to the mills to inform them and let them do the necessary changes in production plans

FROM PROCESSES : 2.9 Evaluate preinspection results

TO PROCESSES :

DATA STRUCTURES : Purchasing data & details

DATA FLOW NAME : Approved order

DESCRIPTION : Order approval and related data are sent from Sales and Marketing Department to be proceeded at mills

FROM PROCESSES :

TO PROCESSES : 2.1 Log order

DATA STRUCTURES : Order approval and related data

DATA FLOW NAME : Order details

DESCRIPTION : Order details are sent to the Planning departments to register the order and put it in the plans

FROM PROCESSES : 2.1 Log order

TO PROCESSES :

DATA STRUCTURES : Order data

DATA FLOW NAME : Logged order

DESCRIPTION : Registared order data

FROM PROCESSES : 2.1 Log order

TO PROCESSES : 2.2 Assign job number

DATA STRUCTURES : Order data

DATA FLOW NAME : Job number

DESCRIPTION : A job number is given to very each order by the Planning Departments and stored with the related order log

FROM PROCESSES : 2.2 Assign job number

TO PROCESSES :

DATA STRUCTURES : Job number for every order

DATA FLOW NAME : Numbered order

DESCRIPTION : Order details with given job number are sent to related people to prepare order lists and put it in the plans

FROM PROCESSES : 2.2 Assign job number

TO PROCESSES : 2.3 Prepare order lists

DATA STRUCTURES : Order number and related data

DATA FLOW NAME : Order lists for each machine

DESCRIPTION : Prepared order lists for every each machine are matched with long term plans and stored with related data

FROM PROCESSES : 2.3 Prepare order lists

TO PROCESSES :

DATA STRUCTURES : Order data

DATA FLOW NAME : Order lists

DESCRIPTION : Order lists are used to prepare related order forms for every job

FROM PROCESSES : 2.3Log order

TO PROCESSES : 2.4 Prepare order forms

DATA STRUCTURES : Order data

DATA FLOW NAME : Machine assigned production orders

DESCRIPTION : Production order lists are used to prepare machine based order lists first. Then order forms are written for every batch. Machine assigned order lists are sent to the related people to check the suitability of the lists. then forms are filled out

FROM PROCESSES : 2.4 Prepare order forms

TO PROCESSES :

DATA STRUCTURES : Order lists

DATA FLOW NAME : Machine assigned production orders

DESCRIPTION : Production order lists are used to prepare machine based order lists first. Then order forms are written for every batch. Machine assigned order lists are sent to the related people to check the suitability of the lists. then forms are filled out. A copy of these forms and related data are stored with order production data

FROM PROCESSES : 2.4 Prepare order forms

TO PROCESSES :

DATA STRUCTURES : Order forms

DATA FLOW NAME : Machine based production data

DESCRIPTION : Production data for every machine and production batch are collected to prepare open order report

FROM PROCESSES : 2.4 Prepare order forms

TO PROCESSES : 2.5 Prepare open order report

DATA STRUCTURES : Production data for every batch

DATA FLOW NAME : Open order report

DESCRIPTION : Production data for every machine and production batch are collected and formatted as a report

FROM PROCESSES : 2.5 Prepare open order report

TO PROCESSES :

DATA STRUCTURES : Production report

DATA FLOW NAME : Purchasing data

DESCRIPTION : All the purchasing data is sent to QC department to let them know about materials to be received

FROM PROCESSES : 2.9 Evaluate preinspection results

TO PROCESSES : 3.1 Prepare inspection plan

DATA STRUCTURES : Inspection status data

DATA FLOW NAME : Purchasing data & inspection status

DESCRIPTION : All the purchasing data and inspection status are sent to QA department

FROM PROCESSES : 3.1 Prepare inspection plan

TO PROCESSES :

DATA STRUCTURES : Purchasing details on material bases and inspection status data

DATA FLOW NAME : Inspection status data

DESCRIPTION : Inspection structure is prepared and necessary forms are used during inspection

FROM PROCESSES : 3.1 Prepare inspection plan

TO PROCESSES : 3.2 Inspect receiving material

DATA STRUCTURES : Inspection structure and forms to be used

DATA FLOW NAME : Receiving material data

DESCRIPTION : As the purchased materials are received to the harbor, Purchasing Department let QC know about the case and gives the necessary data for the inspection

FROM PROCESSES :

TO PROCESSES : 3.2 Inspect receiving material

DATA STRUCTURES : Receiving material details

DATA FLOW NAME : Inspection reports

DESCRIPTION : Receiving material inspection results

FROM PROCESSES : 3.2 Inspect receiving material

TO PROCESSES :

DATA STRUCTURES : Inspection details

DATA FLOW NAME : Report evaluation

DESCRIPTION : Report results are evaluated and approval or disapproval is given for each coil by QC and results are sent to Purchasing Department to be used at history sheets, thus at the evaluation of suppliers

FROM PROCESSES : 3.2 Inspect receiving materials

TO PROCESSES :

DATA STRUCTURES : QC approval or disapproval for materials

DATA FLOW NAME : Receiving inspection data

DESCRIPTION : All the inspection results as a report are sent to the production for every delivery

FROM PROCESSES : 3.2 Inspect receiving material

TO PROCESSES :

DATA STRUCTURES : Receiving inspection results

DATA FLOW NAME : Shift reports

DESCRIPTION : A copy of shift reports is sent to QC to follow production types and batches to be controlled. by Production Department

FROM PROCESSES :

TO PROCESSES : 3.3 Control process

DATA STRUCTURES : Production data recorded on shift reports

DATA FLOW NAME : Daily plans

DESCRIPTION : Daily production plans are sent to QC to follow the production batches

FROM PROCESSES :

TO PROCESSES : 3.3 Control process

DATA STRUCTURES : Production plans prepared by Planning Department daily

DATA FLOW NAME : Test reports

DESCRIPTION : All test reports including visual control to be done in process and their evaluation by QC

FROM PROCESSES : 3.3 Control process

TO PROCESSES : 3.4 Evaluate test results and production data

DATA STRUCTURES : In process inspection details

DATA FLOW NAME : In-line semiproduct or product approval

DESCRIPTION : All tests and inspections carried out during process control are evaluated and tested products/semiproducts are released for final jobs and visual controls accordingly

FROM PROCESSES : 3.4 Evaluate test results

TO PROCESSES : 3.5 Final visual controls

DATA STRUCTURES : Product approval or disapproval

DATA FLOW NAME : Approval/disapproval

DESCRIPTION : QC report evaluations are stored with other product data

FROM PROCESSES : 3.4 Evaluate test results

TO PROCESSES :

DATA STRUCTURES : Product approval or disapproval by QC

DATA FLOW NAME : Control data/forms

DESCRIPTION : Final visual controls are carried out before packaging and recorded on visual control forms (reports) and stored with product data

FROM PROCESSES : 3.5 Final visual control

TO PROCESSES :

DATA STRUCTURES : Visual control reports

DATA FLOW NAME : Inspection data

DESCRIPTION : All tests and inspections carried out during process control and afterwards are evaluated and results are gathered before packaging

FROM PROCESSES : 3.5 Final visual controls

TO PROCESSES : 3.6 Control packaging

DATA STRUCTURES : Inspection status

DATA FLOW NAME : Total inspection data

DESCRIPTION : All tests and inspections carried out during process control and afterwards are evaluated and results are gathered and sent to the Sales Department to be stored in customer own file

FROM PROCESSES : 3.6 Control packaging

TO PROCESSES :

DATA STRUCTURES : Inspection status

DATA FLOW NAME : Final test results

DESCRIPTION : Data gathered from final tests carried out during packaging are stored with product data

FROM PROCESSES : 3.6 Control packaging

TO PROCESSES :

DATA STRUCTURES : Final tests data

DATA FLOW NAME : Ready to ship details

DESCRIPTION : After packaging ready to ship data is sent to Transportation Company and also Planning Department

FROM PROCESSES : 3.6 Control packaging

TO PROCESSES : 4.0 Ship the product

DATA STRUCTURES : Product data to be used during shipment

DATA FLOW NAME : Ready to ship data

DESCRIPTION : All the data concerning product and shipping details, which are came from customer or Sales Department.

FROM PROCESSES : 3.0 Control product

TO PROCESSES : 4.1 Arrange shipment

DATA STRUCTURES : Shipping details

DATA FLOW NAME : Required shipment termini and conditions

DESCRIPTION : Notice from Production Department that an order has been manufactured and is ready for shipping

FROM PROCESSES : 4.1 Arrange shipment

TO PROCESSES :

DATA STRUCTURES : Production order completion status

DATA FLOW NAME : Shipment details

DESCRIPTION : Notice from Production Department that an order has been manufactured and is ready for shipping

FROM PROCESSES : 4.1 Arrange shipment

TO PROCESSES :

DATA STRUCTURES : Production order completion status

DATA FLOW NAME : Shipment confirmation

DESCRIPTION : Notice from Transportation Company that a shipping would be done according to the stated conditions

FROM PROCESSES :

TO PROCESSES : 4.1 Arrange shipment

DATA STRUCTURES : Confirmation to the shipment conditions and terms

DATA FLOW NAME : Shipment confirmation

DESCRIPTION : Notice about shipping that would be done according to the stated conditions by Mill Finishing Department

FROM PROCESSES : 4.1 Arrange shipment

TO PROCESSES : 4.2 Prepare shipment lists

DATA STRUCTURES : Internal confirmation to the shipment conditions and terms

DATA FLOW NAME : Shipment lists

DESCRIPTION : Shipments of batches are listed acc. their characteristics and sent to Production Planning Department for approval; also QC to let them know about timing

FROM PROCESSES : 4.2 Prepare shipment lists

TO PROCESSES :

DATA STRUCTURES : Lists of shipment include. order data

DATA FLOW NAME : Approval/disapproval

DESCRIPTION : QC approval or disapproval for shipments of batches

FROM PROCESSES :

TO PROCESSES : 4.3 Control shipment

DATA STRUCTURES : QC management final approval or disapproval to product

DATA FLOW NAME : Shipment control details

DESCRIPTION : Shipment control details including QC evaluation are stored with product data and used for release

FROM PROCESSES : 4.3 Control shipment

TO PROCESSES : 4.4 Release product

DATA STRUCTURES : All inspection data

DATA FLOW NAME : Shipment details

DESCRIPTION : Shipment details including QC evaluation and Mill Test Certificate are sent to the customer

FROM PROCESSES : 4.4 Release product

TO PROCESSES :

DATA STRUCTURES : Inspection and test results and shipment details

Bibliography

Feigenbaum, A.V., "Total Quality Control", Third Revision, Mc Graw Hill, 1991.

Grahn, D.P., "Five Drivers of Total Quality", Quality Progress, Jan.1995, Vol.28, No.1, pp. 65-70.

Ishikawa, K., "What is Total Quality Control?", Prentice Hall, 1985.

Juran, J.M., and Gryna, F.M., "Quality Planning and Analysis", Second Edition, Mc Graw Hill, 1980.

Mannesmann, Röhren Werke, "The Manufacture and Testing of Steel Pipe and Tubing", Mannesmannröhren-Werke AG, 1986.

Ozawa, M., "Total Quality Control and Management", Juse Press, 1988.

Pyzdek T. & Berger R.W., "Quality Engineering Handbook", ASQC, 1991.

Rowe Parker Associates, "Quality Costs Course", S&Q Mart, 1994.

Senge, P., "The Fifth Discipline", Dell Publishing Group Inc., 1990.

Senn, J.A., "Analysis & Design of Information Systems", Second Edition, Mc Graw Hill, 1989

Supsan, "Corrective and Preventive Action procedure; FMEA Applications", 1993.

Veilleux , R.F. & Petro L.W., "Tool and manufacturing Engineers Handbook; Volume V Manufacturing Mangement",Society of Manufacturing Engineers, 1988.