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In an integrated steel plant, there are many systems monitoring and controlling each of the unit operations, but there are not many system applications available that can be used for total plant monitoring.

Abstract

Steel making processes are highly energy intensive and comprised of many complex unit operations. Iron ore and coal need preprocessing before feeding into a reactor, and molten metal from different reactors needs to be carefully drawn into a solid metal and then rolled into sheets. Each of these operations has a stake in the quality of steel produced, and needs constant monitoring.

There are many systems monitoring and controlling each unit operation, but there are not many system applications available that can be used for total integrated monitoring of plant operations that includes energy optimization across plants, production scheduling and a plant-wide comprehensive reporting system that users can view on computers, tablets or smart phones.

This paper discusses the actual realities and how integrated reporting can benefit steel manufactures.

Abbreviations

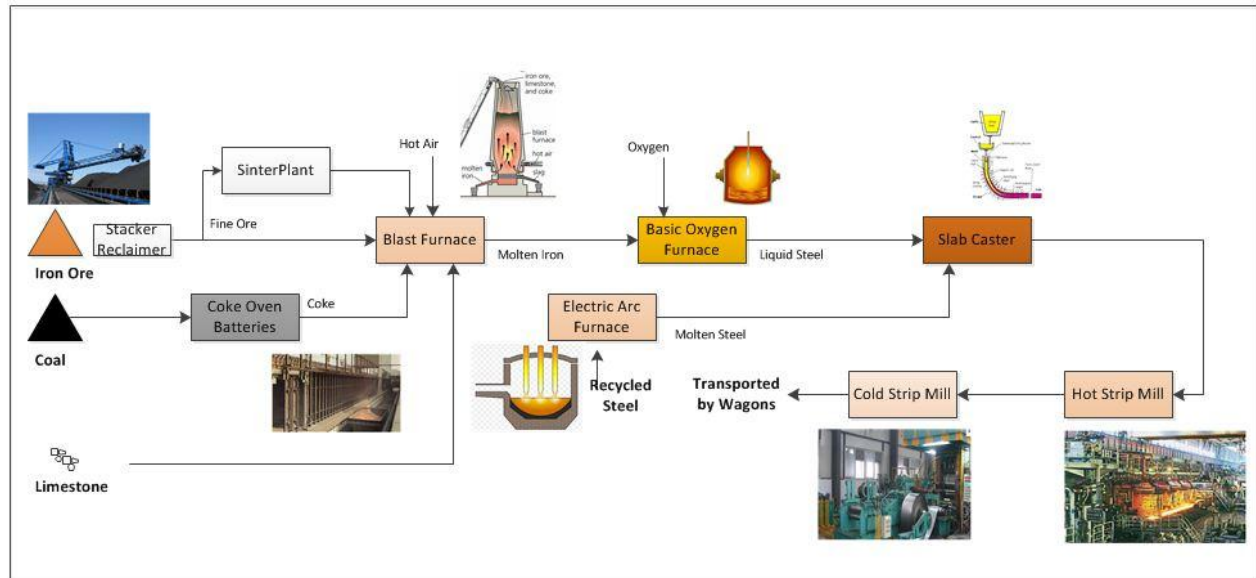
Sl. No.	Acronym	Full Form
1	BOF/LD	Basic Oxygen Furnace – Used in converting molten iron to steel. Also called a Linz-DonaWitz furnace
2	DCS	Distributed Control System
3	KPI	Key Performance Indicators
4	Hadoop	Hadoop is a data storage and handling system for very large databases, on the order of terabytes
5	PLC	Programmable Logic Controller
6	MES	Manufacturing Execution System
7	SCADA	Supervisory Control and Data Acquisition system - similar to DCS

Steel Manufacturing and Automation

Automation in steel manufacturing is complex and varied as there are many operations to be monitored. Here is a brief description of the process flow and automation involved in steel manufacturing.

Steel Plant Operations

The diagram represents a simplified flow diagram in steel manufacturing.

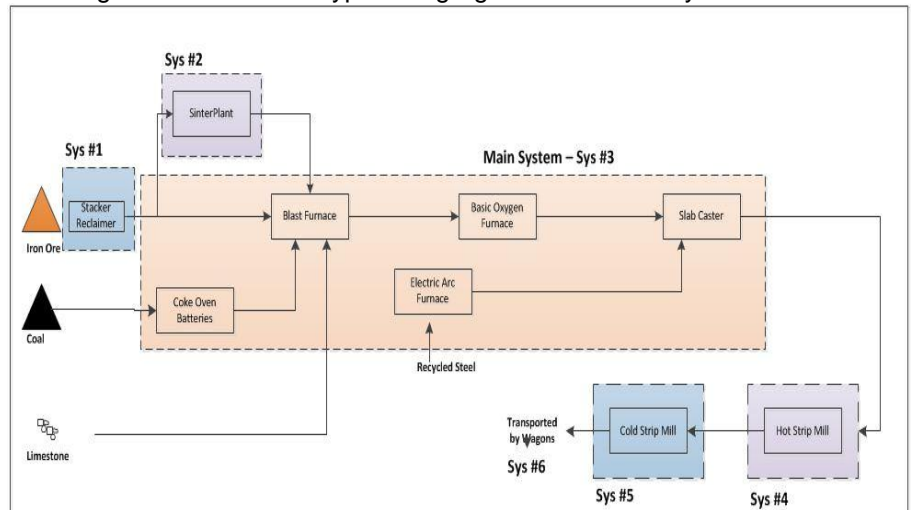


- Crushed iron, coal and limestone from respective mines are brought to the plant by wagons /ships
- A stacker helps in piling the ore and the bucket wheel reclaimer reclaims the ore and puts it onto conveyor belts that transport the ore to the plant area
- Iron ore fines are agglomerated into lumps in a sinter plant
- As raw coal has poor crushing strength and is volatile matter, the coal is baked in the absence of air in coke oven batteries to produce Coke
- Iron ore, coke and limestone are fed into a blast furnace, and hot air from the stoves reduces iron ore to molten iron
- Molten iron is sent to a Basic Oxygen Furnace or LD furnace to reduce the carbon content by treating with pure oxygen. Excess carbon goes out as carbon monoxide, and molten steel is born.
- Molten steel is slowly rolled and cooled to a solid slab in a slab caster or continuous caster
- Slabs are taken to the hot roll mill where they are reheated to bring them to a correct temperature for rolling. They are then rolled to smaller thickness by passing over a series of rolls, and finally made into a rolled coil of steel. The coil is shipped or sent to a cold mill.
- The cold roll mill reduces the thickness further. Annealing and galvanizing is done on the steel to meet the specifications of its intended use.
- Recycled steel or scrap steel is melted in an electric arc furnace, and joins the processes as molten steel.

Stacker Reclaimer, Sinter Plant, Blast Furnace, Hot Strip Mill and Cold Mill all have individual control systems monitoring their operations

Automation Systems in an Integrated Steel Plant

As there are many operations in steel making, there are many control systems deployed, each for a specific or group of operations. The diagram below shows typical segregation of control systems



- The Stacker Reclaimer is controlled by a separate PLC system (Sys #1 in the diagram). Stacker movement, like luffing, travelling and slewing, are controlled by the PLC
- The Sinter plant is controlled by a separate distributed control system that primarily does water addition and sinter mix moisture control, surge hopper level control, sinter mix charging control and air- and gas flow control
- The Coke oven, blast furnace, stoves, BOF, and slab caster are controlled by the main control system (sys #3)
- As hot and cold strip mills are driven by variable speed drives, a separate SCADA system is used in hot strip and cold mill respectively (sys # 4 & 5).
- Wagon movement and scheduling are handled by the wagon monitoring system

Other than these field-based systems, there are other operational systems such as:

- Production planning and control are handled by a separate system to optimize the production schedule



With many control systems, there is a necessity to collect, analyze and view data across plants.

HCL's Maqplex is a cloud-based framework for data collection, data analytics and reporting.

Challenges in Steel Plant Automation

As there many control systems in play in a steel plant, getting a complete view of the entire plant operations from ore handling to the transportation of finished steel requires a supervisory system like a Manufacturing Execution System (MES). In plants that do not have an MES, data consolidation is done manually in some form, leading to error and inconsistencies. There are obvious disadvantages in these, such as:

- It becomes difficult for operators to collate information from all these different sources
- Operators lose track of productivity improvement measures and efficiency monitoring
- Key performance indicators across the plant are cumbersome to calculate, and many times are done manually
- Synchronized archival and playback of past data from different units cannot be done for the complete plant, and moreover, not all individual systems support archival and playback features

Solution - Maqplex in an Integrated Steel Plant

A common reporting framework that would interface to all data sources, i.e. from different control systems, in the plant, collect and archive data with the facility to perform advanced data analytics, and with an easy interface to mobile devices like tablets and smartphones is required. The framework with an option of using the cloud (as it offers the highest scalability for the future at the most optimal cost) would be an ideal choice. HCL's Maqplex M2M framework is best suited for this application.

Benefits of Using Maqplex

Data collected from different sources is time stamped and stored in a central database. The Maqplex dashboard uses the data to present reports, plots and predictions. Some of typical dashboard presentations include:

- Real-time and archived graphical data plotting
- KPI indicators from sinter, blast furnace, basic oxygen furnace and mills
- Energy and mass balance for each unit operation
- Inventory management and waste tracking
- Condition monitoring of equipment
- Video analytics using thermal imaging
- Analytics with Hadoop
- Data/graphics on mobile platforms

Here is brief description of these features.



Maqplex has adapters to collect data from PLC, DCS, LIMS and Asset management systems

Energy & Material Balance help to reduce energy consumption

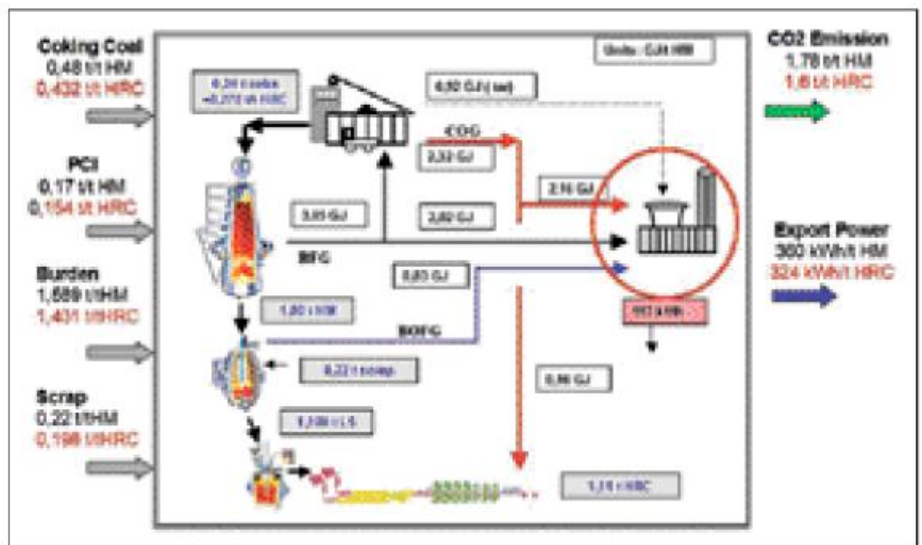
a. Plant-Wide Data Collection

Maqplex has data adapters to collect data from PLC, control systems and even directly from wireless devices or Ethernet networks. Data from the stacker reclaimer to the cold mill and wagon tracking system can be archived on Maqplex.

b. Energy and Material Balance

As 6 million Kcal are used to produce 1 ton of steel, energy conservation plays a very important role in steel manufacturing. As process data across the plant is collected, energy and material balance, especially where gaseous fuels are used, can be computed for:

- Coke oven heating
- Blast furnace stoves
- Soaking pits
- Reheating furnace in hot strip mill



Energy Balance

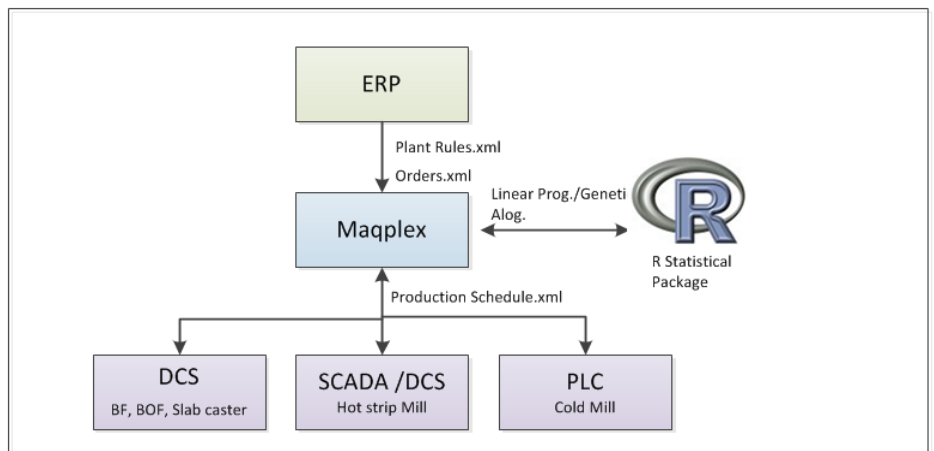
- Reveals actual energy consumption by allocation of the actual use of energy in each of the unit operations
- Identifies areas in which waste heat or gas are not harnessed.
- Generates energy consumption forecasts that can be used when integrated to smart grid

c. Scheduling

Scheduling of production is challenging in a steel plant with many dependent unit operations. Steel plant operation is a batch process – coke oven batteries operate in cycles, blast furnace and BOF furnaces operate in batches. So it is important that the batch production cycle is optimized to ensure there is continuous output of finished steel with minimal latency time.

Scheduling of molten iron operations, hot strip mill and cold mill can be done by Maqplex

The solution fills a critical gap between the company's enterprise resource planning (ERP) system and the plant's real-time production control system (DCS) by optimizing the daily production process.



Maqplex is seamlessly interfaced with 'R' – an open source statistical package that has over 3,000 built-in algorithms. The library of R algorithms gets updated periodically as they become proven.

Scheduling can be performed at three levels:

- Hot molten steel – Blast furnace, BOF and slab caster constraints are considered to guarantee continuous supply of hot metal to slab casters.
- The hot strip mill scheduler considers the activities of the slab yard, reheating furnaces and rolling mills to optimize the production schedule
- The finishing mills scheduler optimizes the resource utilization required for annealing and galvanization to meet requirements of the end customer required output

d. Condition Monitoring of Equipment

Online vibration analysis can be performed on drive trains in hot strip and cold rolling mills. Pattern recognition algorithms are used to detect any deviation from normal vibration levels to alert operators

e. Thermal Imaging

Maqplex can display thermal images sent from fixed thermal cameras and perform video analytics to detect abnormalities. Typical locations for thermal imaging include:

Maqplex is integrated with the R statistical package that has more than 3,000 algorithms in its library



YONG YANG STEEL

Condition monitoring and preventive maintenance is simplified using Hadoop and R statistical packages

Maqplex provides the option of storing non-sensitive data on cloud servers

- Steel from slab caster to hot strip mill is monitored on a thermal camera to compare the actual temperature with the computed, pre-scheduled temperature at various points to optimise the process
- Exterior refractory inspections locate "hot spots" in furnaces and process vessels, indicating thinning or missing refractory lining or insulation

f. Analytics with Hadoop

Maqplex is integrated with Hadoop. Real-time data collected from hundreds of sensors can be archived in distributed servers and effectively analysed for potential breakdown of equipment, pattern matching to compare current plant data with past data to check how plant upsets were handled. As Maqplex can be integrated with the cloud, performing data analytics with Hadoop and the cloud becomes a very cost-effective and feature-rich solution

g. Data on Mobile Platforms

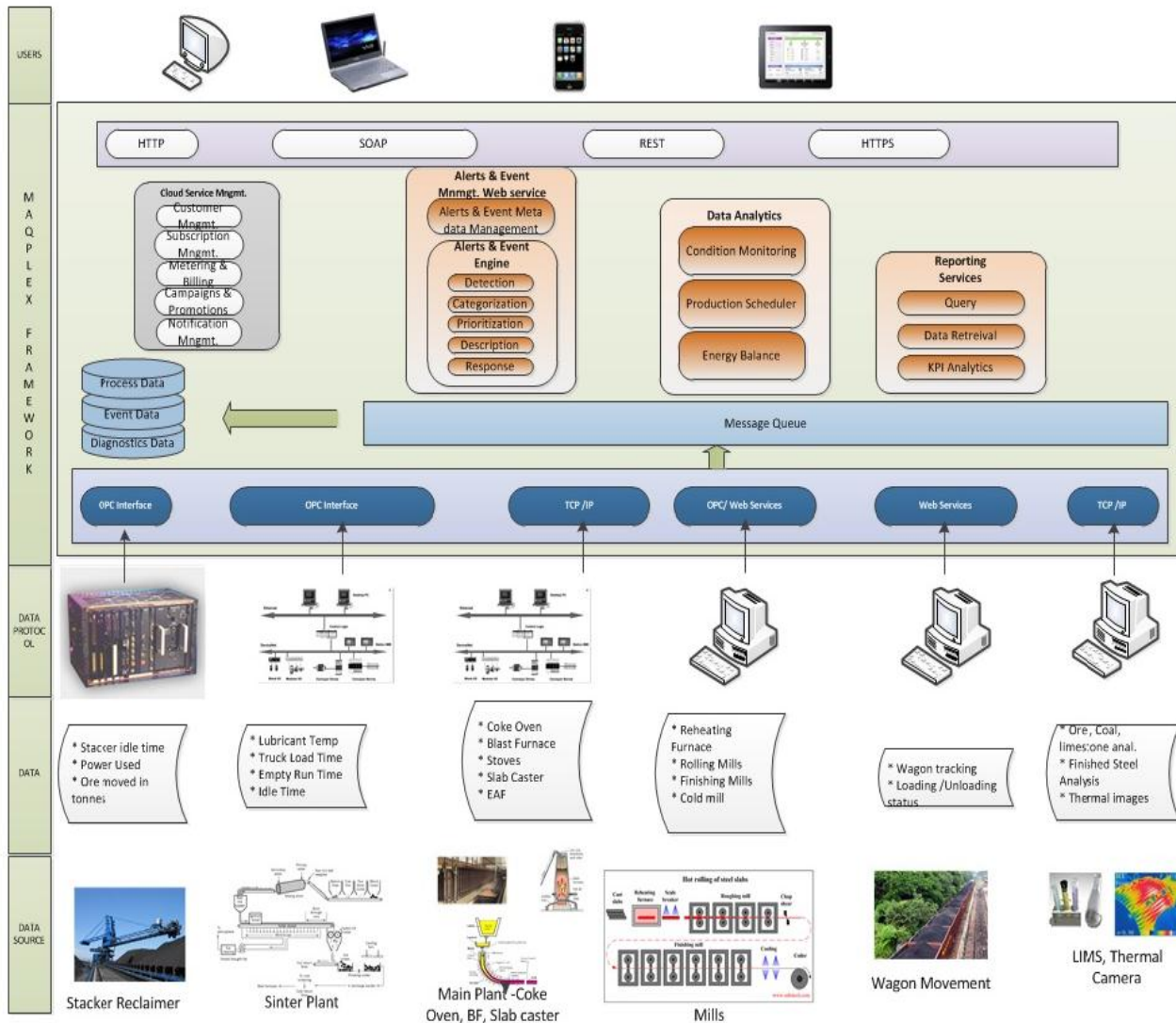
Maqplex has a ready interface to mobile devices like tablets and smart phones. Graphics and plant data can be viewed, and if need be, also controlled from mobile devices.

Application on the Cloud

Maqplex is an M2M framework that uses the cloud infrastructure for hosting the application, computing and for the database. The cloud is the ideal backbone for this application, offering many benefits such as:

- The application can be split into many services – data monitoring services, analytics services, optimization services, etc., and can be offered to customers
- End users pay only for the services used, and only for the time used
- Scalable to cater to any number of end users with performance and response time guaranteed
- Analytics can be expanded in the future to include more proven optimization applications for mines
- Option of remote monitoring by experts in another part of world
- All the above at the least possible cost

Here is architecture diagram of a Maqplex framework as envisaged in a steel plant.





Maqplex consolidates data from systems supplied by different OEM

A Typical Use Case

In the past, an integrated steel plant had different control systems for each of their plants, starting from ore handling to loading finished steel to wagons. There was no system integrating data across all plants and that led to many operational issues.

- It was not possible to compare steam, power and green gas emission efficiencies across each plant at same instant
- Scheduling of hot metal operation was not possible, and done only for hot and cold mills
- Each plant had their own supervisory controls from a range of vendors while they performed very similar functions. Maintaining the application required system knowledge of that application.
- It was not possible to correlate important parameters from other plants when there was upset in one section of a plant

Maqplex is an ideal application to solve these operation issues.

- With Maqplex dashboards, all unit operations and equipment performance are available in easy visual formats
- A user-friendly query engine can compare present data with past data as graphs or tabular formats. Any abnormal increase in fuel or power can easily be identified and root causes determined.
- Powerful analytics using R statistical packages helped engineers try different types of schedulers
- Energy balances ensure there is no waste or energy leakage, thereby reducing the carbon footprint and making a greener plant
- Maqplex is a cloud-based application that requires nominal IT infrastructure cost by end users. All data that were not considered sensitive were moved to the cloud, and more IP related data could be retained on servers within the plant premises. A services subscription can be on a monthly basis, and more importantly, users pay only for what is used.



HCL's Maqplex is ideally suited for steel with adapters to get data from a system that interfaces with real-time sensors combined with powerful analytics

Conclusion

As steel manufacturing extends from ore handling to tracking wagon movement carrying finished steel, operations are complex and there is no single control system deployed to control the entire integrated plant. A comprehensive framework that can integrate with control systems, lab information systems, wagon movement systems or asset management systems is certainly a must.

HCL's Maqplex is ideally suited for the steel industry, with adapters to receive data from any system that interfaces to real-time sensors. Its strong analytics framework is an ideal platform to execute optimization applications like scheduler, energy balances or condition monitoring, and above all, Maqplex is cloud-enabled so it can deliver all the features at a reduced cost with easy integration to smartphones and tablet computers.



SECTION 0

DISTRIBUTION/INDEX and REVISION STATUS OF MANUAL

1. Distribution of the Quality Manual

The distribution of the quality manual is maintained by the Quality Manager/ Management Representative.

The manual is distributed to the following individuals:

- President
- Vice President/General Manager
- Quality Manager
- Warehouse Manager
- Production Manager

2. Index and Revision Status of Manual

Section	Title of Section	Revision
<i>Section 0</i>	<i>Distribution, Index, and Revision Status</i>	<i>I</i>
Section 1	Scope	B
Section 2	Introduction	A
Section 3	Quality Policy	A
Section 4.1	Quality Management System Requirements /General Requirements	A
<i>Section 4.2</i>	<i>Documentation Requirements</i>	<i>A</i>
Section 5.1	Management Commitment	C
Section 5.2	Customer Focus	B
Section 5.3	Quality Policy	Original

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SECTION 1

SCOPE

1. General

- 1.1 The Steel Supply Company's quality management system is designed to achieve customer satisfaction by meeting customer requirements through the application of the system defined in this quality manual and supporting procedures. The system is continuously improved through the management review process as well as internal audits and through a variety of key performance indicators. The Steel Supply Company's quality management system is designed to comply with the requirements of ISO 9001:2008.

2. Scope and Scope Reduction

- 2.1 The scope of the quality management system:

"The manufacture and distribution of and processing of carbon, carbon-alloy, and stainless steel bar and tubular products."-excluding element 7.3 Design and Development.

- 2.2 Element 7.3 Design and Development is excluded in the quality management system. Metal Service Centers, SIC 5051, do not have design functions or requirements by their customers to have an internal design activity.

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SECTION 2

INTRODUCTION

The Steel Supply Company has developed a quality management system to better satisfy the needs of its customers and to improve productivity and profitability of the company. The system is designed to comply with the ISO 9001 standard.

The manual is divided into 26 Sections. The first five sections are administrative/general in nature. All sections following the first five sections starts with a policy statement expressing the general principles and commitment to implement specific actions pertaining to the requirements of the standard(s) relative to the element of the standard. The policy statement is followed by a general and brief procedure outlining how these activities are carried out and referencing the operating procedures that provide more detailed descriptions.

The purpose of this manual is to document the company's quality management system, to instruct and guide employees whose actions affect quality, and to inform the company's customers what controls are implemented to assure quality and performance.

Vice President – General Manager
The Steel Supply Company

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Reviewed & Approved by:	Date:



SECTION 3

QUALITY POLICY AND QUALITY OBJECTIVES

Quality Policy

It is the policy of The Steel Supply Company to provide products and services of the highest quality. *The Steel Supply's Quality Management System is based on the current ISO 9001 standard. The Steel Supply Company is committed to comply with the requirements of the standard and take appropriate actions to improve its effectiveness.* Our policy will be attained through:

- Customer satisfaction
- Personal responsibility
- Employee well being
- Continuous improvement
- Focus on performance excellence
- A systematic approach to quality assurance and management

The processes used to support customer satisfaction and business performance will be continuously monitored and improved to achieve Performance Excellence.

The quality policy has been presented to all employees through general orientation and is displayed in various areas throughout the company.

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Corporate Quality Objectives

The Steel Supply Company monitors its performance and assesses the effectiveness of the quality management system using Key Performance Indicators (KPIs). The Corporate Quality Objectives are used to establish the KPIs. The Corporate Quality Objectives are:

- On-Time Delivery
- Product Availability (Stock outs)
- Internal Rejects (Product Quality)
- Customer Returns and Allowances
- Productivity
- Customer Satisfaction
- Gross Profit

Vice-President / General Manager
The Steel Supply Company



SECTION 4.1

QUALITY MANAGEMENT SYSTEM

GENERAL POLICY

The Steel Supply Company shall implement and maintain its quality management system supported by documentation and reinforcement by management. The system shall be periodically evaluated to assess the effectiveness and suitability of the system. The system shall comply with the international ISO 9001 standard and shall be continuously improved to support customer satisfaction and the attainment of quality objectives.

PROCEDURAL POLICIES

1. General Requirements

- 1.1 The Steel Supply Company has established a quality management system to meet the requirements of its customers. The system is designed to comply with the requirements of ISO 9001. The system is routinely audited to verify implementation, maintenance and improvement of the system. The effectiveness of the systems is reviewed through the examination of Key Performance Indicators and Quality Objectives.
- 1.2 In addition to this manual, the system is supported by a variety of Standard Operating Procedures. A complete list of the procedures is available through the Quality Manager. The purpose of the procedures is to support the requirements described in the quality manual. Most sections of the quality manual are supported by procedures. If there is adequate description of the activities required to implement within a section of the manual, a procedure is not necessarily required.
- 1.3 The organization has identified the key processes needed to support the Quality Management System. These are described in Section 7.1 of this quality manual. These processes are flow charted to define and describe the interrelationship of activities affecting each key business process. Control Plans, Procedures, and Work Orders define the criteria and methods required to ensure the effective operation and control of the key business processes.
- 1.4 The quality management system's key processes shall define the criteria and methods needed to ensure that both the operation and control of the processes are effective. The

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use of Key Performance Indicators shall be the primary vehicle to measure effectiveness.

- 1.5 The Vice President/General Manager shall ensure the availability of resources and information necessary to support the various operations and monitoring of the processes. The development of Quality Objectives, Management Reviews, and the Business Plan supports his decision making process.
 - 1.5.1 Refer to Quality Manual Sections 7.1, 6.1 and 8.4. Refer to SOP-8.2-03 and SOP-8.2-04.
- 1.6 Products as well as processes shall be measured, monitored, and analyzed to determine effectiveness as well as drive customer satisfaction.
- 1.7 The organization shall employ a “bias for action” to attain the business/quality objectives of the company. Management shall encourage innovation and continuous improvement as part of regularly scheduled meetings with staff and operations personnel.
- 1.8 When a supplier is used that could affect product conformity requirements, The Steel Supply Company shall ensure control over the key support processes. The extent of control is defined in QM Section 7.4, Purchasing and its related procedure SOP 7.4-01.

2. Associated Documents

QM Section 5.4	Quality Planning
QM Section 6.1	Resource Management
QM Section 7.1	Planning of Product Realization
QM Section 8.4	Analysis of Data
SOP 8.2-03	Monitoring and Measurement of Processes
SOP 8.2-04	Monitoring and Measurement of Product
QM Section 5.6	Management Review



SECTION 4.2

DOCUMENT MANAGEMENT AND CONTROL

GENERAL POLICY

The purpose and scope of quality system documents are defined. All documents are reviewed and approved prior to issue. The Quality Manual and Operational Procedures are issued by the Quality Department. Quality Systems documents are issued by the Management Representative. Appropriate documents are available at locations where they are used. Obsolete documents are removed from points of use. The Quality Manager is responsible for coordinating and enforcing the document control- related activities. A Document Control Specialist is appointed to assist the Quality Manager in the coordination, printing and distribution of new and revised documents as well as withdrawing and destroying obsolete documents.

PROCEDURAL POLICIES

1. Quality System Documentation

1.1 The Steel Supply Company's quality system documentation comprises the following types of documents:

- Quality Manual
- Operational Procedures
- Work Instructions
- Control Plans
- Standards and other reference material

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- Customer drawings and specifications
- Forms Manual
- Packaging Manual

2. Quality Manual

- 2.1 Procedure SOP 4.2-01, Quality Management System Documentation defines the purpose, contents, and format of the quality management systems documentation. The manual further defines those elements of the standards that do not apply, thereby reducing the scope of the system.
- 2.2 The Quality Manual has an appendix outlining all procedures supporting the quality management system. As appropriate, specific sections of the quality manual refer to supporting SOP's.
- 2.3 The Quality Manual defines the interaction of processes supporting the quality management system.

3. Document Approval and Issue

- 3.1 Rules governing document preparation, review, approval, and issue of documents are defined in procedures SOP-4.2-01, Quality System Documentation, and SOP-4.2-02, Document Control. All documents identified in paragraph 1.1 are reviewed and approved prior to issue.

4. Document Placement

- 4.1 Documents are distributed to personnel and locations where they are used. When appropriate and relevant, documents display a distribution list or may refer to a distribution matrix maintained by the Document Control Specialist. Document placement is regulated by Procedure SOP-4.2-02.

5. Document Changes



- 5.1 Document changes are reviewed and authorized by the same authority that issued the original document. Revised portions of documents are distributed with a change brief, and obsolete documents are removed. The Document Control Specialist maintains a master list specifying the latest issues and revisions of the documents.
- 5.2 The Quality Manual, Standard Operating Procedures and other quality systems documentation outlined in paragraph 1.1 are distributed by the Management Representative to the personnel listed in the distribution. Superseded copies are to be collected by the Document Control Specialist and destroyed. One superseded copy of the Quality Manual or Section is to be retained for three years. Superseded copies of procedures will be retained for three years. The Document Control Specialist maintains a record showing the most current issue of the Quality Manual and Procedures. Changes from the superseded copy of the Quality Manual or Procedure are indicated by italicized print.
- 5.3 Changes to quality system documentation is recorded and maintained by the appropriate department defined in SOP-4.2-03, Control of Records and SOP-4.2-02, Document and Data Control.

6. Control of Records

- 6.1 Quality records demonstrate achievement of the required quality and effective operation of the quality system. The records are identified and stored in a suitable environment to minimize deterioration.

7. Establishment of Records

- 7.1 Records are usually established by the personnel directly involved with the task, operation, or activity whose results need to be recorded.
- 7.2 Records identify the product, person, or event to which they pertain; provide the relevant facts and data; and may be signed and dated by the person who established the record when required by procedure or instruction.
- 7.3 Specific record formats are usually prescribed by the procedures that call for their establishment. These can be forms, reports, minutes of meetings, sign-offs or stamps placed on other documents, and so forth. Records can also be established and maintained in electronic media (computer files or databases).

8. Indexing and Storage



- 8.1 Records are indexed and grouped to facilitate their retrieval. Binders, drawers, cabinets, etc., containing records are clearly labeled with identification of their content. Records may not be stored in private desk drawers or other obscure locations that are not generally known.
- 8.2 The activities of identification, collection, indexing, filing, storage, maintenance and disposition of quality records are governed by Procedure SOP-4.2-03, Control of Records.

9. Storage Location and Retention Periods

- 9.1 Records are usually stored and maintained by the same department that initially established the record. Procedure SOP-4.2-03, Control of Records, defines the management of records and storage locations for all types of records required by the quality system.
- 9.2 Retention period for records is determined by the department that establishes and maintains the records. The retention period is determined on the basis of contractual obligations, useful life of products, legal considerations, etc. Procedure SOP-4.2-03, Control of Records, stipulates the retention periods for all types of records required by the quality system.

10. Storage of Electronic Media

- 10.1 Storage of electronic media is routinely backed up.
- 10.2 *Back up, is store in secure fire proof storage area.*

11. Availability of Records

- 11.1 Customers/Regulatory Agencies are permitted to review quality system records of The Steel Supply Company as it pertains to the general quality system and to the records, which pertain specifically to their products.

12. Associated Documents

- 12.1 SOP- 4.2-01 – Quality System Documentation
- 12.2 SOP- 4.2-02 - Document and Data Control
- 12.3 SOP- 4.2-03 – Control of Records
- 12.4 SOP- 8.2-02 – Internal Quality Auditing



SECTION 5.1

MANAGEMENT COMMITMENT

GENERAL POLICY

The Executive Management is ultimately responsible for establishing, implementing, and maintaining the quality management system. Specific responsibilities comprise:

- a) creating and maintaining awareness of the importance to fulfill customer as well as regulatory and legal requirements;
- b) formulating the quality policy and quality objectives;
- c) performing management reviews;
- d) Deploying resources to facilitate the attainment of customer and organizational requirements.

PROCEDURAL POLICIES

1. Key Actions of Management

- 1.1 Management is responsible to provide direction and execute policies and procedures that are defined in the organization's Quality Management System. Actions include development and execution of the quality plans of the organization; deployment of appropriate resources to facilitate attainment of the business objectives of the organization; review business/quality management systems performance, and directing efforts towards continual improvements of the Quality Management System.

2. Allocation of Resources and Responsibilities

- 2.1 The Steel Supply Company appoints as the Management Representative the Quality Manager. The Quality Manager has the authority and responsibility to ensure that the quality management system is maintained and its effectiveness is continuously improved, and that the system complies with the requirements of ISO 9001.
- 2.2 Specific responsibilities related to maintenance and improvements of the quality

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management system are defined in SOP 5.5 Quality Management System-Administration.

- 2.3 The Vice President-General Manager is responsible for assuring there are adequate resources available to meet customer requirements and support/maintain the quality management system.
- 2.4 Management is responsible for establishing quality objectives. As part of this process they establish Key Performance Indicators, which include annually established objectives/goals.

3. Identification of Legal/Regulatory Requirements

- 3.1 The Steel Supply Company as part of its on-going business practices identifies the legal and regulatory requirements associated with the products produced and the business itself. It is the policy of the company to perform all activities in an ethical manner.
- 3.2 The facility will maintain or have access to binding legal or regulatory requirements affecting the business.
- 3.3 The Vice President has the ultimate responsibility to ensure the organization complies with legal, regulatory and ethical practices.
- 3.4 Resources to legal counsel are available to the President and Vice President to provide guidance and direction. Legal counsel should be capable of informing the President of new regulatory requirements impacting the business and the products produced.

4. Safety and Environmental Practices

- 4.1 Refer to Quality Manual Section 6.4 regarding Safety and Environmental (Work Environment) responsibilities and methods.

5. Creating Awareness of Customer Requirements

- 5.1 *At least monthly, management will conduct meetings, or present written information to all employees to discuss company performance, key issues, company objectives, and discuss the importance of fulfilling customer requirements. As part of the meetings employees are encouraged to provide input and suggestions to improve performance and customer satisfaction.*



6. Management Reviews

6.1 Management Reviews are conducted quarterly to assess the effectiveness and suitability of the quality management system. Management is committed to using this process to drive continuous improvement as well as higher levels of customer satisfaction.

7. Associated Documents

QM Section 5.2	Customer Focus
QM Section 5.3	Quality Policy
QM Section 5.4	Planning
QM Section 5.5	Quality Management System - Administration
QM Section 5.6	Management Review
QM Section 6.1	Resource Management
QM Section 6.5	Management of Work Environment



SECTION 5.2

CUSTOMER FOCUS

GENERAL POLICY

It is the responsibility of the Management Team to ensure that customer needs and expectations are determined and converted into precise requirements with the aim of achieving and maintaining customer confidence and satisfaction. The Management Team shall use the performance reporting system (Key Performance Indicators) to determine if customer requirements have been fully met.

PROCEDURAL POLICIES

1. Identification of Customer Requirements

- 1.1 Refer to SOP-7.2-01 for a complete description of the methods used to identify customer requirements.
- 1.2 *Sales are responsible for on-going assessment of immediate needs and requirements of customers, subject to input from customers.*
- 1.3 Consideration is given to conformity requirements, product quality, availability, delivery, and costs.

2. Sales Management

- 2.1 Customers are supported by Inside Sales and in some territories by Outside Sales personnel.
- 2.2 The Customer Service Master file includes the basic information for each customer as well as order history and special requirements.
- 2.3 As part of the Customer Satisfaction Survey, a market analysis is performed to assess buying criteria, the relative importance of satisfaction drivers and competitive comparisons.

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3. Customer Perceived Value

- 3.1 As part of the assessment of customer satisfaction customer value analysis is determined. Gaps are identified and plans are developed to address deficiencies. Satisfaction survey results include: competitive analysis, price/value relationship, and relative importance of drivers of customer satisfaction.

4. Associated Documents

- | | | |
|-----|----------------|-----------------------------------------------------|
| 4.1 | SOP-7.2-01 | Identification of Customer Requirements |
| 4.2 | SOP-7.2-02 | Review of Customer Requirements |
| 4.3 | SOP-5.4-01 | Business Planning |
| 4.4 | QM Section 8.4 | Analysis of Data |
| 4.5 | SOP-8.2-01 | Measurement and Monitoring of Customer Satisfaction |



SECTION 5.3

QUALITY POLICY

GENERAL POLICY

The President with input from the Vice President-General Manager has established a quality policy and shall ensure that it is effectively communicated and reinforced.

PROCEDURAL POLICIES

1. Creating and Maintaining Awareness

- 1.1 The Quality Policy is posted throughout the company.
- 1.2 As part of new employee orientation all new employees are trained on the company quality policy as well as specific policies and procedures related to their job.

2. Business Use of the Quality Policy

- 2.1 The Quality Policy is an integral component of the Quality Plan.
- 2.2 The Quality Objectives and Key Performance Indicators are established to ensure they are compatible and reinforce the Quality Policy.
- 2.3 As part of the Annual Quality Planning Process the Quality Policy is reevaluated for adequacy and continued suitability.

3. Key Components of the Quality Policy

- 3.1 The quality policy emphasizes:
 - Commitment to customer satisfaction
 - Continuous improvement of systems and processes
 - Performance management and review

4. On-going Reinforcement

Reviewed & Approved By:	Date:
Reviewed & Approved By:	Date:



- 4.1 As part of formal quality management training the quality policy is reviewed.
- 4.2 The policy is distributed and posted throughout the company.
- 4.3 Verification of understanding and compliance is achieved through internal audit, assessment of customer satisfaction and review of key performance indicators.

5. The Steel Supply Company Quality Policy

It is the policy of The Steel Supply Company to provide products and services of the highest quality. Our policy will be attained through:

- Customer Satisfaction
- Personal responsibility
- Employee well being
- Continuous improvement
- Focus on performance excellence
- A systematic approach to quality assurance and management

The processes used to support customer satisfaction and business performance will be continuously monitored and improved to achieve Performance Excellence.

6. Quality Objectives

The Steel Supply Company monitors its performance and assesses the effectiveness of the quality management system using Key Performance Indicators (KPIs). The Corporate Quality Objectives are used to establish the KPIs. The Corporate Quality Objectives are:

- On-Time Delivery
- Product Availability (Stock outs)
- Internal Rejects (Product Quality)
- Customer Returns and Allowances
- Productivity
- Customer Satisfaction
- Gross Profit

7. Associated Documents

- None