CHAPTER – 5 CASE STUDY

5.1 Introduction

This chapter explains the detailed case study carried out in manufacturing organization, which is implementing JIT. The case study has been conducted in a phased manner starting from the evolution of the need for incorporating the JIT at the tactical level to the excellence at the strategic level by incorporating the new technology and sourcing practices as a competitive tool in manufacturing organization. The objectives of case study include investigation of current status of JIT implementation in Indian manufacturing industry to assess roadmap followed by Indian manufacturing entrepreneurs for successful JIT implementation and evaluating the contributions made by strategic JIT implementation programs towards affecting manufacturing performance enhancements.

In order to scrutinize the manufacturing organizations for the research work, support was sought from various reputed Indian manufacturing organizations rigorously involved with adaptation of JIT principals. For this purpose, the detailed research objectives, methodology, scope of work was shared and discussed at length with the industrial experts and resource persons, followed by detailed clarifications and personal interactions. Letters were sent to various manufacturing organizations to allow conducting case study in their organization.

5.2 JIT implementation at DSM Anti-Infectives India Ltd.

A case study has been taken up at DSM Anti-Infective India Ltd. located in the northern part of India. DSM Anti-Infective is a part of DSM group of companies. DSM group of companies, with an annual turnover of $8 billion, is one of the oldest business groups in world and has pioneered various new ventures in the country. The detailed evolution of DSM group has been depicted in the Figure 5.1. The DSM group is also known as life sciences and materials sciences Company. The core activities of this group are Climate and Energy, Health and Wellness, Functionality and Performance and Emerging Economics. The core activates of DSM Group are listed in Figure 5.2.
Figure 5.1 Evolution of DSM Group of Industries

Figure 5.2 Core actives of DSM Group
Though the Company’s main business is manufacturing and sales of various types of chemicals. DSM is a leading provider of high-quality custom contract manufacturing and development services to the pharmaceutical, biopharmaceutical and agrochemical industries. DSM holds global leadership positions in penicillin G, penicillin intermediates (6-APA and 7-ADCA), active pharmaceutical ingredients such as semi-synthetic penicillins and semi-synthetic cefalosporins (beta-lactams), and other active ingredients such as nystatin. DSM has annual net sales of about €8 billion and employs some 22,700 people worldwide. The company is headquartered in the Netherlands, with locations on five continents.

DSM Anti infective India Pvt. Ltd is the flagship company of DSM Group, world’s most admired trademark, with an annual turnover of 550 crores. The plant was commissioned in 1985. The growth of DSM Anti infective is shown in Figure 5.3

![Figure 5.3 Evolution of DSM Anti infective Ltd.](image)

The plant employs 400 personals which include 120 officers and supervisors and 280 workers. The plant is having four sections named as Chameleon, Classic, Lotus, Tabla. These are also known as pillars of the plant. The products, production capacities, technology used and year of commissioning the section are shown in figures below:
• **Chameleon**
  - Product – 6-APA
  - Capacity 2160 TPA
  - Enzymatic technology
  - Commissioned: 2006

• **Classic**
  - Product – Iso oxazoles
  - Cloxa/Oxa CEP available.
  - Capacity 600 TPA
  - Chemical synthesis
  - Commissioned: 2004

• **Lotus**
  - Purimox – CEP available.
  - Capacity 2000 TPA
  - Enzymatic technology
  - Commissioned: 2006
The layout of aforesaid plants are shown in the Figure 5.4

**Figure 5.4 Layout of DSM Anti infective Pvt. Ltd.**

### 5.2.1 Reasons for JIT Implementation at DSM Anti infective

The major factors influencing organization’s decision to implement JIT included critical external factors like: Demographic shifts and urbanization, growth in emerging economies (incl. innovation), increased resources consumption and efficiency, high impact of new technologies, constant pressure on price, need to reduce new product development cycle time and thrust on quality. Moreover, certain internal factors also played a crucial role in enforcing the management to implement JIT. These included: high delivery lead time by suppliers (> one month), High number of delays of
delivery from suppliers (>10 per year), less manufacturing flexibility (<20%), high setup time (>30 hours), high average lead time from customer order to product delivery (20-25 days), difficulty in meeting daily schedule adherence, more customer complaints (>10 per year), less average return on investment (<2%).

5.2.2 JIT Implementation Journey at DSM Ant infective Ltd.

The organization began journey of JIT in year 2000 when top management declared its implementation. It all started by joining hands with DSM Group. This followed a joint agreement between the management and union to implement JIT in the organization. Managers and other employees were provided train about JIT, conducted quality seminars and company visits, to have a thorough understanding of JIT methodology, practices and benefits.

Moreover, the complete master plan towards JIT implementation was aggressively chalked out to ensure successful JIT implementation to exploit the true potential of JIT. Figure 5.5, 5.6 and 5.7 depicts the master plan for JIT implementation, which also shows the structure of management and documentation hierarchy. Moreover, benchmark performance indices like Productivity (P), Quality (Q), Cost (C), Delivery (D), Safety (S) and Morale (M) have been setup. This was followed by setting up of realistic targets to be achieved through JIT initiatives over the period of time. The details of benchmark and target performance indicators have been presented in Figure 5.6, thereby revealing the potential manufacturing performance improvements through strategic JIT initiatives.

This was followed by finalization of JIT policies for the organization. These policies are listed below:

‘We, DSM Anti-Infectives India Limited, believe that total quality is commitment to;

• Customer Satisfaction
• Cost Leadership
• Safety Health and Environment
• Employee Empowerment

through best practices and continual improvement.’
Figure 5.5 Quality and GMP affairs

Figure 5.6 Structure of Quality
The organization ensured the total participation of employee towards JIT implementation. The employees at all levels starting with top executives along with middle management and lower management were taken into confidence, provided adequate training regarding JIT practices and assigned their roles and responsibilities for ensuring their whole heated participation towards JIT implementation. For this purpose, a total of 6 quality control in charges were deputed as shown in Figure 5.6.

The workers were motivated to contribute effectively towards holistic JIT implementation in the plant. Inventory control, Kaizen, Planned Maintenance, Quality Control, Education and Training, and Safety Hygiene and Environment were rigorously followed for achieving benefits through JIT implementation. The major and minor losses regarding critical and non-critical machines alike were identified and duly addressed using appropriate quality improvement techniques (why-why analysis, PM analysis, root cause analysis, FMECA analysis, 3M analysis, 7 QC tools); 5S principles properly understood and implemented by operators and total commitment shown by workers for affecting manufacturing performance improvements. The major emphasis was laid on proper training and education of employees regarding understanding of the equipment, maintaining appropriate standard operating conditions, quality, awareness, working with cross-functional-teams.

A brief account of the activities and initiatives adopted under various JIT implementation issues have been presented to elaborate on various strategic
organizational improvement initiatives adopted in the organization for reaping true potential of JIT. The stepwise initiatives under various JIT implementation issues have been discussed here.

5.2.3 JIT implementation strategies adopted for successful JIT Implementation

The organization is working on the integrated triple ‘P’ approach and Figure 5.8 shows this approach of the organization. The organization deployed JIT in the organization and the various JIT issues adopter by the organization are discussed below

![Figure 5.8 DSM’s integrated Triple P approach](image)

5.2.3 (a) Organization culture, Management Commitment and Employee’s involvement

To maintain the JIT manufacturing environment training has been considered as the first component. By incorporating an effective training system, the company ensured that both managers and workers understand the JIT approach and that a new culture and attitude evolve due to training has been appropriate for JIT manufacturing. Education and training programs have maximize the potential of each individual employee as a productive resource in the organization. Continuous training supplemented by formal classroom study have been taken as an innovative way to emphasize a long-term investment in human resources and its contribution to the company’s success.
Figures 5.9 to 5.12 have depicted the gain achieved by organization due to implementation of JIT. It is clear that organization gained significantly in the participation of employee in various activities after implementation of JIT.

5.2.3 (b) Work Place Organization

It has been found that after implementing JIT the work place organization of Industry got remarkable gains. The employees of organization take part in cleanliness of organization. Materials got well managed and there is no difficulty of finding the tools etc. The organization also pays great attention to its surrounding to make it more
friendly to employees and society. The organization also got award in Green credentials Figure 5.13 depicts that

![Benchmarking Green Amongst Industries]

**Figure 5.13 Green manufacturing award**

### 5.2.3 (c) Issues Related To JIT Purchasing

The JIT concept as applied to purchasing translates into frequent releases and deliveries. So in JIT environment purchasing requires frequent, reliable deliveries in exact quantities. In today’s competitive markets, close cooperation between the vendor and the buyer is necessary to reduce the joint inventory cost and the response time of the vendor-buyer system. Lorefice (1998) stressed that a sort of partnership has to be established among supplier and customer in order to involve the latter into the efficient process of JIT. Most relevant factors for the selection of suppliers are not price but to eliminate defective goods from production cycle and improved quality turn outs. The selection of supplier should be based on the criteria such that there should be minimum
waste, minimum inspection, minimum freight costs (with geographic proximity), minimum paperwork and small and frequent lot size delivery.

The organization has listed 3-5 suppliers and more that 50% supplier implemented JIT. The organization has association of more than 4 years with suppliers. Figures 5.14 and 5.15 depicts the after implementing JIT the delivery lead time got reduced to 9 days from 35 days and delay in supply of material got reduced to 2 per year from 10 per year.

![Figure 5.14 Delivery Lead time of Parts in days](image1)

![Figure 5.15 Number of delays in one year of Parts in days](image2)

5.2.3 (d) Product And Manufacturing Flexibility, Facility Layout and Production System and Process Control

For the success of JIT the organization must have manufacturing flexibility proper facility layout and control on production system and process. Figure 5.16 shows that organization achieved gain in flexibility of production after implementing JIT. Before JIT number of product categories was 1 and after JIT it increases to 7.

![Figure 5.16 Number of product categories is produced in the manufacturing system](image3)
The organization also divided the plant floor into manufacturing cells. There are 5 modules/cells are formed in the organization and machines are grouped into product family. There is minimum/approximately nil in process inventory. Histograms and flow charts are being used to control the process and more than 60% of the equipment is automated. Percentage of organization’s shop-floor supported by FMS (Flexible Manufacturing System) has increased to 40% as shown in Figure 5.17

![Figure 5.17 Percentage of Organization’s shop floor area supported by FMS](image)

5.2.3 (e) Set-up Time

Setup time is the down-time of an operation to change from one part or product to another. By reducing setup time, smaller run quantities become economically feasible, manufacturing lead times fall, lead times variability is reduced, quality is improved, and shop floor flexibility is greatly enhanced. Through the setup reduction, capacity that is previously consumed by setups can be freed up and made available for production. The organization got reduced the setup time as well as lead time of production drastically after implementing JIT. Figures 5.18 and 5.19 shows the in setup as well as lead time before and after implementing JIT.

![Figure 5.18 Setup time before and after JIT in hours](image)

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5.2.3 (f) Quality

Implementation of quality control techniques in an organisation can also lead to realisation of intangible benefits in the form of improved image of the organisation, leading to the possibility of increased orders.

DSM Anti-Infectives India Limited, believe that total quality is commitment to;

- Customer Satisfaction
- Cost Leadership
- Safety Health and Environment
- Employee Empowerment

through best practices and continual improvement. In the plant quality management system includes:

- Integrated Quality Management System (ICH Q7)
- Corporate Policy ISOP Local SOPs/ WI
- Well defined Quality and Manufacturing Policies
- Quality Policy (ISO 9000)
- SHE and Manufacturing Policy
- EMS Policy (ISO 14000)
- JIT
• Control of All Operations
  • Advanced Process Control Systems
  • SAP (ERP) with QM Module

• Modern QC Laboratories
  • 7 HPLC, 2 Head Space GC and 3 GC

• Qualification / Validation
  • All equipment and instruments qualified/calibrated
  • Production process and Analytical Methods validated
  • Cleaning Procedure validated to prevent cross contamination
  • Validation of Computerized Systems

• Qualified and trained Staff
  • Job descriptions describing all key responsibilities
  • Involvement of People (Trainings and Workshops)
  • Awareness drive (Quality Champion)

• Management of Change
  • Assessment of changes, review, and approval of changes along with SHE department.

Due to implementation of quality initiatives the organization reaped the benefits of low rework and scrap as shown in figures 5.20 and 5.21.

![Figure 5.20 Percent rework](image)
![Figure 5.21 Percent scrap](image)
5.2.3 (g) Customer’s Orientation

Customers want to purchase quality products at fair prices and have those products delivered in a timely manner and the overriding purpose of strengthening relationships with customers is to more effectively respond to changes in customer demand (Green and Inman, 2006). Claycomb et al. (1999a) define JIT-with-customers as ‘the use of the integrated, problem-solving initiatives of a JIT philosophy concentrating on improving quality and facilitating timeliness in supply and distribution to external customers’.

DSM Anti-Infectives India Limited has slogan that we have the responsibility to customers, patients, shareholders, business partners, employees and local communities, as well as to the world around us, to conduct our business in a compliant manner. Focused on the customers more than 60% of the products are delivered to customers Just in Time. Most of the products manufactured by the organization are accepted without inspection by customers.

5.3 Concluding Remarks

A manufacturing facility has been studied and analyzed to study JIT implementation issues, the roadmap followed and the key benefits achieved from JIT implementation. Through JIT implementation, the cost and quality were improved significantly by reducing and minimizing rework, inventories, and equipment failures. Cost of rework and repairs has also reduced due to very limited products rejected due to JIT implementation, as a result of which Number of Major and Minor Accidents has also reduced, various other factors along with above has been shown in Figures 5.14 to 5.21. Thus, the overall effectiveness at DSM anti-infective plant improved significantly as shown in Figures.

Intangible JIT performance measures have been reflected through top management commitment, customer involvement and satisfaction, employee involvement and empowerment, customer–supplier relationships, and better process improvement and management. Also change in attitude of the employees, ‘can do it’ spirit, clean and green plant, improved tool management, visual material inventory, proud to show plant to outsiders, fun and joy to work with visual controls and improved level of communication.
Further, the organization has also developed vision of 21st century and implications for JIT in pursuit at the work place and have decided to continue adopt JIT as a management strategy for companywide system. Under this strategy, the organization plans to continuously implement strategies / mechanisms for addressing all losses affecting production system, improving OEE beyond 90 % in future, realizing and sustaining zero defects, ensuring lowest cost producer with highest quality and realizing best operating margins.