IMPLEMENTATION OF KNOWLEDGE MANAGEMENT IN AN ORGANIZATION USING CMMS

A PROJECT REPORT

Submitted By

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In partial fulfillment for the award of the degree of

MASTER OF ENGINEERING

in

INDUSTRIAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

KUMARAGURU COLLEGE OF TECHNOLOGY
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JUNE – 2008

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BONAFIDE CERTIFICATE

Certified that this project report entitled "**Implementation of knowledge management in an organization using CMMS**" is the bonafide work of

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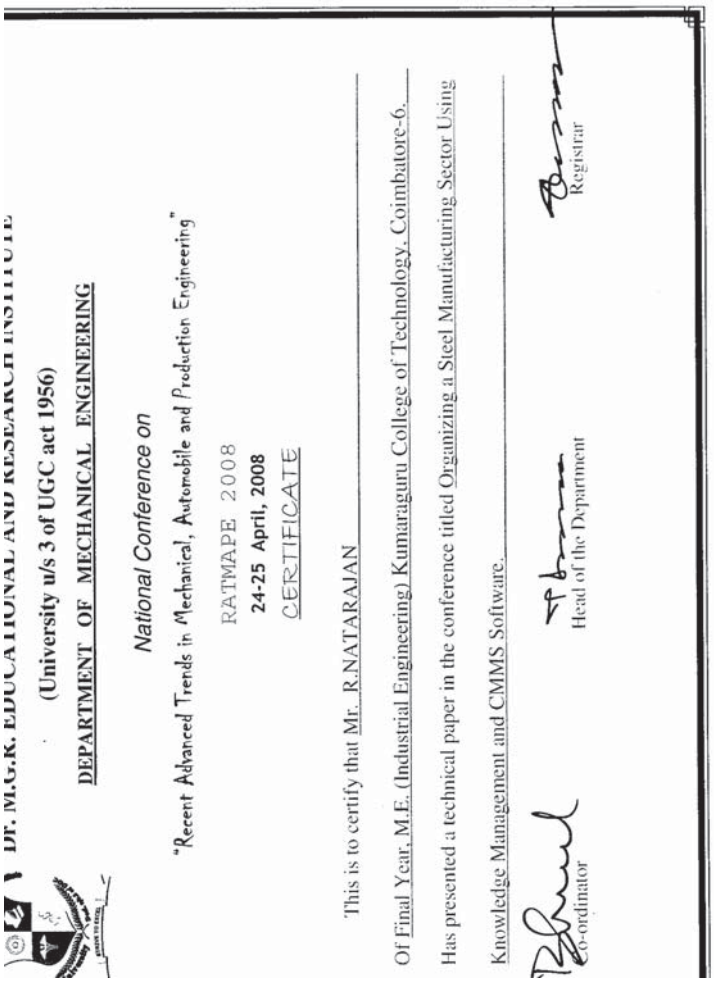

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Abstract

ABSTRACT

Manufacturing sector plays a vital role in Indian economy. It contributes almost 25% of GDP in the Indian economy. Among 315 million total workforces, only 29.61 million are in organized sector and remaining about 285.39 million workforces are unorganized. This project entitled "IMPLEMENTATION OF KNOWLEDGE MANAGEMENT (KM) USING COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)" in an unorganized steel plant, shows how the organization is organized in all departments using knowledge management as a basis to complete using the CMMS software. Although there is a wider acceptance of KM in many sectors, but there appears to be virtually no in-depth case study of KM in the existing literature. It describes in detail how the project was selected and how knowledge methodology was applied. It shows how various tools and techniques within KM methodology have been employed to achieve substantial productivity benefits. This project work is done to increase the productivity and to reduce the manpower by analyzing using the software CMMS. CWorks is a computerized maintenance management system (CMMS), which delivers various benefits to organizations by delivering information to maintenance engineers and managers. CWorks is used to keep track of all aspects of maintenance performed on equipment, locations and etc. that make up the facility. It is flexible and easily customizable to meet the user's needs and users decide how they want CWorks to track maintenance, employee management, assets, facilities planning, work orders, suppliers/contractor details, and the reports for all details.

ஆய்வு சுருக்கம்

இந்திய பொருளாதாரத்தில் உற்பத்தி நிறுவனங்களின் பங்கு மிக முக்கியமான ஒன்றாகும். இதில் இரும்பு உற்பத்தி நிறுவனங்களின் பங்கு மிக அதிகம். எனவே இந்த ஆய்வில் இரும்பு உற்பத்தி ஆலையை மையமாகக்கொண்டு, அதில் அறிவு மேலாண்மையை (Knowledge Management) பயன்படுத்தி நிறுவனத்தின் அனைத்து நிலைகளிலும் சீர்படுத்தப்பட்டது. இதற்கு CMMS (Computerized Maintenance Management System) என்ற மென்பொருள் மூலம் சீர்செய்ய உதவியது. மென்பொருள் உதவியுடன் நிறுவனத்தின் அனைத்து துறைகளிலும் அறிவு மேலாண்மை பயன்படுத்தப்பட்டது. இந்த மென்ப் பொருளிலும் உற்பத்தி நிறுவனங்களுக்கு தேவயான அனைத்து தகவல்களையும் கணிப்பொறியில் சேகரிக்க உதவுகிறது. எனவே இந்த ஆய்வின் மூலம் உற்பத்தி நிறுவனத்தின் நிதிநிலையை கட்டுப்படுத்தவும் உற்பத்தியை மேம்படுத்தவும் அறிவு மேலாண்மை அதிகம் உதவியது.

Acknowledgement

Contents

ACKNOWLEDGEMENT

All that have started well will end well and at this instant of time I would like to thank the people who were directly and indirectly instrumental in initiating me to do this work.

I register my hearty appreciation to **Dr.N.Mohan Das Gandhi**, my thesis advisor. I thank for his support, encouragement and ideas. I thank him for the countless hours he has spent with me, discussing everything from research to academic choices.

I take this opportunity to thank **Dr. C. Sivanandan**, Ph.D., Head of the Department, Mechanical Engineering, for the continuous motivation. I would like to thank **Dr. Joseph V. Thanikal**, Ph.D., Principal for providing the necessary facilities to complete my thesis.

My sincere thanks to **Dr. T. Kannan**, Associate Professor and **other faculty members** of the Department for their encouragement and cooperation in carrying out my project work. My sincere thanks also to all friends for their help in all the matters during my project work.

I also wish to express my sincere thanks to **Mr.V.Naveen Kumar**, Managing Director-Sri Vela Smelters pvt limited, Tiruchengode for providing valuable help, Guidance and for innovate ideas in completing this project. Finally, I would like to thank all my student colleagues, without them this work would not have been completed successfully.

CONTENTS

List of tables

LIST OF TABLES

List of figures

LIST OF FIGURES

Nomenclature

NOMENCLATURE

KM	Knowledge Management
CMMS	Computerized Maintenance Management System
B2B	Business to Business
RFID	Radio Frequency Identification
CKOs	Chief Knowledge Officers
GDP	Gross Domestic Product
NDP	Net Domestic Product
IT	Information Technology
BOF	Basic Oxygen Furnace
SMS	Steel Melting Shop
EAF	Electric Arc Furnace
WOM	Work Order Module
PM	Preventive Maintenance

Chapter 1

Introduction

CHAPTER 1

INTRODUCTION

In recent years, the increasing recognition of knowledge management (KM) as a critical dimension of value extraction in the contemporary enterprise has helped create a strong focus on knowledge organization as a means to facilitate effective knowledge exchange between its constituents. In practice, various business centric factors significantly influence the organization of knowledge thereby affecting the nature and quality of knowledge management (KM) within the enterprise. For example, the rapidly changing needs for knowledge of various communities, the diverse forms in which it is obtained from different sources, the multiple mechanisms that are needed to ensure its reliability and applicability, and the speed with which it is required to be made available or becomes obsolete, are important considerations that shape practical knowledge organization in today's enterprises.

The Manufacturing sector came into being because of efficiencies realized by specializing work and tools. With the potential of knowledge management, efficiency is once again the prize. Private exchanges and business to business (B2B) transactions offer opportunities for lowering costs using knowledge management. Integration, both external and internal, fine tunes the supply chain and helps optimize productivity across the enterprise. In the standardized, connected world, success comes through coordination and flexibility. Portals, virtual teaming, technologies that support integration, radio frequency identification (RFID) and electronic logistics solutions are already primed to make an impact. The next technology wave will probably include more extensive use of simulation, automated approaches to "sense and respond," using knowledge as dynamic partnering and next generation workflow.

So, it's ironic that manufacturing has an uneven record of using information technology like transferring records into databases .Although manufacturers have certainly led the way in certain areas, such as simulation and supply chain management, this sector has generally been a follower in business analytics, knowledge management (KM) and, most recently, software transitions. Some of the reasons for this –enormous capital investments, legal restrictions and concerns about quality – are obvious.

But, as potential opportunities become more visible and as the material component of manufacturing shrinks relative to the information component, integration and electronic markets have appeared on the agendas of manufacturers, large and small.

1.1 THE CHALLENGES

Manufacturers face a complex, highly competitive global market. Trade barriers are falling, the cost of entry is decreasing and access to suppliers and innovation is becoming ubiquitous. There is pressure to coordinate the activities of all participants and to reduce costs by leveraging emerging opportunities for integration. These challenges can be overcome by

1. Integrating knowledge management with supply chain management and e-commerce to integrate operations from end to end:

- Touching the whole internal enterprise.
- Managing external suppliers and channels with the Internet.
- Adhering to industry standards throughout the business practice.

2. Process discipline can be improved by using knowledge management activities together, to promote efficiency and reduce costs by standardizing processes.

3. Developing effective coordination of customers, complemetors and the supply chain is seen as a key competitive advantage – managing access to and flow of information is as important as its availability.

1.2 CAPABILITIES

Three capabilities are needed as the Manufacturing sector goes forward: efficiency, credibility and flexibility. For each of these capabilities, there are specific technologies – or clusters of technologies – that promise to make a difference in the mid-term.

1.2.1 EFFICIENCY

If efficiency is the finish line, integration is the vehicle that can get you there. Put the pieces together, get them into balance, keep them working together and you'll win. Now, integration across departments – and even between businesses – has become practical, thanks in part to the adoption of industry standards and open software (such as CMMS). Data and processes are increasingly modular, and by using knowledge queries there are "connectors" that permit the use of data and applications across different platforms. Knowledge management modeling tools can be used to reengineer and optimize processes and the IT like Computerized Maintenance Management System that supports them.

1.2.2 CREDIBILITY

With globalization, the use of virtual teams has become more widespread. Here again, credibility is often key to success. While cultural approaches are dominant here, everything from collaboration tools to the use of biometrics (to assure identity) to Social Network Analysis (to ascertain and support interpersonal connections and commitments) can been listed to make virtual teams more successful. Electronic identities, single sign-on and personalization can be used to help individuals engage appropriately and bring their talents (tacit knowledge) and skills to the manufacturing process.

1.2.3 FLEXIBILITY

The use of standards and modular data and processes not only creates efficiencies, it also provides options. The organization and the product line can be more rapidly reconfigured, even customized to meet emerging opportunities. In fact, the whole knowledge management can be made more adaptable and able to leverage coming developments in automating sense and respond. At the limit, dynamic partnering becomes an option, with a Lego-like approach to the knowledge management. With the free flow of tagged, safeguarded information, whole organizations can be added, deleted, outsourced using CMMS or put into new sequences without loss of the deep associations that are often required.

1.2.4 TECHNOLOGY ORIENTED KM MODEL

Therefore, this project contributes to three things: first is to identify the disadvantages of technology-oriented KM model in relating to knowledge sharing and knowledge creation; second is to synthesize the theories about web log application in knowledge management and then propose a more systematic web log-based knowledge management model and more practical implementation method to solve the problem of knowledge sharing and knowledge creation; the last one is to discuss both the advantages and disadvantages of web log-based knowledge management model and recommend to form a two-way and cyclical model as improvements is explained in Fig 1.1.

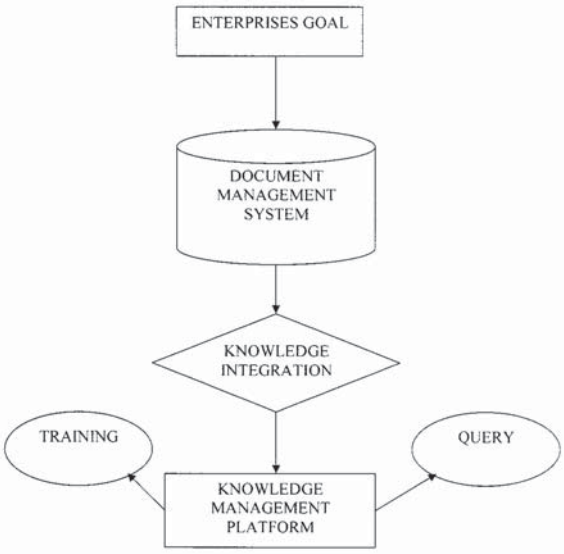

Fig 1.1 Technology oriented KM model

Chapter 2

Review of literature

CHAPTER 2

REVIEW OF LITERATURE

Following are the overview of the relevant work done earlier related to the problem identified and the methodology to be adopted to solve the chosen problem for this work. It gives the description of literature reviewed from various research papers published in international and national journals, proceedings of various conferences and books.

Thomas Jackson, et al [1] has developed a practical, business oriented approach to managing knowledge within an organization. The four key areas that have been recognized as critical to the success of a KM scheme are 'strategy','technology','measurement',and 'culture'. This paper suggests 'KM activities' should be labeled with terms that are relevant and conceivable by the organization and progressively integrated with mission-critical business process that will generate faster bottom-line results.

Kostas Metaxiotis, et al [2] has presented the key aspects of the role of KM in the enterprises, explores the relationship between KM and innovation. This paper fierce business competition, fuels organizational growth, drives future success and is the engine that allows business to sustain their viability in the new knowledge based economy.

Rick Dove [3] defined the application of knowledge as requiring a change, and overviews a body of analytical work on change proficiency in business system and processes. This paper defines the agile enterprise as one which is able to both manage and apply knowledge effectively, and suggests that value from either capability is impeded if they are not in balance. It looks at the application of knowledge as requiring a change, and overviews a body of analytical work on change proficiency in business systems and processes.

William Keogh, et al [7] has considered how the existing knowledge transfer partnership might be augmented or adapted to assist in the technological development of small and medium sized enterprises. This paper outline s the findings from the study visit and compares the state of Minnesota with Scotland after giving a brief overview of the knowledge economy. An economy that creates, acquires, adapts, and uses knowledge effectively for its economic and social development". Thus it includes social, economic, environmental and political underpinnings that impact on society. Politically, it is also central to the development of a country of word standing, particularly as competitiveness and the economic power emerging from the knowledge economy sought-after elements for countries in the developed world.

Dr.Yogesh Malhothra [8] has implemented measures for facilitating knowledge management. Knowledge management caters to the critical issues of organizational adaptation, survival and competences in face of increasingly discontinuously environmental change. Essentially it embodies organizational processes that seek synergistic combination of data and information technologies and the creative and innovative capacity of human beings. The traditional paradigm of information system is based on seeking a consensual interpretation of information based on socially dictated norms or the mandate of the company bosses. This has resulted in the confusion between knowledge and information. However, knowledge and information are distinct entities, while information generated by the computer systems is not a very rich carrier of human interpretation for potential action; knowledge resides in the user's subjective context of action based on that information.

Dr.Paul James [4] has defined a discipline that promotes integrated approach to identifying, capturing, evaluating, retrieving and sharing of enterprises information assets. This paper discusses about the technological advances that have changed the face of librarianship and the design of libraries is not solely technological. There are massive cultural, social, psychological forces at wok. Knowledge management emerging from similar changes has influenced the library and information professions with both opportunities and challenges. knowledge management is now widely recognized as a key factor in organizational success and as such is of relevance to libraries.KM is relevant to and has considerable relevance with library and information professions.

Rose Alinda Alias [5] has developed a paper which overcomes knowledge management model and architecture that would ensure right knowledge could be acquired from and disseminated to the right people at the right time. Knowledge exists when data and information are applied. Knowledge could also be categorized into two types, explicit and tacit knowledge. Tacit knowledge is obtained by internal individual process and store in human being like experience, reflection, and individual talent. Explicit knowledge is possible to be stored in a mechanical or technological way, like in hand books or information systems, or data bases, manual, internal newsletter, documentation.

Graham Durant-law [6] has suggested a combined soft systems methodology and grounded theory approach is an appropriate research methodology to investigate a Knowledge management Question. Both methodologies have in common surfacing and exploring participants. The practical difference is that soft systems methodology values data from the perspective of the participant, while grounded theory develops theory from data interpretation by the researcher. Grounded theory and soft systems methodology share anti- foundation list ontology and a realist epistemology. Plainly there is a need to return to first principles and work out what knowledge is truly is for an organization and what it really means to manage knowledge.

Chapter 3

Knowledge management and methodology

CHAPTER 3

KNOWLEDGE MANAGEMENT AND METHODOLOGY

3.1 INTRODUCTION

To support Knowledge management (KM) processes, many researches have been conducted on the methods and tools in several domains. Group wares, email groups and forums are ways for interchanging knowledge in a team environment. However, many of the contents in a forum or a chatting process contain irrelevant information that interferes with knowledge reuse. Even worse, some of the knowledge is incorrect and will inevitably mislead future decision makings and operations for an organization. If an incorrect piece of knowledge provided by an unqualified personnel enters into a knowledge base.

Business requirements change frequently. The requirements change not only for different enterprises, but may also for different period of time in the same enterprise. Some researchers argue that all software (CMMS) should be designed to adapt to on-demand requirements since requirements usually change as markets and business practices change in this paper framework is proposed for creating a more flexible and adaptable knowledge management system to fit the fast changing requirements in the lifecycle of a KM process. In addition, it demonstrates the ways of controlling the knowledge quality and of facilitating the well-organized knowledge for future retrieval in relevant applications. The original aim of ontology is to provide away for concept sharing among a group of agents or people. The indexes or descriptions are used for users to find the relevant components and then compose a new system for future use. However component level reuse is programmer-oriented, i.e., the components can only be reused by programmers or software companies. They are not useful to end user applications. The reason is that component reuse usually needs significant source code modifications when new requirements come in.

3.2 EXPLICIT TO TACIT

All knowledge can be classified according to its complexity on a Continuum from explicit to tacit. Michael Polanyi identified the distinction between these two types of knowledge in 1966 (Polanyi, M., The Tacit Dimension, Routledge & Kegan Paul, 1966).

Explicit knowledge is knowledge that is articulated in formal language and easily transmitted among individuals both synchronously and asynchronously. Tacit knowledge, on the other hand, is personal knowledge embedded in individual experience and involving such in tangible factors as personal belief, perspective, instinct, and values. Explicit knowledge is referred to as information in the context of our discussion.

The challenge of explicit knowledge is one of handling the sheer volume of information that is available. On the other hand, while tacit knowledge potentially can represent great value to the organization, it is, by its very nature, far more difficult to capture and diffuse. The challenges represented by each type of knowledge at a very high level are the same – to build a bridge between seekers and providers of knowledge. But from a practical level the challenges are very different. Explicit knowledge can be adequately transferred with the help of electronic tools. On the other hand, the most efficient way to convey tacit knowledge throughout the organization is face to face. Practices such as apprenticeships, mentoring and communities of practices prove effective.

For decades, organizations have focused their information technology investments on explicit knowledge, rather than tacit knowledge. There are three reasons for this: first, explicit knowledge is often conveyed as a standard part of most transaction based information systems; second, explicit knowledge is much easier to convey and capture than tacit knowledge; and, third, we have an inherent mistrust of anything that cannot be conveyed objectively and quantified (i.e. tacit knowledge).

3.3 FROM TACIT TO IMPLICIT

In some cases, knowledge believed to be tacit is only so labeled because no one has ever taken the time or energy to codify the knowledge. Users may be too quick to reply, "It's just too difficult to explain; it defies explanation." This is a real problem and one not easily resolved. You must determine if bodies of un coded knowledge can be captured and made explicit. However, it is critical to first be sure that a culture that promotes and supports knowledge sharing is in place, or users may recoil by hoarding even more of what they know. In any case, it is imperative that you appreciate that perfect management of tacit knowledge is not possible. Do not get preoccupied with getting it perfect, because you could miss out on great success without ever achieving 100 percent accuracy.

3.4 THE KM CHAIN

Fundamental to the practical definition of knowledge management is the concept of the knowledge chain. The knowledge chain was first recognized by Koulopoulos, Toms and Spinello in doing research for their book Corporate Instinct. There are four links in the knowledge chain that determine the uniqueness and longevity of any organization. These four links are:

- Internal Awareness.
- Internal Responsiveness.
- External Responsiveness.
- External Awareness.

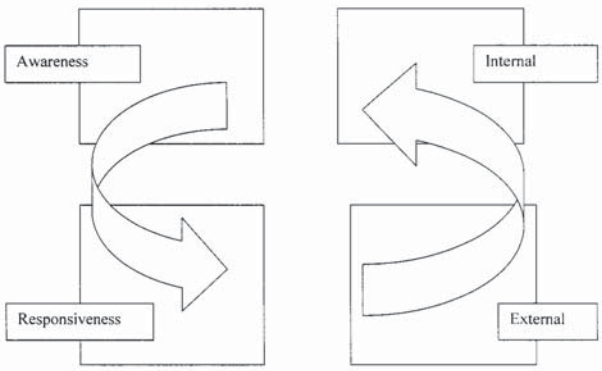

Fig 3.1 Knowledge Management Chain

3.4.1 INTERNAL AWARENESS

In its simplest terms, internal awareness is the ability of an organization to quickly assess its inventory of skills and core competency. It is the awareness of past history in terms of talent, know-how, interaction, process performance, and communities of practice. Strong emphasis on functional organization structures, which often permeate traditional companies, inhibits the development of internal awareness. Organizations with a rigid functional structure most often define their core competency as their products and services, not their skills. Strong internal awareness is built on an ongoing challenge of what is done and a focus on what is possible. This is what Peter Drucker refers to as "organizational knowledge management."

3.4.2 INTERNAL RESPONSIVENESS

Internal responsiveness is the ability to exploit internal awareness. An organization may be well aware of its strengths and market demand, but if it is not able to adequately effect change within itself quickly enough to meet market requirements, its competencies are virtually moot. In a study conducted by Delphi Group of 350 respondents, 30 percent indicated that they had greater external awareness than internal responsiveness .In other words, these organizations felt that "we are better at understanding the market then we are at rallying and coordinating our own resources in response." No wonder 50 percent of respondents to the same survey indicated that a good idea of knowledge management have more chance of resulting in a new startup or ending up at a competitor before their own organization acted on it.

3.4.3 EXTERNAL RESPONSIVENESS

Simply put, external responsiveness is the ability to best meet the requirements of the market. When all is said and done, an organization's ability to better satisfy this cell in the knowledge chain than its competitors will determine its success or failure. External responsiveness is measured by the ability to effectively respond to opportunities and threats outside of the organization in a timely manner. This is the essence of competitive advantage a level of responsiveness to environmental conditions that is significantly faster than that of its competitors.

3.4.4 EXTERNAL AWARENESS

External awareness is one of the cornerstones of the Internet, where new business models are sprouting up at an unprecedented pace. The velocity of the Internet provides an incredible opportunity to act upon the market's reaction to new products. However, new models for capturing market responses are just as critical. For example, Amazon. Com's ability to capture buying trends of many book buyers and then use these to suggest books with similar themes and authors is the very essence of external awareness coupled with external responsiveness. A body of knowledge management (customer buying habits) is productized and offered as a value-add, differentiating the online bookstore from its brick and mortar counterpart.

3.5 METHODOLOGY

3.5.1 PHASES OF KM

This project is organized into several phases starting from phase one that describes the performance of fieldwork such as literature study and pre-KMS implementation, which is developed and distribute the questionnaire as well as to produce a model and architecture for KMS related with collaborative environment. The questionnaire was developed based on the area of interest in KMS from the literature study.

And then, followed by the phase two that implements the KMS prototype using collaborative technology and knowledge transfer plan and scripting language visual basic. After that in phase three another round of questionnaire was distributed to the respondents (post-KMS) implementation. A comparison is made between the pre and post KMS implementation.

3.5.2 KNOWLEDGE TRANSFER PLAN

This tool is designed to help to identify and capture the knowledge that is critical to the work to do so that others can access the experience that is valuable to the co-workers and the customers. There are three simple steps to complete the work sheets.

1. Identify critical tasks and activities.
2. Define each task and activity.
3. Develop a knowledge transfer plan.

3.5.3 IDENTIFY CRITICAL TASK AND ACTIVITY

There are probably some aspects of the work that only know how to do. In this step we are developing a list of those tasks and activities.
List the tasks and activities below, using as many blanks as possible.

1	Defining the existing problem.
2	Defining all departments in the organization.
3	Where is the problem arising?
4	Who are all responsible?
5	What are all the process involved?
6	What is the efficiency of the process?
7	Is the methodology cost effective?
8	How is the tool used?
9	How to list the steps to solve?
10	How to enter problem in the computer system using CMMS?

Table 3.1 Identifying the Tasks

3.5.4 DEFINE EACH TASK AND ACTIVITY

Here the focus is mainly on things only you know and that others need to learn. Consider these areas to get you started:

- Knowing key contacts.
- Having strong relationships with key customers and coworkers.
- Knowing logistics or locations.
- Knowing past history.
- Knowing locations of critical files or information.
- Knowing how to carry out the tasks or responsibility.

Task or activity
List the critical knowledge, experience, or skill needed for this task: 1. Knowing how to enter special requests into the computer system. 2. Knowing how to assign special requests, based on each person's experience. 3. Knowing which information to ask customers for when they make a special request.

Table 3.2 Defining the Tasks

3.5.5 DEVELOPING A KNOWLEDGE TRANSFER PLAN

For the tasks identified as critical, working with manager to develop a strategy for addressing that area is done:

Critical Tasks	Importance	Availability	Impact	Resources	Strategy
Special requests are not processed	High	No	High	Database	Step-by-Step process of handling special requests

Table 3.3 Knowledge Transfer plan

3.5.6 KNOWLEDGE TRANSFER SHEET IN ORGANIZATON

For the tasks identified as critical, working with manager to develop a strategy for addressing the office department is done and then transferred to CMMS. The following table shows how the importance for the employees to be identified and all other departments are done in the same way and transferred to CMMS.

Employee name	Employee code	Designation	Importance	Availability	Resources
VASUDEVAN	O-001	GENERAL MANAGER	HIGH	YES	DATABASE
MOORTHY	O-002	MANAGER	HIGH	YES	DATABASE
LOGANATHAN	O-003	ASST. MANAGER	HIGH	YES	DATABASE
KAILASAM	O-004	PROD. MANAGER	HIGH	YES	DATABASE
RAMESH	O-005	QUALITY MANAGER	HIGH	YES	DATABASE
SEKAR	O-006	WEIGH BRIDGE	HIGH	YES	RECORDS
PALNISAMY	O-007	INVENTORY MANAGER	HIGH	YES	RECORDS

Table 3.4 knowledge transfer sheet

Chapter 4

Role of steel sector

CHAPTER 4

ROLE OF STEEL SECTOR

4.1 INDIAN STEEL INDUSTRY

The last decade of the twentieth century will go down as one of the most turbulent phases for Indian steel industry. The period witnessed sweeping changes in the steel arena —transformation of self contained national markets into linked global markets and consequent fierce competition; over supply of most kinds of steel resulting in no real appreciation of steel prices and simultaneous rise in input cost; and most importantly, rise in customer expectations. The problem was compounded by a slowdown in growth of steel intensive industries like consumer durables and capital goods leading to negligible growth in demand. All these came as a shock since for decades Indian steel industry operated under a protective environment. Consequently, Indian steel manufacturers are in need of an effective forward-looking strategy that would ensure their survival, sustenance and growth. Formulation of an effective strategy that would successfully take on the market forces and would provide sustainable competitive advantage requires an effective understanding of the steel scenario in the international arena, the trends of the Indian market and responses of the Indian steel industry.

4.1.1 STEEL: A GLOBAL PERSPECTIVE

Recent years have witnessed unprecedented turmoil in the global steel market. The crisis in the international steel market might be attributed to the misbalance between capacity, demand and production and consequent drop in prices. Throughout the world there is an apparent over capacity (estimated to be between 100 Mt-150 Mt) in the steel sector. According to the IISI, the companies have been selling their products below costs to survive in global competition. Since 2001, while growth has been negative in most mature markets, Asia has maintained a steady growth rate. The Asian production growth has mainly been driven by the surge in steel demand and production in China.

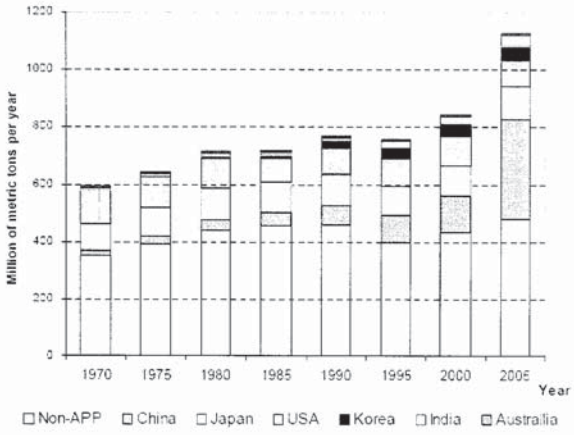

Fig 4.1 World Steel Production

4.2 OPPORTUNITIES IN STEEL INDUSTRY

The nature of the steel industry provides the sector with attractive options to reduce emission sand increase energy efficiency. For one, steel is fully recyclable. At the end of their useful life, products containing steel can be converted back into 'new' steel, ready for other applications. Furthermore, the steel production process can utilize wastes

and by-products as alternative reductants and raw materials, which reduces air pollution and the use of fossil fuels.

Sharing technical and performance data among Partner countries will enable the Partnership to establish appropriate metrics, which will be used to measure the progress of Partners as they 1) identify key opportunities, 2) break down barriers, and 3) implement state-of-the-art and cost-effective clean technologies.

4.2.1 STEEL INDUSTRY AN ANALYSIS

India has rich mineral resources. It has abundance of iron ore, coal and many other raw materials required for iron and steelmaking. It has the fourth largest iron ore reserves (10.3 billion tones) after Russia, Brazil, and Australia. Therefore, many raw materials are available at comparatively lower costs. It has the third largest pool of technical manpower, next to United States and the erstwhile USSR, capable of understanding and assimilating new technologies. Considering quality of work force, Indian steel industry has low unit labour cost, commensurate with skill. This gets reflected in the lower production cost of steel in India compared to many advanced countries with such strength of resources, along with vast domestic untapped market, Indian steel industry has the potential to face challenges successfully.

4.2.2 COST REDUCTION

Cost reduction is probably the most important driver for improving competitiveness. To ensure a competitive advantage, steel makers have to concentrate on the following areas:

- Reducing operating costs.
- Reduction in working capital costs.
- Reduction in product inventory (unsold stock).
- Improving techno-economic parameters.
- Substitution of raw material.
- Differentiated sourcing.
- Effective supply chain management.
- Social infrastructure costs.

Operating and working capital costs need to be brought down through a combination of benchmarking and strict cost control; potential for improvement in techno-economic parameters like energy consumption, yield etc need to be identified through benchmarking and implemented through in-house research and technological expertise. A major cost in steel manufacturing relates to the cost of raw material. There is a need to selectively focus on purchase of high-value items. This can be achieved through focusing on the .Total Cost of Ownership. Instead of just the purchase price and identifying critical levers that can be used to reduce the ultimate cost. Cost of raw material like imported coal is to be analyzed with respect to its productivity and for the optimum purchase pattern. Efforts should also be made to develop product specific and differentiated sourcing strategies instead of current practice of a single strategy for all purchases. The other opportunities for cost reduction lie in reducing internal business costs like inventory holding, transportation and purchase processing costs. Plants should also identify on a continuous basis the measures to increase revenue by reducing freight costs, cost of a risings, demurrage and non-confirmed orders. The social infrastructure costs may also be looked into for its effectiveness and brought down in a phased manner.

4.2.3 BARRIERS

Barriers include the quality of raw materials (iron ore and coal); the large number of unorganized secondary steel producers (1,500 small to medium entrepreneurs produce about40% of the total steel production); the high cost of capital; the availability of trained, skilled man power; the availability of 'space' for the introduction of new technologies in old plants; and the high cost of ferrous scrap for recycling .Achievements include the introduction of coke dry quenching technology; the introduction of top recovery turbine; COREX process implemented at Jindal Steel (PVT); the introduction of continuous casting technology in about 70% of integrated plant capacities; the improvement of blast furnace productivity from 1.5 T/m3 to 2.0 T/m3; and the improvement in energy efficiency from 8.5 GCal/tcc to 7.25 GCal/tcc.

4.2.4 UNORGANIZED SECTORS

In the Indian national accounts, the informal sector is referred to as the unorganized sector. This sector broadly corresponds to the household sector including private unincorporated enterprises. The unorganized sector also includes some formal activities on which there is no regular system of data availability. However, contribution of these formal activities in the GDP of unorganized sector is quite small.

The unorganized sector contributed 58.0 per cent of the Net Domestic Product (NDP) in the year 2004-05, of which 18.7 per cent was from the agriculture and allied activities, 4.5 per cent was from the manufacturing, 4.4 per cent from construction, 14.5per cent from trade, hotels and restaurants, 5.1 per cent from transport, storage and communication, 6.5 per cent was from financing, insurance, real estate and business services and 4.0 per cent from community, social and personal services

The share of unorganized sector in the total net domestic product of the country is, however, declining. During 1999-2000, the unorganized sector contributed 61.1 percent. The decline in the unorganized sector's share is mainly on account of declining share of agriculture in the overall NDP from 26.5 per cent to 19.8 per cent. The agriculture and allied activities are predominantly in the unorganized sector, to the extent of 94.4% of agricultural activities. Thus, if the agriculture and allied activities are excluded, the unorganized sector's contribution in the overall NDP increased from35.5 per cent in 1999-2000 to 39.3 per cent in 2004-05. Within non-agricultural activities, the share of unorganized sector is 49% in 2004-05, up from 48.3%in 1999-2000.

Chapter 5

CMMS

CHAPTER 5

COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

5.1 CWORKS

CWorks is a computerized maintenance management system (CMMS), which delivers various benefits to organizations by delivering information to maintenance engineers and managers. These benefits include:

- Work order status for easy analysis.
- Management decisions are simplified by the availability of equipment maintenance history.
- Contractor management is simplified and documented.
- Equipment preventive maintenance schedules available on-line and preventive work orders can be automatically generated.
- Time-saving features due to centralized database and communication regarding maintenance works.

5.1.1 USAGE

CWorks is used to keep track of all aspects of maintenance performed on equipment, locations and etc. that make up the facility. It is flexible and easily customizable to meet the user's needs and users decide how they want CWorks to track maintenance;

- First, use it to store information about the things maintained (e.g., equipment or locations) and the resources used to maintain them (e.g., labour and parts)
- Second, use it to assign and schedule maintenance on the facility using the stored information.
- Most importantly, use it to track the history and cost of the maintenance performed on the facility.

5.1.2 BEFORE STARTING

- Gather information about the maintenance facility based on the masters required by the system. For examples assets, locations and etc.
- Organize the assets according to the hierarchical structure if required.
- Enter the basic data into CWorks. It does not have to be set up at once, but certain information must be entered before a work order can be issued.
- Other information can be added on as CWorks is used. Now CWorks is ready to manage maintenance. Maintenance management involves significant amounts of data.

5.2 CWORKS MODULE

5.2.1 WORK ORDER MODULE

The work order module (WOM) provides the user with the ability to view and manage all maintenance activities. It provides an accurate basis for work order costing, analysis and management of site activities. The work order module is integrated with the Planned Maintenance module in order to integrate scheduled preventive maintenance work with ad-hoc breakdown work. Work orders can also be raised for non-asset activities, such as changing a light bulb, repairing a leaking roof or plumbing problems. The module enables the capture of all material and labour costs, and labour utilization.

5.2.2 ASSETS MODULE

The Asset module provides the user with the facility to record and manage an organization's assets. It stores data on every asset which the user wants a record of maintenance activities. The following screens are available in the Asset Register;

- Asset List Summary
- Current Asset Register
- New Asset Registration
- Additional Info. – Information about the registered asset can be listed in this section.
- Relationship – Enables an asset tree to be built using the parent-child relationship.
- Work Order History – List of all work orders opened on this asset.

5.2.3 LOCATION MODULE

The Location module provides the user with the facility to record and manage the facility's physical locations. It stores data on every location which the user wants a record of maintenance activities. The following screens are available in the Location Register;

- Location List Summary.
- Current Location Register.
- New Location Registration.

5.2.4 PREVENTIVE MODULE

This module describes how to schedule and generate preventive maintenance work orders within CWorks. A preventive maintenance (PM) master and schedule specifies work to be performed based on an elapsed time interval. PM schedules can be set-up for either an asset or a physical location.

5.2.5 EMPLOYEE MODULE

The employee module provides the user with the facility to record and manage the employee data. It stores data for every personnel employed in the company which the users want a corresponding record of maintenance activities. It also records assets to which an employee is trained to operate and maintain.

5.2.6 MASTERS MODULE

This module captures all basic maintenance data which is required to start CWorks. Below are the masters:-

- Department.
- Failure Code.
- Asset Category.
- Contractor.
- Suppliers.
- Assets.

5.2.7 REPORTS

This module provides a wide range of management reports. Reports produced by CWorks are a combination of related data contained in the system. Reports are used for management information purpose, documentation and accounting of the productivity and performance of the maintenance departments.

5.2.8 EXIT

To close or exit from CWorks program.

5.3 TO CHANGE DATABASE SOURCE FILE

A default Access 2000 database file is installed in the cworks (c:\CworksFOC2_1c) directory with each installation of CWorks CMMS ver 2_1x The CWorks CMMS can be configured to a different CWorks data source file in another directory. To do this, select File in the program menu bar and click on Data Link.

The Connect to Data Source utility screen will pop-up. The current database source is displayed at the top of the screen. To connect to a database stored in a different directory or different computer within a network, define the location of the file in "Data Source Location:" field. You can browse for the file by clicking on the icon. Select or specify the database file path and click on "Connect". A message will appear to confirm that the connection is successful.

5.4 HELP FILE

In CWorks help file the following terms are used to describe mouse actions and keyboard functions:

5.4.1 MOSE ACTIONS

Click	Press and release the left mouse button.
Double-click	Click the left mouse button twice.
Right-click	Press and release the right mouse button.
Put a Check in the Box	Move the mouse pointer over a check box and click it to activate.

Table 5.1 Mouse Action

5.4.2 KEYBOARD FUNTIONS

<Tab>	Move the focus of the cursor to the next available control.
<Enter>	Moves the focus of the cursor to the next available control
<Delete>	Remove selected data from fields and some datasheets.
<ESC>	Stops a function.

Table 5.2 Keyboard Functions

5.5 WORK ORDERS

Work orders are written records of maintenance activities. They are used to assign maintenance to the areas and equipment that make up the maintenance facility.

Work orders contain information about a maintenance activity, such as where and how it is to be done, who is supposed to do it and any supplies needed to complete it. They keep track of the maintenance activities and store valuable time and cost information that is used in reports. All tracked maintenance history in CWorks is based on the information stored in the work order records.

Creating work orders for all maintenance activities is the key to an efficient maintenance facility. Use work orders to assign work quickly and in a format that helps improve the efficiency of the facility.

Work Orders are created for two primary reasons:

- Unscheduled work that is requested by tenants, customers, employees, and supervisors.
- Regularly scheduled or preventive maintenance that is performed on a routine basis.

CWorks could create both the above work orders.

5.6 ASSETS REGISTER

The Asset Register provides the facility to record and manage organizations assets. This module stores data on every asset which has a record of maintenance activities.

The following screens are available in the Asset Register;

Asset List Summary

A comprehensive list of all the assets to be maintained in the facility.

Current Asset Register

Capability of modifying information regarding current assets.

New Asset Registration

To create a new asset record which allows users to specify details such as location, serial number, warranty, purchase price, important technical notes etc.

Asset History

All work order transactions which have occurred on a piece of equipment are recorded and can be viewed at this section.

5.7 LOCATION REGISTER

The Location Register provides the facility to record all the physical locations in your facility. This module stores data on every location with a record of maintenance activities.

The following screens are available in the Location Register;

Location List Summary

A comprehensive list of all the registered physical locations to be maintained in the facility.

Current Location Register

Capability of modifying information regarding current locations. Users are able to view all work orders which has been raised on this particular location.

New Location Registration

To record new location information in your facility.

Work Order History on a Location

All work order transactions which have occurred on a location are recorded and can be viewed at this section.

5.8 EMPLOYEE/REQUESTER REGISTER

The Employee Register captures two types of data:
Employee, which provides the facility to record all the maintenance personnel in the facility. An employee can also be a requester. This module helps capture data on.

- Time spent on a work order in a facility
- The employee record and their hourly rates.
- Asset accountability for each maintenance personnel.

Requester, which provides the facility to record all the requesters. Name of person who requested for a service. The person could also be an employee of the organization or a customer to the organization.

The following screens are available in the Employee Register;

- Employee/Requester List Summary - A list of all the employees or requesters recorded in the system.
- Current Employee/Requester Register - Capability of modifying information on the employee or requester. Users are able to view all assets assigned to the employee.
- New Employee/Requester Registration - To record new employee or requester information in the facility

The following are a list of fields and explanations

PM Task No

Identifier of the PM Task master record.

PM Task Name

Description of the PM Task master.

Estimated Labour Hours

The estimated labour hours to complete the PM Task.

PM Checklist

The list of tasks to be carried out for this PM

Once a PM Task has been registered, the system would not allow removal of the PM Task number. However, details on the PM Task can be modified.

5.9 REVENTIVE MAINTENANCE

Equipment and location require periodic maintenance to ensure uninterrupted efficiency and to guard against breakdowns. Preventive maintenance (PM) is a scheduled work on an asset. PM schedules can be planned for either an asset or physical location.

The following components are available in the Preventive Maintenance Screen:

PM Task List

A list of all work steps to be performed on a task. Displays the PM Task List master. New PM Tasks can be added and existing PM Tasks can be viewed or modified in this section.

PM Schedule

A schedule where one or more job task is specified with the start date and frequency. Displays the master PM Schedules. New PM schedules can be added or existing PM schedules can be viewed or modified in this section.

PM Generation

Automatic generation of PM Work Orders on a regular basis is accomplished via this screen. This can only be done only after scheduling the PM.

5.10 NEW PM TASK

Click on "New PM Checklist" in the PM Task List screen.

Complete the fields in the form and click the "Save" button. The PM Task Master will be updated immediately. To exit without saving the changes, click the "Close" button.

Chapter 6

System study

CHAPTER 6

SYSTEM STUDY

6.1 CASE STUDY PROBLEM

A case study is taken to validate this model in real time. Software developed (CMMS) for the above conceptual model is not restricted for this case study problem alone .A company that has a strong Research and Development and many suppliers at its manufacturing is chosen for the case study.

6.1.1 COMPANY AND PRODUCT DETAILS

- Company name : SRI VELA SMELTERS
- Address : 1/628, Pommakkapalayam,
  Nallur-kandampalayam,
  Paramathi Velur-637203
- Product manufactured : Manufacturers of steels ranging from 8mm diameter to 32 mm diameter. They are producing steel about 40 to 60 tones of steel per day.

6.1.2 MACHINE DETAILS

NAME	NUMBERS
ELECTRIC FURNACE	3
COAL HEATING FURNACE	3
LATHE MACHINE	8
SHAPING MACHINE	4
MILLING MACHINE	2
PLANNING MACHINE	2
RIB CUTTING MACHINE	2
ROUGH MILLING MACHINE	2
SURFACE FINISHING MACHINE	2
CONTINOUS MILL	2
TMT BOXES	4
TESTING MACHINES	5
COOLING BED	2

Table 6.1 Machine Details

6.2 SYSTEM ANALYSIS

The existing system does not facilitate manipulation of CMMS requirement and running the CMMS. They are done manually. The needed data are typed and the details are retrieved as hard copies. Numbers of files are maintained year by year and no sort of database is maintained to record the details. It is hard to get the sorted reports manually.

6.2.1 PROBLEMS IN THE ORGANIZATION

- To improve standards of the chemical mixture to ISI level.
- Wastage of TMT bars during manufacturing processes.
- Non availability of databases like employee register, preventive maintenance, work orders and asset descriptions and so that it requires number of files to be maintained manually.
- To control energy savings in the whole organization to have effective cost control.

6.2.2 LINKING KM WITH PEOPLE, PROCESS AND PRODUCT

The main aim of the new system is to overcome the drawbacks in the existing system. In the proposed system all the details are maintained in the tables. Whenever needed the required details are retrieved from the database.

Here the package provides all the options in the screen. In the proposed system the database is available for all the planning activity.

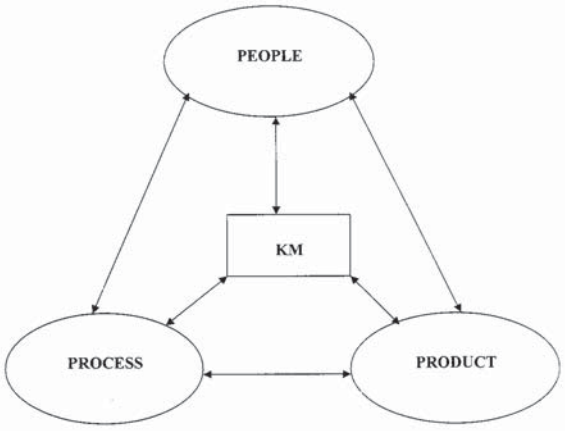

Fig 6.1 Linking Knowledge Management into organization

6.3 METHODOLOGY FOLLOWED

Knowledge transfer plan is used as a tool to resolve the existing problem. There are probably some aspects of the work that only know how to do. In this step we are developing a list of those tasks and activities.
List the tasks and activities below;

1. Where is the problem starting?
2. Who are all responsible?
3. How to list the steps to solve?
4. How to enter problem in the computer system using CMMS?
5. Knowing the key factors for the problem.

6.4 TEAM DISCUSSION TO INCREASE ISI STANDARD

After the problems are taken into account, we had the team discussion between all managers of quality, production, maintenance and general manger to solve the problem. The main problem in vela smelters private limited is the chemical composition mixture. Chemical composition plays a major role for the ISI standards. To have the IS standards in to the system, we analyzed the problem and came into the conclusion to increase the composition level into the molten stage. We increased the following chemical composition % level to the approximate of ISI. They are

- Carbon
- Sulphur
- Phosphorus
- Manganese

CHEMICAL COMPOSITION	ISI STANDARD	VELA TMT
Carbon (max %)	0.30	0.20
Sulphur (max %)	0.06	0.035
Phosphorus (max %)	0.06	0.035
Manganese (max %)	0.30 to 0.70	0.30 to 0.55

Table 6.2 Chemical Properties Of Bar Grade 415

6.5 AFTER IMPLEMENTING KM WITH CMMS

After implementing knowledge management using the CMMS software many of the problems are solved by having team discussion and the main problem of chemical composition is leveled to the ISI level. The following table shows the increased standard of ISI level in the organization.

CHEMICAL COMPOSITION	ISI STANDARD	VELA TMT
Carbon (max %)	0.30	0.25
Sulphur (max %)	0.06	0.05
Phosphorus (max %)	0.06	0.05
Manganese (max %)	0.30 to 0.70	0.30 to 0.70

Table 6.3 Chemical properties of bar grade 415 after Implementing knowledge management

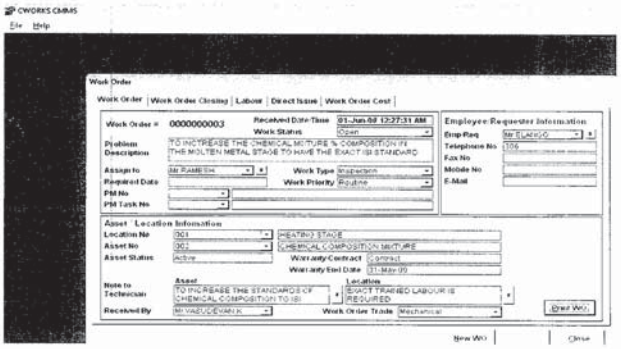

Fig 6.2 CMMS work Order for Increasing Chemical Mixture

6.5.1 PHYSICAL PROPERTIES

The following table shows the physical properties of the Vela TMT which is been to the standards of ISI level. Every improvement is done using the step by step process.

SL.NO	PROPERTIES	ISI STANDARD	VELA TMT
1	Yield strength (N/mm^2)	415 (min)	440-480
2	Tensile strength (N/mm^2)	485 (min)	510-580
3	Stress ratio	1.10 (min)	1.16-1.22
4	Elongation	14.5 (min)	20-25

Table 6.4 Physical Properties Of Bar Grade 415

6.5.2 SECTION WEIGHT OF TMT BAR

After implementing all data into the CMMS software it becomes very much easier for the organization to have easy usage of the system and to have the standards. The section weight of the TMT bar also improved to the level of ISI standard. The following table shows the section weight of TMT bar.

SECTION	ISI STANDARD (Kg/m)	VELA TMT (Kg/m)
08 mm	0.367 to 0.423	0.360 to 0.400
10 mm	0.574 to 0.660	0.580 t0 0.620
12 mm	0.844 to 0.932	0.850 to .890
16 mm	1.500 to 1.658	1.500 to 1.580
20 mm	2.393 to 2.541	2.390 to 2.460
25 mm	3.750 to 3.960	3.750 to 3.850
28 mm	4.680 to 4.970	4.680 to 4.830
32 mm	6.120 to 6.490	6.120 to 6.310

Table 6.5 Section Weight of TMT Bar

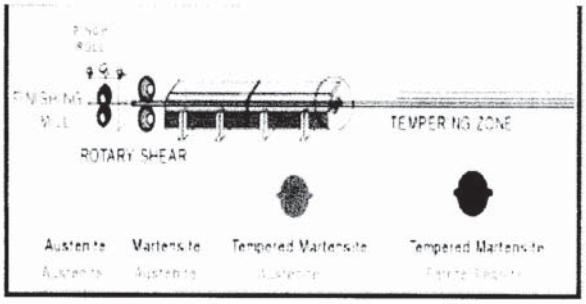

Fig 6.3 TMT Process of Vela Smelters

6.5.3 FEATURES OF VELA TMT BARS

- Earthquake Resistant.
- Excellent weldability and durability.
- Uniform strength throughout the bar due to PLC controlled TMT process.
- Uniform space and depth of lugs maintained by CNC machine.
- Higher strength with better elongation.

Chapter 7

Results and discussions

CHAPTER 7

RESULTS AND DISCUSSIONS

7.1 SYSTEM IMPLEMENTATION

An important aspect of a system analyst's job is to make sure that the new design is implemented to the established standards. The term implementation has different meanings, ranging from the conversation of a basic application, to a complete replacement of a computer system.

7.1.1 IMPLEMENTATION PLAN

Implementation used here to mean the process of converting a new system design into an operational one. Conversion is one aspect of implementation.
There are three types of implementation:

1. Implementations of a computer system to replace a manual system.
2. Implementations of a new computer system to be replace an existing one.
3. Implementation of a modified application to replace an existing one is using the same computer.

7.1.2 IMPLEMENTATION DESIGN

Implementation is the stage in the project where the theoretical design is changed into a working system and is giving confidence on the new system for the users that it will work efficiently and effectively.

Implementation involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over, an evaluation of change over methods. Apart from planning major task of preparing the implementation are education and training of users.

The more the system being implemented, the more involved will be the system analysis and the design effort required just for implementation. An implementation coordinating committee based on policies of individual organization has been appointed. The implementation process begins with preparing a plan for the implementation of the system. According to this plan, the activities are to be carried out, discussions made regarding the equipment and resources and the additional equipment to be acquired to implement the new system.

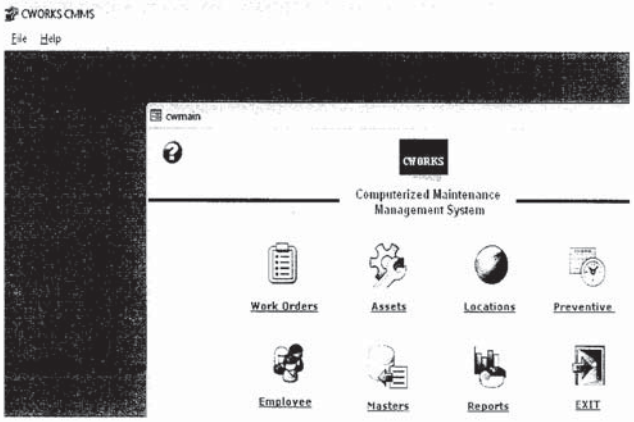

Fig 7.1 Computerized Maintenance Management System

7.2 CMMS USAGE IN THE ORGANIZATION

7.2.1 ENERGY SAVINGS THROUGH ID FAN

Chimney height is increased to reduce load on ID (Induced draft) fan drive. Team discussion is made between all managers and decision is made by using the knowledge management as a tool. We arrived into a conclusion that the ID fan should be switched off when it is not in use. To save energy as a main part this conclusion is made and implemented in the system. By switching of ID fan, it saves up to 20-25 units per hour.

Power usage of ID fan	=	23 units/hr approximately.
If it is stopped for 4 hrs/ day	=	92 units/day.
Cost of one unit current bill	=	3.50 Rs/unit.
Savings of cost per day	=	322 Rs/day.
Savings of cost per month	=	9660 Rs/month.

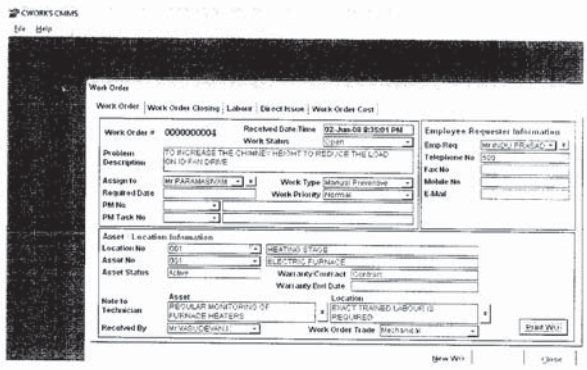

Fig 7.2 Work Order for Energy Savings

7.2.2 EMPLOYEE REQUESTER DETAILS

In every organization there is need for having the database system to have an effective control from top level of management to the bottom level management. Here in this organization, the system does not have any database for all employees. Thus we had a discussion between the management team to have an effective control by using CMMS. Thus all the details of the employee are collected effectively and the data are transferred to the CMMS software.

Non-contract labours	=	115
Contract labours	=	more than 300
Shift length for contract labours	=	2 shifts/day
Working shift hours for contract labours	=	12 hours/shift

Thus by having discussion with the general manager and production manager, the shift length have been reduced to 10 hours/ shift and the remaining 2 hours is been idle and is used for the regular maintenance of machines. Thus it does not affect the productivity. Thus by doing this reduction of shift hours the cost is been saved to an extent of Rs.5000 per month approximately.

Cost savings due to reduction of shifts = Rs. 5000/ month.

Thus all details of the employee starting from general manager to security been collected and transferred to the CMMS software for the effective control. The following figure shows the how the employee requester details are enrolled into the CMMS software.

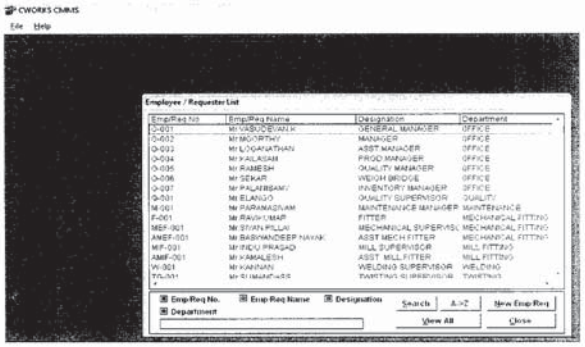

Fig 7.3 Employee Requester List

7.2.3 REPLACING TUBELIGHTS BY FLUORESCENT LAMPS

In order to save energy through lighting in Vela Smelters all 2*40W tube lights been replaced by 1*36W fluorescent lamps. Thus discussion being made between maintenance manager and the management, having knowledge as a basis conclusion is made to replace all tube lights. Thus greater amount of energy being saved through this preventive maintenance.

Energy saved by replacing tube lights	=	25 units/ day.
Cost for one unit of current	=	3.50 Rs / unit.
Therefore cost saved per month	=	2625 Rs / month

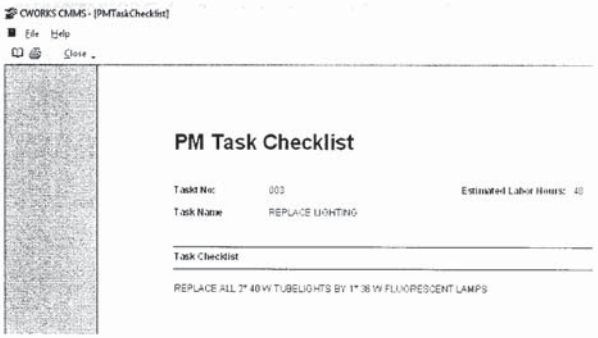

Fig 7.4 PM checklist for replacing tube lights using CMMS

7.2.4 WASTAGE REDUCTION USING CMMS SOFTWARE

In any manufacturing industry waste reduction is one of the main problems to be solved. Thus in this organization waste reduction is by means of the TMT bars running out of the mill (continuous and finishing mill) during the manufacturing. Thus this becomes the main problem for the management to be solved. Thus we had the discussion between the maintenance and the quality managers and by using the knowledge as a tool, problem solving methodology is found.

Where the problem is arising?
Who are all involved in the processes?
What are all the processes to be monitored?
What is the cost involved for the process?
What is the importance?

Table 7.1 knowledge management tool for wastage reduction

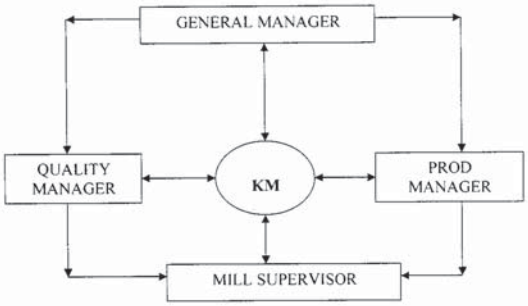

Fig 7.5 Management Team for KM Cycle

Thus the management team has been made to discuss about the problems and using the knowledge management as a basis, regular monitoring of machines been done in all departments and the wastage is reduced at a greater extent. Thus half the wastage been reduced in small time. The analysis of wastage is shown below.

WEEKLY ANALYSIS	WASTAGE OF TMT BARS (Kgs / day)
1ST WEEK	56
2ND WEEK	47
3RD WEEK	49
4TH WEEK	54
5TH WEEK	48
6TH WEEK	46
AVERAGE	**50 Kgs / day**

Table 7.2 Wastage analysis of TMT bars

Thus after the analysis, problem is then solved by using knowledge basis. Thus the bars coming out of the continuous mill is been prevented by placing the safety inguards from the continuous mill to the finishing mill. Now the wastage been reduced to a level of 50 Kgs per day.

Wastage of TMT bars reduced per day	=	50 kgs/day.
Cost savings for one kg of TMT bar	=	6 Rs/kg
Thus cost savings per day	=	300 Rs/day
Cost savings per month	=	9000 Rs/month

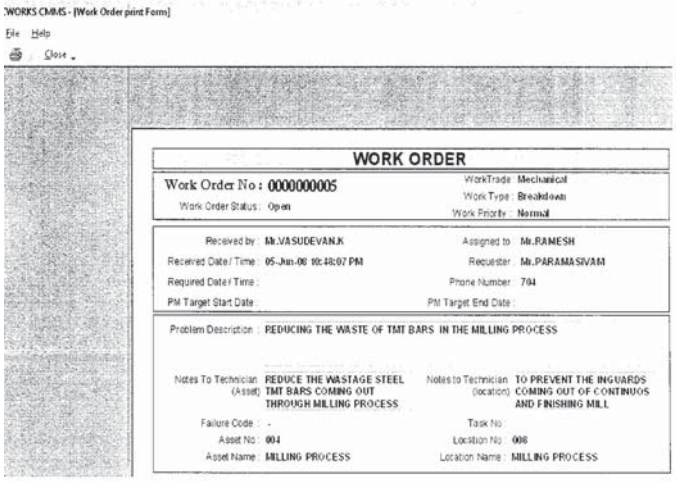

Fig 7.6 CMMS work order form for wastage reduction

7.3 MANAGEMENT ACTIVITIES DONE USING KM AND CMMS

Some other management activities is been done using the knowledge management as methodology and transferred in to the CMMS software. The following are some other management activities in the organization.

1. Rain Water harvesting (figures per year)
Supply of Rain Water in 10 acre campus is 1, 00,000 kL
Water Demand in plant is 50,000 kL
Surplus of 50,000 kL
Helps meet plant requirement during 4 – 6 months a year.
2. Replaced obsolete and inefficient fans and pumps.

3. Extensive training of all personnel in
   - Handling equipments
   - Energy savings methods

4. Motivating the workers to save energy through small group and project team activities.

5. Translucent sheets for natural illumination inside sheds

Fig 7.7 Translucent Sheets Inside Sheds

7.4 SOFTWARE USED IN THE ORGANIZATION

Thus CMMS helps the management in various ways to combine the knowledge management methodology to record all transactions into the database. The various other categories that can be used by the CMMS are as follows;

7.4.1 FAILURE CODE DESCRIPTION

Thus this module helps the management to pre-define the failures that occurs in the system. By using this module we can easily predict the failures and we can take the measures according to that extent and the preventive maintenance can be done using the PM task.

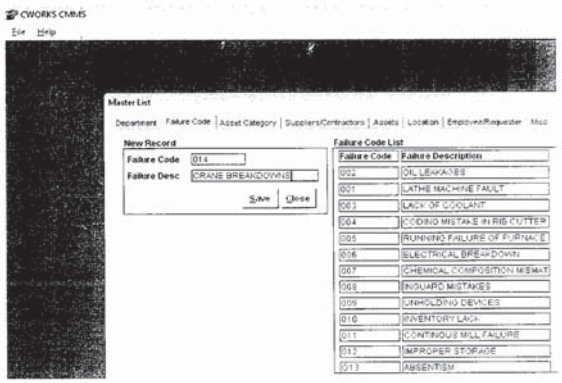

Fig 7.8 Failure code description using CMMS

7.4.2 TOTAL SAVINGS USING CMMS

By using the Computerized Maintenance Management System (CMMS), the organization gained lot of energy savings and wastage reduction and all the record maintenance were transferred to the data system. The following table shows total amount saved using the software.

CATEGORY	SAVINGS/MONTH(Rs)	SAVINGS/YEAR(Rs)
POWER SAVINGS	9660	115920
LABOUR CONTROL	5000	60000
ENERGY SAVINGS	2625	31500
WASTE REDUCTION	9000	108000
TOTAL	**26285**	**315420**

Table 7.3 Total cost savings using CMMS

7.5 ADVANTAGES USING CMMS

1. Time consumption for recording all transactions is extremely reduced by using CMMS software. Before using CMMS it takes about one week to record data into the files. But now it just takes about one day to complete the work.

2. There is no need to maintain files separately as all the functions are stored in single software called CMMS.

Chapter 8

Conclusions

References

CHAPTER 8

CONCLUSIONS

This project is completely menu driven, to provide smooth execution of the material planning function. It has been developed for the present requirements and the system was tested with the proper data. This project deals with the knowledge management as a concept and CMMS as a tool, to solve the data management system as main criteria. This project also deals with the methodology of knowledge transfer plan and the required fields are given importance to transfer the data to Computerized Maintenance Management System (CMMS). Main activities are conducted to improve process of the organization and to have the ISI standards.

Facilities are provided for the latest updates and are aimed to satisfy the requirements of the organization to the maximum extent. In comparison with the existing system, the benefits under a computerized system were considerable in saving energy, time and effort spent on the planning activities. This project with its integrity will go long way in managing the data. The future scope of this project is that concluded of using software as a basis of knowledge in the organization. The use of CMMS is that provides clear verification data management system and mainly used in the form of energy savings. This maintenance management software is very much useful for organizing the whole organization.

This project has enhanced my aspiration and has helped me to raise my level of knowledge in application.

REFERENCES

1. Thomas Jackson, et al, International Journal of Knowledge, Culture and Change Management, Vol-4(2004), pp (643-650).

2. Kostas Metaxiotis, et al, International Journal of knowledge management studies, Vol-1(2006), pp (79-89).

3. Rick Dove, Journal of Knowledge Management, March 1999, pp (1-17).

4. Dr.Paul James, actKM online journal of knowledge management, Vol-2(2005), pp (92-102).

5. Rose Alinda Alias, International Journal of Computer science and network security, V0o-6(2006), pp-(237-246).

6. Graham Durant-law, actKM online journal of knowledge management, Vol-2(2005), pp (13-23).

7. William Keogh, et al, International Journal of knowledge management studies, vol-1(2006), pp (219-237).

8. Dr.Yogesh Malhothra, The journal of quality and participation, july-aug 1998(Special issue on Knowledge Management).

9. www.cworks.com.my

10. www.plantmaintenanace.com