BENCHMARKING OF PLANT LAYOUT FOR A TEA PROCESSING UNIT

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38th ISTE

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ABSTRACT

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Benchmarking is the process of identifying, sharing, and using knowledge and best practices. It focuses on how to improve any given business process by exploiting top notch approaches rather than merely measuring the best performance. Finding, studying and implementing best practices provide the greatest opportunity for gaining a strategic, operational, and financial advantage.

To enhance development and acceptance of new control strategies, a standard benchmarking methodology to evaluate the performance of tea processing plant has been proposed. The proposed methodology is, however, for a typical plant with typical loading and environmental conditions. Thus, benchmarking a full-scale plant working under different situations is still a problem that needs to be solved. This paper proposes a realistic approach to benchmark specific full-scale activated tea processing plant used for the control of moisture, and to identify the vital factor through Pareto Analysis for developing a low cost layout based on real design, operational and performance data.

Keywords: Benchmarking, Control of moisture, Tea processing plant

ஆய்வு சுருக்கம்

ஒரு தொழிற்சாலையின் அதிகபட்ச தர நிர்ணயத்திற்கு, பிற தொழிற்சாலைகளின் அமைப்புக்களை கண்டறிந்து குறைந்த முதலீட்டில் அதிக தரமான பொருட்களை உற்பத்தி செய்ய வேண்டும்.

தேயிலை தொழிற்சாலைகளின் உள் கட்டமைப்பு மற்றும் அவற்றின் உற்பத்திக்குத் தேவையான இயந்திரங்கள், கருவிகள் ஆகியவற்றின் செயல்களை ஒப்பிட்டு, தரமான தேயிலை தயாரிப்பதற்கு குறிப்பிட்ட கட்டமைப்பில் குறிப்பிட்ட முறையில், ஒரு குறிப்பிட்ட சூழ்நிலையில் அதிக தரமான தேயிலை பெற ஆய்வு செய்யப்பட்டுள்ளது. மேலும் பேரட்டோ ஆய்வின் மூலமாக சில தொழிற்சாலையின் அமைப்புகளை ஒப்பிட்டு, எதன் மூலம் தரம் குறைகிறது மற்றும் முதலீடு அதிகரிக்கிறது என்பதும் கண்டறியப்பட்டுள்ளது.

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CHAPTER - I

INRODUCTION

CHAPTER 1

INTRODUCTION

Tea processing units are complex systems, which are subject to large variations in environmental conditions and in influent load and composition. Nonetheless, the tea processing units have to meet strict standards in order to avoid adulteration to ensure high quality tea to compete in the global market. To achieve these strict standards at reduced costs is a real problem due lack of standard evaluation criteria, process complexity and due to large variations in plant configuration. To enhance development and acceptance of new control strategies the author has proposed a standard benchmarking methodology for evaluating the performance of a tea processing unit. The benchmarking methodology is developed for benchmarking a typical tea processing plant that works under typical loading and environmental conditions.

Benchmarking is an ongoing investigation and learning experience. It ensures that the best practices are uncovered, adopted and implemented. Benchmarking is a process of industrial research that enables managers to perform company-to-company comparisons of processes and practices to identify the best of the best and to attain a level of superiority or competitive advantage.

Benchmarking is a method of establishing performance goals and quality improvement projects based on industry best practices. It is one of the most exciting new tools in the quality field. Searching out and emulating the best can fuel the motivation of everyone involved, often producing breakthrough results.

The basic idea behind benchmarking is simple:

- Find an organization that is best at what your own organization does;
- Study how it achieves such results;
- Make plans for improving your own performance;
- Implement the plans; and
- Monitor and evaluate the results.

In other words: *benchmarking is to identify and implement best practice.*

CHAPTER - II

PROBLEM IDENTIFICATION

CHAPTER 2

PROBLEM IDENTIFICATION

There has been considerable progress in tea production in Niligiris during the last two decades. The thrust has so far been primarily on the volume of crop, quite often, the quality aspects taking a back seat. With changing market scenario and stiff competition from other tea producing countries, it is high time that quality of tea is given at least equal importance if not priority over quantity. The motto for the industry in the coming years has to be "Quality with Quantity".

The quality of tea depends primarily on the climatic conditions such as temperature, air, humidity, sunshine duration and rainfall not only in the field but also in the factory. Thus to maintain the quality of tea the layout of the factory plays a major role during the various processes of tea manufacturing like Withering , Rolling, Cutting, Fermentation and Drying.

Ideal conditions suitable for the highest quality of tea production are as under:

- Withering: 12-18 hrs for removal of 18% of moisture
- Rolling : Located at well ventilated side with room temperature of 27^0 c- 29^0 c and 90-95 % Relative Humidity and Hygrometer reading of 3^0 c
- Fermentation: Temperature to be maintained between 25^0 c and 27^0 c with 95% Relative Humidity
- Drying: The inlet and exhaust temperature must be maintained at 250 F to 260 F and 150 F to 160 F.

Moisture removal from green leaves is a key factor to success in quality production. The layout of the industry influences ease of moisture removal. The layout if optimally designed cuts down cost of moisture removal to a large extent. Hence the problem of moisture removal has been identified.

Relating to all the conventional tea industries of the Niligiris district, M/s. Nirsan Plantations, Coonoor, has a recently designed industry campus, the layout of which, differs in the design. The new layout invented primarily focuses on ease of moisture removal and low cost in both erection of the industry and the recurring expenses involved in making moist free tea. The invention also helps comply with UPASI recommended standards of tea manufacturing. The produce is of globally competitive quality. In an effort to design a new layout, this case has been used as the benchmark of the study.

CHAPTER - III

BENCHMARKING PROCESS

CHAPTER 3

BENCHMARKING PROCESS

3.1 INTRODUCTION:

The markets today are moving fast, competition is increasing, customers are more aware and demand more, and change is occurring at an unprecedented rate. In this circumstance to survive in the next decade, organizations need to rethink their structures, products, processes, and markets. They must re-establish themselves to be quicker to market, customer focused, innovative, nimble, flexible, and be able to handle rapid change. A major weapon to face these challenges is benchmarking.

Benchmarking is defined as a continuous improvement process of measuring their products, process, services and practices against the toughest competitors to improve the quality. It is an ongoing effort of identifying and implementing world best practices that are done to get superior quality for delivering customer satisfaction. In this process of comparison, the Benchmarking team will measure the progress of the organization periodically to find out the magnitude of the performance gap and where the gap is occurring. It highlights the critical success factors as well as vital problem areas, which form the undercurrent of design of advantageous action plans. Investigation of the competitor's practices reduces the benchmarking gap as well as for improves the quality. Successful benchmarking is based on achieving several important factors and managerial behaviors.

Benchmarking encourage copying, adapting, and learning from other's best practices which is becoming virtually mandatory for future success. It promotes superior performance by providing an organized framework through which organizations learn how the "best in class" do things, understand how these best practices differ from their own, and implement change to close the gap. The essence of benchmarking is the process of borrowing ideas and adapting them to gain competitive advantage.

Cause and effect analysis is a practical tool for cost analysis and cost reduction that complement engineering techniques to enhance target costing.

3.2 NEED FOR BENCHMARKING

To achieve competitive advantage, the most critical things to decide are as to which of the following strategies the business shall have to pursue.

- Cost strategy,
- Value strategy,
- Hybrid of the above two

The factors listed below need to be considered before adopting any of the above three strategies.

- Value that has to be delivered to the customers.
- Cost of the customer will have to pay for this value.
- Customer's perceptions about performance of the product(s) or value of the services provided.

3.3 OBJECTIVES OF BENCHMARKING:

The purpose of benchmarking is derived primarily from the need to establish credible goals and pursue continuous improvement. It is a direction-setting process, but more important, it is a means by which the practices needed to reach new goals are discovered and understood.

Benchmarking legitimates goals based on external orientation instead of extrapolating from internal practices and past trends. Because the external environment changes so rapidly, goal setting, which is internally focused, often fails to meet what customers expect from their suppliers.

Benchmarking is an important ingredient in strategic planning and operational improvement. To remain competitive, long-range strategies require organizations to adapt continuously to the changing market. To energize and motivate its people, an organization must:

- Establish that there is a need for change
- Identify what should be changed
- Create a picture of how the organization should look after the change.

Following are the main advantage of benchmarking:

- Achieving competitive strength
- Understanding customer requirements and developing abilities to meet them.
- Designing, developing and implementing realistic measure of productivity.
- Establishment of ambitious performance goals.

3.4 BENCHMARKING PROCESS STEPS

Major steps of benchmarking process which is the formalized and disciplined are exhibited in Figure 3.1 (Juran Quality Hand Book – Fifth Edition)

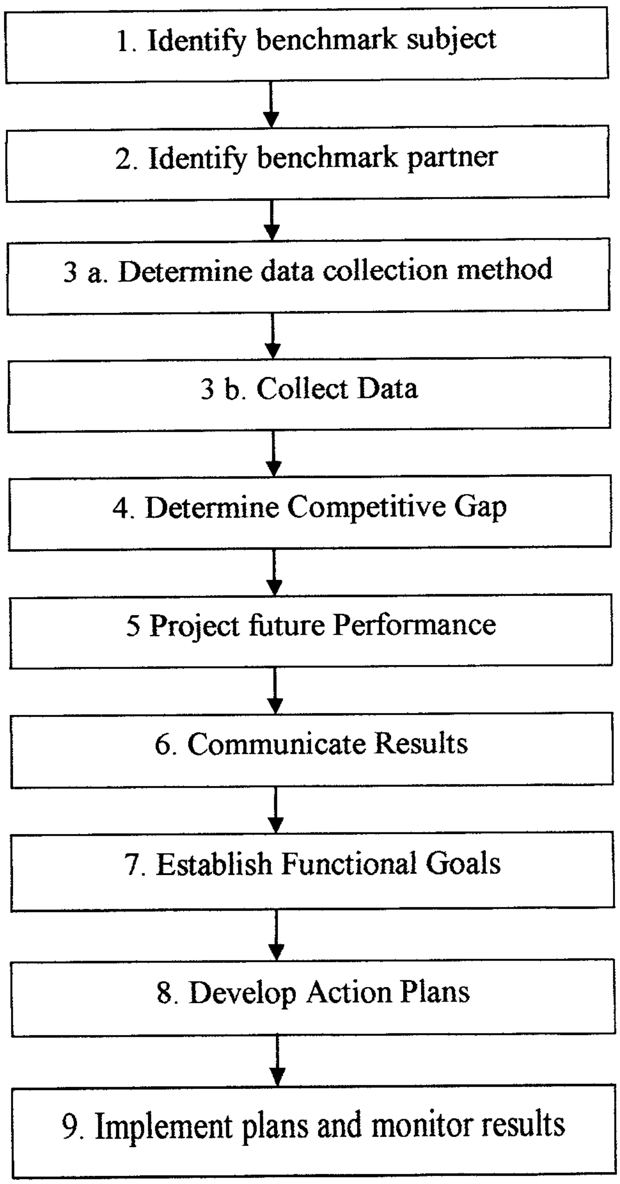

FIGURE 3.1 BENCHMARKING PROCESS STEPS

3.5 LEARNING FROM THE DATA:

Learning from the data collected in a benchmarking study involves answering a series of questions:

- Is there a gap between the organization's performance and the performance of the best-in-class organizations?
- What is the gap? How much is it?
- Why is there a gap? What does the best-in-class do differently that is better?
- If best-in-class practices were adopted, what would be the resulting improvement?

Benchmarking studies can reveal three different outcomes. External processes may be significantly better than internal processes (a negative gap). Process performance may be approximately equal (parity), or the internal process may be better than that found in external organizations (positive gap). Negative gaps call for a major improvement effort. Parity requires further investigation to determine if improvement opportunities exist. It may be that when the process is broken down into sub-processes, some aspects are superior and represent significant improvement opportunities. Finally, the finding of a positive gap should result in recognition for the internal process.

3.6 FOLLOW UP STRATEGY:

The assumption that everything is going well on its way can produce dangerous results. So there should be a follow up strategy after implementing the action plan.
The importance of follow up strategy can be understood from the following clues:

- Deficiencies in various activities can be sought out
- Areas creating trouble can be detected.
- Many new insights can be obtained.
- The Benchmarking process can be made more efficiency.

One should be careful about one thing that before preparing the follow up strategy all steps of Benchmarking should be reviewed carefully. (Anil Puri & Bali 1999).
Figure 3.2 shows the follow up strategy for benchmarking.

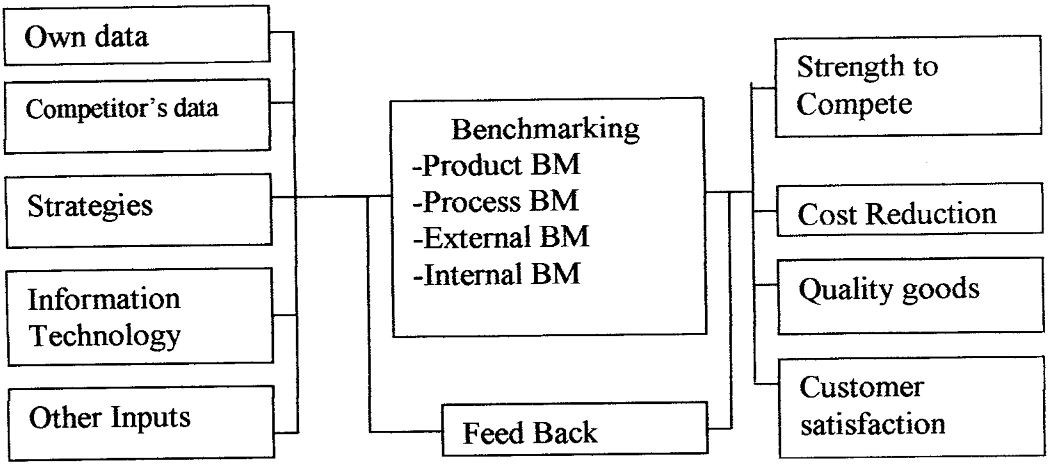

FIGURE 3.2 FOLLOW UP STRATEGY FOR BENCHMARKING

3.7 INDIAN EXPERIENCE IN BENCHMARKING:

Some of the Indian firms have tried benchmarking technique to improve their corporate performance by removing problematic factors. A summary of the work areas, strategic directions, and benchmarking partners attempted is presented in the accompanying Table 3.1

BENCHMARKING APPLICATIONS IN INDIA -A SUMMARY TABLE 3.1

S. No	Company	Area of operation	Benchmarking Partner	Parameters of Benchmarking
1	RPG Group	35 Companies spanning seven different business Rs.5,500 – Crore group	Companies within the group	Purchase Management, Energy saving, Demand Forecasting, Value Engineering, Pricing strategy
2	City Bank	Banking Services	Non competitors Indian companies	Business Development, Human Resource Management, Environment Management, Customer service
3	Modi Xerox	Manufacturing Xerox Machines	Rank Xerox Portugal	Satisfaction Level of Customer
4	Arvind Mills	Denim & Textile Makers	P & G HL Ltd	Shareholder Returns

The basic Plan-Do-Study-Act cycle was originally developed by Walter A. Shewart. But it was popularized by Edward Deming and that's why it is often called the Deming Cycle or Deming Wheel. It is an effective continuous improvement technique which comprises of various activities as shown in Figure 3.3

DEMING CYCLE	STEPS	ACTIVITIES
PLAN	PLANNING	1. Defining mission statement 2. Establishing goals 3. Soliciting experts opinion 4. Identifying processes to benchmark
DO	COLLECTING	1. Identifying participating firms 2. Arranging visits 3. Collecting data from participating firms
CHECK	ANALYZING	1. Comparing process and identifying gaps 2. Identifying superior performance 3. Determining how to close the
ACT	RECOMMENDING	1. Summarizing the benchmarking study 2. Recommending the best practices with guidelines to take action 3. Communicating the summary & recommendations to participating firms

FIGURE 3.3 DEMING CYCLE

3.8 PRE-REQUISITIES OF SUCCESSFUL BENCHMARKING

- A permanent keenly aware and committed to Benchmarking.
- Willingness to improve and change as per findings of Benchmarking.
- A realization of the fact that the state of competition is ever changing and any disregard of this fact endanger your survival.

- ❖ Willingness and honesty in sharing information with benchmarking partners.
- ❖ Dedicated adherence to the Benchmarking process.

Willingness to, seek and adopt new ideas, creativity and innovativeness, for the improvement of the existing process.

3.9 IMPLEMENTATION OF BENCHMARKING

The various steps adopted in implementing Benchmarking are as follows (Rama Mohan 1996):

1. Permission from top management
2. Creating awareness
3. Understanding present system
4. Identification of critical factors
5. Selection of competitors
6. Developing action plan
7. Feasibility analysis
8. Getting management approval
9. Implementation and Follow up

1. **Permission from top management**: Before starting the study, the Benchmarking team has to get the permission from the top management by explaining its benefits.

2. **Creating awareness**: Awareness is to be created in the middle management and to other people in the industry by explaining the benefits of Benchmarking and how the company can become competitive in the market after implementing the study.

3. **Understanding present system**: The present system should be studied thoroughly and the products that are manufactured, the processes that processes that are used to manufacture should be noted down. Quality control measures and customer needs are also to be noted.

4. **Identification of critical factors**: For conducting Benchmarking study, a product or department or a strategy or any other important factor can be selected.

5. **Selection of competitors**: Companies which are the leaders in the market are to be selected for Benchmarking. Depending on the capacity of the firm, the Benchmarking partner is selected from local level, national level or global level.

6. **Developing action plan**: There are innumerable ways to conduct Benchmarking investigations. Most data are readily and easily available. Data can be collected from the competitors itself or from consultants, dealers and experts. The company practices should be compared with the competitor's practices with the help of collected data; from which best practices will come into existence. The dimensions of performance gap between the two companies can be obtained by answering the questions like why is the competitor better. How to match his superiority?

7. **Feasibility analysis**: All the findings are analysed to see whether the findings can be implemented practically and whether it is financially feasible. The new practice is whether suitable to practice in the industry or not is also studied.

8. **Getting Management approval**: The Benchmarking team has to get approval from the top management by presenting findings clearly and convincingly supported by creditable data. What will be the cost incurred and the returns are also explained to the management.

9. **Implementation and Follow up**: An action plan which will suit the organizations is developed and communicated to all employees. The old practices are to be replaced by new practices and the output is tested to find whether there is any improvement over the old product. There is to be regular follow up to see that there is no deviation from the practices.

3.10 TYPES OF BENCHMARKING

Benchmarking consists of following constituents:

1. External Benchmarking
2. Internal Benchmarking
3. Product Benchmarking
4. Process Benchmarking

3.10.1 External Benchmarking

External Benchmarking is the comparative analysis of competitors products with the companies products. Here the industry leaders can be chosen from local competitors or competitors at the National level or competitors at the Global level depending upon the capacities of the firm.

The external benchmarking is again classified as competitive benchmarking and cooperative benchmarking. The competitive benchmarking refers to collecting specific information about competitor's products, services, processes strategies and business results and marketing comparisons with those of benchmarking firms. It is useful in positioning the firm's products and services in the market place. The cooperative benchmarking focuses on sharing experiences with and identifying best practices of organizations, which are willing to cooperate. These organizations may or may not be direct competitors.

3.10.2 Internal Benchmarking

This is the comparison between functions, departments or a similar organization as a means of improving performance. The usual aim is to optimize process performance by the removal of errors.

3.10.3 Product Benchmarking

Product Benchmarking is the comparative analysis of the product performance of competitor's products. Catalogues are the main sources of information. The main focus is on the capabilities of products with reference to their pricing strategies. Such comparison leads to identification of the features to be improved. Product Benchmarking generally leads to redesign of product to build into it the desired strength. To achieve the required level of customer satisfaction one needs to identify the features delivered by the competitors. Usually, a matrix of the type shown in Table 3.2 is used as a part of product Benchmarking. On horizontal axis the importance to customers and on the vertical axis the quality as compared to competitors (for a specific feature of product) is plotted.

The various features are plotted on this matrix, from where the attributes or features that have to be improved can be identified.

TABLE 3.2 PRODUCT BENCHMARKING

Competitor ↑	Low	Average	High
Superior			
Equal			
Inferior			

Importance to customer →

3.10.4 Process Benchmarking

Process Benchmarking refers to comparison of processes. It helps to identify the troublesome activities in the process. Thus, it leads to redesign of the process to increase the value delivered to the customer and to enhance the market share.

3.11 BENEFITS OF BENCHMARKING

The benefits that a company will get by implementing Benchmarking study are

1. If best practices are followed the customer requirements can be met easily.
2. Proper implementation of Benchmarking results in getting good quality products.
3. When customer's requirements are properly met, the sales of the company will increase which has encouraging impact on the profitability of the company.
4. There is increase in productivity of the company because of the following of best practices that are available.

The higher profitability leads to higher earnings of the employees. So their involvement in the company will become more.

CHAPTER - IV

METHODOLOGY TO SOLVE THE PROBLEM

CHAPTER 4

METHODOLOGY TO SOLVE THE PROBLEM

4.1 IMPORTANCE OF THE PROBLEM:

The tea processing units in Nilgiris occupy nearly 90% of the industrial sectors in the district. Depending on this unit many small growers have promoted themselves in planting of tea gardens for their economy. But only when quality tea is being manufactured the per capita income of each individual could be increased. Moreover the Government is also taking steps in creating awareness to plant more amounts of tea plants in Nilgiris and increase the production. On the other hand by planting of tea plants the erosion of soil could also be minimized in the hilly areas. Thus in the past few years many agriculturist have started to convert their agriculture land where they have been producing vegetables to tea gardens. Hence due to the increase in cultivation of small tea gardens sufficient numbers of tea processing units are to be constructed by the peoples of Nilgiris so that they could also increase the economy and provide employment to the local community.

But the construction of tea manufactuirng units requires huge investment which has triggered the UPASI (United Planters Association of South India) to create a Mini Tea Processing unit at a very low cost. This has triggered the author to concentrate on minimizing the plant cost for constructing a tea processing unit for the future through benchmarking a tea processing unit (M/s Nirsan Plantations) who has set standard for constructing a different type of layout when compared with the normal conventional layout which were present for years. This layout ensures that they meet the standards laid by the UPASI for maintaining the temperature, air, humidity, during various process of tea manufacturing, because the removal of moisture content in each process plays a vital role. Thus benchmarking methodology has been adopted by the author to measure the organizations performance against that of best-in-class companies in their infrastructure.

4.2 DETAILS OF ORGANISATION:

Nirsan Plantations are perhaps the most well known tea merchants from the Nilgiris, and have in the process developed a long list of thoroughly satisfied tea.

Our diversification from retailing to wholesaling tea and packaging was but a natural process after which we took to exporting the finest Indian teas in a wide range of attractive, indigenous hand crafted gift packaging , which is often tailor made to the specific requirements of our clients in India.

At Nirsan we source our teas from the tea auctions as well as directly from the tea plantations. Experienced tea tasters at Nirsan Plantation ensure that the highest standards are followed while selecting, buying and blending teas so that the consistency in tea quality, that goes with the **NIRSAN** name is maintained.

There are several plans for the constant promotion of Niligiri teas by ways of events, meets, festivals, contests, visits and talks by eminent people and experts from the industry and trade at the showroom premises.

This latest venture of Nirsan is slated to become a focal point for all connoisseurs and tourists visiting Niligiri in the near future and for all times to come.

4.3 METHODOLOGY:

The methodology adopted for finding out the solution for the above mentioned problem could be obtained through benchmarking the layout of M/s Nirsan Plantation with those of the normal conventional tea manufacturing units.

The 10 step process for conducting a benchmarking investigation consists of the following five essential phases

4.3.1 PHASE I : PLANNING

1. **Decide what to benchmark**: All functions have a product or output. These are priority candidates to benchmark for opportunities to improve performance.

2 **Identify whom to benchmark**: World Class leadership companies or functions with superior work practices, wherever they exist, are the appropriate comparisons

3. **Plan the investigation and conduct it**: Collect data sources. A wide array of sources exists, and a good starting point is a business library. An electronic

search of recently published information on an area of interest can be requested. Begin collecting. Observe best practices.

4.3.2 PHASE II : ANALYSIS

1. **Understand the internal business process**: It is important to have full understanding of internal business processes before comparing them to external organizations. After this, examine the best practices of other organizations. Then measure the gap.

2. **Project the performance level:** Comparing the performance levels provides an objective basis on which to act and helps to determine how to achieve a performance edge.

4.3.3 PHASE III : INTEGRATION

1. **Redefine goals and incorporate them into the planning process**

2. **Communicate benchmark findings and gain acceptance from upper management**: After management approves the recommendations, the impacts of practice changes must be identified and communicated to the affected individuals.

3. **Revise performance goals**: every organization and the units within it have clear, definite direction regarding the short and long term objectives that must be accomplished.

4.3.4 PHASE IV : ACTION

1. **Best practices are implemented and periodically recalibrated**: to ensure success and effectiveness, benchmarks must be planned and recalibrated.

2. **Develop and implement action plans**: Describe the specific tasks that must be completed and the results expected.

3. **Monitor progress**: The team needs to establish measurements to gauge implementation progress.

4.3.5 PHASE V : MATURITY

Determine when a leadership position is attained. Maturity is achieved when best practices are incorporated in all business processes: when benchmarking becomes a standard pat of guiding work: and when performance levels are continually improving toward a leadership position. Assess benchmarking as an ongoing process.

CHAPTER - V

LITERATURE REVIEW

CHAPTER 5

LITERATURE REVIEW

Abusam .et al. proposes a standard simulation benchmarking methodology for evaluating the performance of wastewater treatment plants to enhance development and acceptance of new control strategies. However the proposed methodology is for a typical plant and typical loading and environmental conditions.

J. Alex .et al. describes the development of a benchmark for the evaluation of control strategies in wastewater treatment plants The benchmark is a platform-independent simulation environment defining a plant layout, a simulation model, influent loads, test procedures and evaluation criteria.

H.Marzi and E.Marzi, have discussed an optimized layout for production of microelectronic components. A manufacturing group revisits their production layout and plans an improved layout to avoid existing unanticipated difficulties that were revealed through analysis of the existing layout. The final proposal is a manufacturing layout, utilizing process cells to implement "Just in Time" technique, highlighting optimization of WIP and throughput time.

Gomez Gomez .et al. conducts a Genetic Algorithm application to the plant layout problem. Usually, this problem was focused as one of the optimization kind. However, the solutions obtained by these means could rarely be implemented without previous designer revision. Not only, is the GA capable of efficiently solving complex optimization problems, but allow for several constraints to be included in the analysis Alberto and Fernandez, University of Oviedo, use genetic Algorithm to solve a plant layout problem for a manufacturing industry

Professor Klaus Schwab, Executive Chairman, The Global Competitiveness Network, (2007) uses Benchmarking as a tool for National Attractiveness for Private Investment in Latin American Infrastructure

S K Deb, Dr B Bhattacharyya, Fellow (2003) in IE (I) journal paper a hybrid heuristic model is proposed for integrating plant layout and selection of material handling equipment (MHE) under manufacturing environment. The MHE assigned to different .moves. are based on fuzzy system. The optimal locations of incoming machine blocks in the two-dimensional plane are made with the help of a multi-criteria objective function. The methodology uses many facts and rules for the selection of material handling equipments. A plant layout problem having six machines and 30 moves with different pick-up/drop-off location and 14 different types of material handling equipments are solved considering different selection orders to demonstrate the potential applicability of the proposed methodology.

Heiskanen .et al. presents the development process of a consumer-oriented, illustrative benchmarking tool enabling consumers to use the results of environmental life cycle assessment (LCA) to make informed decisions. Active and environmentally conscious consumers and environmental communicators were identified as key target groups for this type of information

Jack Holloway, Mathew Hinton, refer to the pursuit by an organization of enhanced performance by learning from successful practice of others and answers the questions for why to benchmark and how to understand the processes of best benchmarking.

A National Benchmark study of Computer Technology related programs in Industrial Technology by Dr. Dan Brown, indicates in his research that rapidly emerging programs must be continuously assessed and monitored to make certain that they are academically appropriate, differentiated from other computer-related programs, and are meeting the needs and expectations of key stakeholders. Benchmarking provides a means to achieving those

Ian Smith, Manager, Human Resources of La Trobe University Library, emphasize those Libraries, along with many other organizations world-wide, is increasingly adopting benchmarking as a means of evaluating their organizational practice against best-practice standards. Benchmarking of human resource development (HRD) is an emergent area of practice in a number of countries and sectors of activity. This paper outlines the principles of benchmarking, examines dimensions which may be useful in benchmarking HRD and focuses in particular on the potential for the application of benchmarking principles to HRD activity in the library and information services (LIS) sector.

Chetan (1999) suggests that Benchmarking is understand, what is the 'best' the others are doing that satisfies customers wants & at what level we are working. It further helps to plan the strategy to bridge this gap & improve oneself. It is a judgment process & it would prove vital in achieving success in global competition for an organization.

Rama Mohan (1996) suggested, Benchmarking is a new technique emerged to improve the quality of not only the products, but also processes and services. It will search for best practices in industry which will lead to get superior quality. With the growing emphasis on quality, it has got much significance in the present competitive world. To get continuous quality improvement, it is being found out to offer promising solutions. Numbers of step by step approaches have been given different researchers who are authorities in benchmarking.

Dutta (2005) indicates benchmarking, a term used frequently to mean a yardstick, has assumed a very special significance in today's competitive world. It is now recognized as an effective approach towards improvement in Productivity, Quality and other dimensions of performances that are determinants of competitiveness. It is an organized way of learning from others.

Anil Puri and Bali (2000) suggested, Benchmarking is the most appropriate concept and technique for this purpose. It is an ongoing effort at all levels of business of identifying and implementing world best practices, the key things that are done to deliver customer satisfaction. To achieve the required level of customer satisfaction one needs to identify the features delivered by the competitor.

John Bank (2003) compares one company's performance with that of another is a reflex of TQM. Competitive benchmarking is a continuous management process that helps firms assesses their competition and themselves and to use that knowledge in designing a practical plan to achieve superiority in the market –place. To strive to be better than the best, competitor is the target. The measurements take place along the three components of a total quality programme – products and services, business processes and procedures, and people.

Bhimaraya (2004) says, benchmarking is the need of the hour to improve the overall performance. Benchmarking helps in identifying areas that need improvement, further, it analyses what others are "doing right".

According to Jaffer Razmi (2000) graphical techniques have been developed for use in benchmarking partner selection, and are based on multi-attribute decision-making tools. Graphical techniques is that they allow decision makers to compare the potential benchmarking partners based on individual attributes and finally, provide a comprehensive profile of all the partners characteristics in an understandable manner.

Rama Mohan and Padmashri (1997) suggested, the benchmarking technique can be applied to increase customer service in which practices of the firm is compare with that of the practices of the competitors.

CHAPTER - VI

CRITICAL STUDY AREAS

CHAPTER 6

CRITICAL STUDY AREAS

6.1 DECIDE WHAT TO BENCHMARK:

All functions have a product or output. These are priority candidates to benchmark for opportunities to improve performance.

Benchmarking can be applied to any business or production process. During this step we have to determine which functions, tasks, processes or activities will be subjected to benchmarking. Most organizations have a strategy that defines how the firm wants to position itself and compete in the marketplace. They are often referred to as the critical success factors.

Hence in this work the author has decided to benchmark the layout of a tea manufacturing unit with those of the standards recommended from the UPASI who act as the helping agencies for all the tea manufacturing industries in South India.

6.2 IDENTIFY WHOM TO BENCHMARK:

World Class leadership companies or functions with superior work practices, wherever they exist, are the appropriate comparisons. Important criteria the selection of benchmark partners are that they should be outstanding regarding the benchmark subject.

Thus it was identified that M/s Nirsan Planations has a unique layout for tea manufacturing unit when compared with all the other tea manufacturing units in Nilgiris and also provides the layout at a very low cost and less building space for the manufacturing of tea as per the recommendations of UPASI. Thus the description of the plant layout of a conventional tea manufacturing unit and that of M/S Nirsan Plantations are described in detail:

6.3 ANALYSIS OF PLANT LAYOUTS:

The conventional tea manufacturing units present in Nilgiris are normally designed a few decades back which comprises of two floors in which the top floor is used only for withering process and the bottom floor is used for the remaining processes like Rolling, Cutting, Fermentation, Drying and sorting.

The schematic diagram for the top floor of a normal conventional tea manufacturing unit is shown in the Figure 6.1

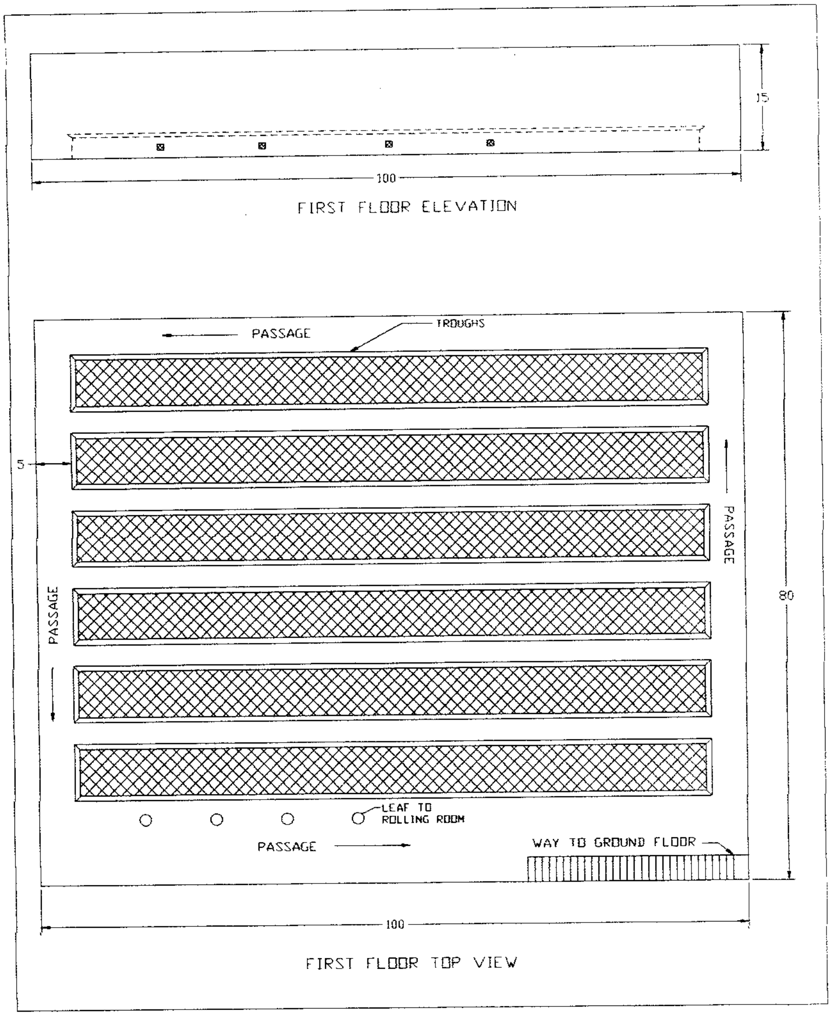

FIGURE. 6.1 DIAGRAM OF TOP FLOOR OF THE CONVENTIONAL TEA MANUFACTURING UNIT (VERTICAL LAYOUT)

Withering is a simple but most important operation in tea manufacture. There are two types of withering namely physical and chemical withering.

The main objectives of physical withering are:

1. Removal of certain amount of water from the plucked leaf: 10-15%moisture removal for RC Tea manufacture and 15-20% for Non-RC tea manufacture.
2. Conditioning of leaf physically and bio chemically for the subsequent stages of manufacture.
3. Condition the leaf from turgid stage to flaccid stage which facilitates better rolling.

Generally for CTC Tea manufacture withering for 12-18 hours is essential for removing 10-15 percent moisture. The rate of moisture removal and duration of withering depend upon the following factors:

1. Type of leaf
2. Thickness of spread (Trough Load)
3. Drying capacity of the air (Relative humidity)
4. Condition of leaf (Wet of Dry)

From the diagram shown the normal conventional tea manufacturing unit uses the top floor exclusively only for the withering process this comprises of 100X80 square feet = 8000 sq.ft.

The withered leaves from the top floor after 12-18 hrs are then transferred to the bottom floor through the openings of the top floor which connects to the next process at the ground floor.

The schematic diagram of the ground floor of the normal conventional tea manufacturing unit is shown in Figure 6.2

The various processes that are undertaken are

1. Rolling.
2. Cutting.
3. Fermentation.
4. Drying &
5. Sorting.

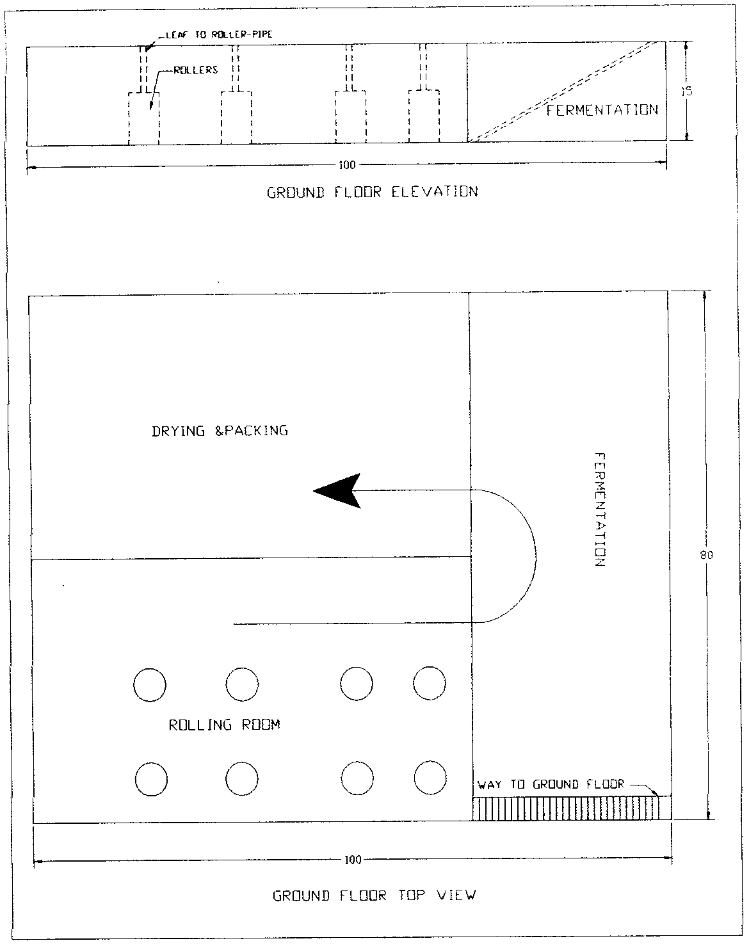

FIGURE 6.2 DIAGRAM OF GROUND FLOOR OF THE CONVENTIONAL TEA MANUFACTURING UNIT (VERTICAL LAYOUT)

Thus in a normal conventional tea manufacturing unit the space required for Rolling and cutting (usually undertaken in the same section) requires a space of 80X40=3200 Sq. Ft whereas the area required for the Fermentation Process is 20X80=1600 Sq.Ft. and the area required for the final process i.e. Drying and Sorting is also 80X40=3200Sq.Ft.. this has led totally to 8000 Sq.Ft for the bottom floor also, thus the total area required for a normal convention tea manufacturing unit is approximately 16,000 Sq.Ft.

Hence the layout cost for a conventional tea manufacturing unit is found to be around 21 lakhs. Hence an approach has been undertaken to analyze and find a suitable layout for a tea manufacturing unit which can bring down the cost of the layout so that the industries could meet the demand of the fast growing tea cultivation in Nilgiris.

To overcome this critical factor of reducing the cost the author proposes to identify who is the very best and who sets the standards and what the standard is rather than invent a new one. For Example in Cricket, one could argue that three consecutive world cup championships made the Australian Cricket Team the benchmark.
Benchmarks and benchmarking can provide the answers to the following questions of an organization: "How are we doing?', "How do we compare with others?', 'Are we tracking the right measures?' and "Are we using the best practices?"

For this a tea manufacturing unit which has been recently constructed has a unique layout which differs from all the normal conventional tea manufacturing units in Nilgiris. This layout has been identified as the best in class since it meets all the requirements of the UPASI (United Planters Association of South India) who help the tea factories about the latest technologies and information on tea manufacturing.

The layout of this unique tea manufacturing unit named **M/s NIRSAN PLANTATIONS** plant layout's schematic diagram is shown in Figure.6.3

As per M/s Nirsan Plantations plant layout the main concept of having two floor has been totally eliminated and the various processes for tea manufacturing as recommended by UPASI has been maintained.

In this layout the Withering section requires a total area of 64X42 = 2688 Sq.Ft, the Rolling ,Cutting and Fermentation area requires the same 64X42 = 2688 Sq.Ft and the final section i.e. the Drying and Sorting requires 85X42 = 3570 Sq.Ft.. This totally sums up to a maximum of 8946 Sq.Ft only. Hence the cost of the plant layout could be minimized.

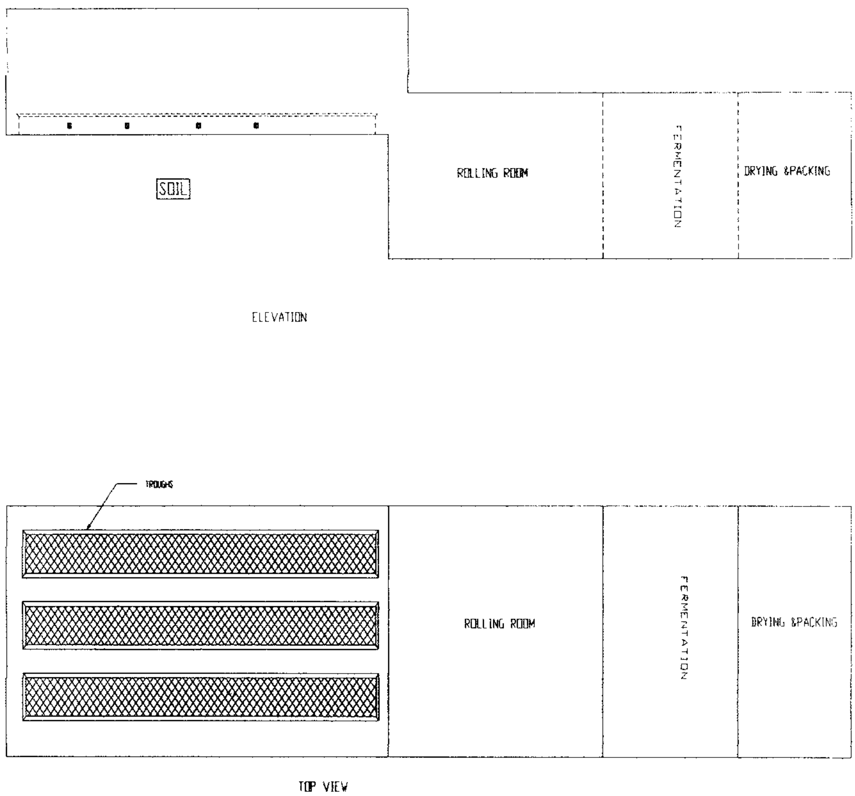

FIGURE 6.3 DIAGRAM OF THE BENCHMARKED TEA MANUFACTURING UNIT (M/s Nirsan Plantations-Horizontal Layout)

6.4 CONTROL OF MOISTURE CONTENT DURING THE MANUFACTURING OF TEA:

The next critical factor that has been taken for considerations is the control of moisture content and to check whether the proposed benchmarked layout i.e. M/s Nirsan Plantations meet the standards for manufacturing the tea as per the recommendations of the UPASI. This is because the quality of tea is based on the amount of moisture removal and maintaining the required temperature at various processes. This critical factor also has to be analyzed to manufacture quality tea as per the recommendations of UPASI.

CHAPTER - VII

DATA COLLECTION

CHAPTER 7

DATA COLLECTION

7.1 PLAN THE INVESTIGATION AND CONDUCT IT:

Collect data sources. A wide array of sources exists, and a good starting point is a business library. An electronic search of recently published information on an area of interest can be requested. Begin collecting. Observe best practices.

7.2 INTRODUCTION TO DATA COLLECTION:

Benchmarking studies look for two types of information: a description of how best-in-class processes are practiced and the measurable results of these practices. In seeking this information, bench markers can use internal sources, data in the public domain, original research, or- most likely – a combination of sources. Considerations include the cost and time involved in gathering data and the need for appropriate data quality and accuracy

When most people think of benchmarking, they generally think of conducting original research through site visits and interviews. This is not always necessary and some organizations find industrial tourisms a waste of time. Needed information that is easier and faster to obtain may be available internally or publically. In any case internal and public sources should have been examined during the planning process, so bench markers will have a good idea as to what additional information should be collected.

7.3 TYPES OF DATA COLLECTION:

Three techniques for conducting original research are questionnaires, site visits and focus groups.

Questionnaires are particularly useful to ensure respondent anonymity and confidentiality, when data are desired from many external organizations, and when using third party to collect information.

Site visits provide the opportunity to see processes in action and for face-to-face contact with best-in-class operators. Site visits usually involve a tour of the operation or plant followed by a discussion period. Because personnel of both the visiting and the host organizations devote time, it is important to prepare properly for the visit.

Laying the ground work stats with the initial contact, this should establish a basis of mutual learning and information sharing as well as rapport.

Focus groups are simply panels of benchmarking partners brought together to discuss areas of mutual interest. Most often the panels are comprised of people who have some previous joint benchmarking activity.

From the above mentioned techniques the author has preferred for the technique of site visit for collection of data since it provides an opportunity for the author to see the processes directly and have a face-to-face interaction with the best-in-class and also create a rapport with the organizations.

7.4 CONDUCT OF SITE VISIT:

Conducting a site visit is not a trivial activity. Extensive preparation is required to ensure the visit is mutually useful and productive. Simply visiting with another organization may be socially pleasing, but it is not apt to yield any significant learning. In addition, world class organizations that are over-whelmed with requests for benchmarking visits will not allow one to occur without extensive assurances that the visit will be productive.

An agenda for the site visit should be prepared and exchanged, and the participants identified. As part of this site visit preparation, a benchmarking protocol should be agreed to so that what information's will be exchanged and what documents will be available. It is this report on which the team will base its recommendations to the management.

The author has conducted a site visit directly with the Managing Director Mr. Sanjay of M/s Nirsan Planations and recorded the following data's for its analysis to be followed in the next stage.

7.5 DATA REQUIREMENTS:

7.5.1 Performance of the tea manufacturing unit:

- **Withering**
    1. Type of leaf
    2. Thickness of spread
    3. Requirement of Motor, Fan Size and delivery capacity

- **Rolling**
  1. Temp at Rotarvane
  2. Humidity
  3. Hygrometer
- **Fermenting**
  1. Temperature of air in fermenting drum
  2. Time requirement for fermentation
- **Drying**
  1. Fuel consumption for per kg of made tea

7.5.2 Data's regarding the Production cost/kg of made tea:

1. Electricity consumption
2. Fuel consumption
3. Labour cost
4. Maintenance & consumable cost
5. Transportation cost
6. Sampling test cost
7. Office salary
8. Jute bag cost
9. Miscellaneous cost

7.5.3 Data's regarding the plant cost

1. Land space
2. Building space requirements

CHAPTER - VIII

ANALYSIS PHASE

CHAPTER 8

ANALYSIS PHASE

8.1 UNDERSTAND THE INTERNAL BUSINESS PROCESS:

Black tea manufacturing technology essentially involves disruption of the cellular integrity of tea shoots, thereby enabling the mixing up of substrates (polyphenols) and the enzymes (polyphenol oxidases). This results in the initiation of a series of biochemical and chemical reactions with the uptake of atmospheric oxygen and formation of oxidized polyphenolic compounds that are characteristic of tea along with volatile flavor compounds that impart characteristic aroma to tea.

Tea manufacturing is normally carried out in two ways, (i) CTC and (ii) orthodox. CTC refers to the Crush Tear & Curl process where the withered green leaves are passed in-between two rollers rotating in opposite directions. There is complete maceration of the leaves and the resulting powdery material referred to as "cut dhool". Enzymatic action is maximum in CTC type of manufacture. In orthodox type of manufactured, the withered leaves are rolled on specially designed orthodox rollers which twists and crushes the leaves thereby rupturing the cells. The maceration is less as against CTC processing. But this process results in teas with good flavor aroma.

8.2 STEPS IN CTC TEA MANUFACTURING:

Following are the various steps followed for manufacturing of CTC tea. They are:

8.2.1 Withering:

The evaporation of moisture in the green leaf is brought about by blowing or moving air over it in the withering trough. The current of air performs a twofold function: Conveying heat to the leaf as well as carrying of water vapor through a bed of green leaves to achieve physical withering. Whenever the hygrometric difference is below 3° C, hot air is mixed in suitable proportion or heat energy is supplied to increase the hygrometric difference with the concomitant rise in the dry bulb temperature of air. But the dry bulb temperature of air after mixing should not exceed 35° C.

8.2.2 Green Leaf Sifting

Extraneous matter such as stones, sand or metal pieces may find their way in the leaves brought into the factory; if such materials are fed into the fine-tuned, continuous machines, the moving parts will be severely damaged. Similarly if the leaves were not fed evenly into these machines, they could become jammed or would not function efficiently. Hence green leaf sifting is essential prior to processing

8.2.3 Reconditioning:

In South India, secondary grades and other residues which are obtained while cleaning the primary grades are ground and recycled to the withered leaf. It is known as reconditioning. The primary objective of this practice is to produce grainy grades as well as tea of high density. It also helps to minimize or eliminate secondary grade teas.

8.2.4 Leaf Conditioning:

The leaf is distorted and shredded as it moves along the cylinder and cut into small pieces by the revolving cutter through which it must pass before it can leave through the apertures of an iris diaphragm. For good results the rotorvane should crush the leaf along with the RC dust at the maximum possible pressure. The 8" rotorvane exerts a much higher pressure on the leaf than does he larger machine, consequently the leaf is much more damaged when passing through it. In the larger rotorvane, a cone end plate is attached at the discharge end to increase the pressure; the leaf is discharged between the gap of the cone and the cylinder; the inner of the cylinder and cone are provided with battens in order to increase the efficiency of crushing.

8.2.5 Rolling:

After preconditioning, the leaf is passed through four or five CTC machines arranged in tandem. The CTC machine essentially consists of two contra-rotating toothed rollers of equal diameters (20.3 cm or 8"). Depending upon the processing capacity required, rollers with different width are used ie. 61 cm (24"), 76.2 cm(30"), 91.4cm(36"). The two rollers rotate at different speeds. A slow speed roller; high speed roller ratio of 1:10 with speeds between 70:700 rpm and 100:1000 rpm have good effect. The slow speed roller acts initially as a conveyor apart from providing a surface for cutting. In order to derive the maximum benefit of a good cut, the drop point should be adjusted behind the crown of the slow speed roller, so that the leaf is conveyed into the cutting area. Otherwise, a portion of the leaf gets thrown over the high speed roller, thereby, losing the benefit of cut.

8.2.6 Fermentation

It is the practice in south Indian CTC factories to pass the CTC, 'dhool' through a large revolving drum for 60 - 90 minutes with conditioned air. Rotation of the fermentation drum facilitates granulation of the tea particles and increases the bulk density which is desirable for South India CTC teas. In drum fermentation, the whole process is dynamic and the leaves are constantly rotating. Every bit of tea that is being fermented is constantly layered and exposed to the fresh air or conditioned air. Rubbing of leaf against leaf takes place and the juices present in the micro cells of leaf are evenly coated on the exterior of the tea leaf. Drum fermentation produces blacker teas as compared to floor fermentation. These teas are usually brisker due to better aeration.

8.2.7 Drying:

The objectives of drying are to:

Arrest fermentation

Remove moisture and produce tea with good keeping qualities

Drying is the most expensive process in the manufacture of tea. The capital investment on the driers is the highest among the different processing machines.

8.2.8 Grading and Sorting:

Sorting is the operation in which tea particles of the bulk are separated into various grades of different sizes and forms confirming to trade requirements. In other words, it basically converts the bulk into finished products. The process of sorting has two objectives (i) to enhance the value (ii) to impart quality.

8.2.9 Packing:

Teas are packed in airtight containers in order to prevent absorption of moisture, which is one of the main causes for loss of flavor during storage. Packing chests are usually constructed of plywood, lined with aluminum foil and paper, and sealed with the same material. Corrugated cardboard boxes lined with aluminum foil and paper sacks lined with plastic are also employed. Jute bags lined with BOPP liners are extensively used for the packing of tea in the Industries. As timber is becoming scarce and consequently expensive, the multi wall paper sack proved to be suitable alternative and is being widely adopted in the tea industry.

8.3 DATA ANALYSIS:

8.3.1 Analysis of the Performance Level of the Tea Manufacturing Unit:

Comparing the performance levels provides an objective basis on which to act and helps to determine how to achieve a performance edge.

The Data's required for comparing the performance of the tea manufacturing unit are as follows

- **Withering**

1. Type of leaf:

The standard of leaf plays a major role in determining the duration of withering. Generally, finer the leaf component, lesser the duration of withering. (Though the moisture level in the fine leaf is higher than the coarse, rate of moisture removal is faster.) Coarse leaf with less moisture content takes longer time for remove the same amount of moisture from the Greenleaf because of the hardy texture. An example on the influence of green leaf on withering is given in the Table 8.1

TABLE: 8.1 EFFECT OF COARSE LEAF ON WITHERING:

Recommendations from UPASI:

Sl.No.	Coarse leaf composition	Weight of green leaf	Weight of withered leaf	Withering percent	Qty. of water removed/100kg of green leaf
1.	50%	200	164	82	18
2.	25%	200	142	71	29
3.	15%	200	130	65	35

* After 15 hrs of withering

Analysis:

At M/s Nirsan Plantations it was found out that the leaf that are used for manufacturing are comprising of 15% coarse leaf composition and it takes a time of 14 Hrs for the removal of 35% of moisture per 100 kg of green leaf

2. Thickness of spread:

Recommendations from UPASI:

Depending on the size of the trough, the withering trough fan is designed to evaporate water to the desired level. In the withering trough the leaf is normally loaded to a depth of 8" maintaining a spread of 2.5 to 3 kg per square foot of trough area. Too thin spread not only leads to wastage of space, but also gives uneven withers. Higher loading at a rate of 4 to 5 kg per square foot, as practiced in many factories, leads to insufficient withering.

Analysis:

It was found that M/s Nirsan Plantations the trough size is (45X6) =270Sq ft which indicates the amount of leaf loaded is 270 X 3Kg = 810Kg. But when on site visit it was found that 850kg of leaf was loaded.

3. Requirement of Motor, Fan Size and delivery capacity:

Recommendations from UPASI:

Nowadays withering troughs installed in the first floor of the factory are used for withering. Green leaf is spread over a wire mesh (No.4/16, gauge) which is fitted on the plenum chamber. The height of the plenum chamber is 2 to 2.5 feet and the leaf is loaded over the mesh to 8" to 9" height of 2.5 to 3 kg/sq.ft of the withering trough. The size of the withering trough is 100' long 6' wide or 75' long and 6' wide.

To achieve proper withering the fan has to deliver 45cfm air for every one square foot of trough area. The Table 8.2 gives the details of Horse power of the motor, fan size and delivery capacity of the fan for different sizes.

TABLE: 8.2 REQUIREMENTS OF MOTOR, FAN SIZE AND DELIVERY CAPACITY

S.No.	Horse Power of the motor	Size of the motor	Qty. of air
1.	2Hp	1000mm(40")	15000cfm
2.	3Hp		21000cfm
3.	5 Hp		22000cfm
4.	3Hp	1200mm(48")	22000cfm
5.	5Hp		29000cfm
6.	7.5Hp		38000cfm

Analysis:

Trough size: 45 X 6 = 270 sq.ft

Air Reqd. for one Sq.Ft = 45 cfm

(Recommended From UPASI

Hence 270 X 45 = 12150 cfm

Required is 2 Hp with 40" (but when undertaking the site visit found out that 3 Hp motor was used and recommended that it could be converted to 2 Hp motor.

- **Rolling:**

The rolling room should be located in a cool part of the factory and away from the direct rays of the sun. In the rolling room, temperature as well as humidity is playing vital role I tea manufacture.

Rotarvane consists of a cylindrical drum having a diameter of 8", 15", or 18" depending on the capacity. The main shaft which rotates inside the drum has vanes at equal intervals. There is a worm arrangement in the main shaft which facilitates forward motion of the leaves into the drum. He leaves are crushed in between the vanes and resisitors and discharged through the diaphragm.

It is important to note that the temperature of the discharge "dhool" in the rotarvane should not exceed 35° c as it reduces enzymic activity which is responsible for biochemical changes.

Generally the reason for higher temperature generation in the rotorvane is over loading and addition of Reconditioning material without ascertaining the withered leaf moisture.

In addition to temperature humidity should be maintained between 90-95%. Generally in south India from February to April the level of humidity is low. So to maintain higher level of humidity in the rolling room a humidifier should be installed. To maintain optimum humidity, the dry and wet bulb reading in the hygrometer should be kept below 3°c. when the difference is more than 3° c, the humidifier should be operated. If the difference is narrow i.e. below 3° c, it is not necessary to operate the humidifier. The Table 8.3 shows the recommendations and analysis at the rolling room.

TABLE: 8.3 TEMPERATURE, HUMIDITY AND HYGROMETER REQUIREMENTS:

S.No.	Particulars	Recommendations	Analysis
1.	Temperature at rotar vane	Not above 35° c	28° c
2.	Humidity	90-95%	85%
3.	Hygrometer reading	3° c	Hygrometer reading at production on 21-02-09 was 10 c initially and by operating three humidifiers brought to 3.5° c in 20 minutes

- **Fermentation:**

Generally the rate of fermentation depends on the concentration of substrates, the leaf, availability of oxygen, activities of enzyme and temperature. Floor fermentation is practiced by putting the rolled dhool on the floor to 2-3" height depending on the climatic condition. Factories that are producing tea or liquor market can adopt drum fermentation followed by floor to have good liquor as well as better appearance and density. To achieve density for 20-30 minutes the rolled dhool should be kept in the drum and the remaining period of fermentation on the floor. The Table 8.4 indicates the factors influencing the fermentation process.

TABLE: 8.4 FACTORS INFLUENCING FERMENTATION:

S.No.	Factors influencing fermentation	Recommended	Analysis
1.	Time of fermentation	60-90Minutes	90 minutes
2.	Temperature	27^0 c	26^0 c
3.	Humidity	95%	85%
4.	Thickness of spreading	2-3" height	3"hieght

- **Drying**

1. Mechanism of drying:

The keeping quality of tea mainly depends on the drying technique and final moisture content in the made tea. The objectives of drying are to terminate the bio chemical changes and to remove moisture to have better keeping quality. Generally the fermented dhool contains 55 to 60 percent moisture and the made tea contains 2.5 to 3% moisture.

Any we solid particle contains two types of moisture i.e. surface moisture and core moisture. The surface moisture easily evaporates from the particles but core moisture takes longer time to evaporate. When the tea particles are subjected to drying, the rate of evaporation is not the same throughout the drying period. Evaporation takes place in two stages i.e. constant rate period and falling rate period. The recommended temperature for the drier is shown in the Table 8.5

TABLE: 8.5 TEMPERATURE REQUIREMENTS FOR DRYING:

S.No.	Particulars	Recommendations	Analysis
1.	Constant rate period	250-260 F	258 F
2.	Falling rate period	150-160 F	160 F

8.3.2. Fuel consumption for per kg of made tea:

Different types of fuel shown in Table 8.6 are used to preheat the ambient air for drying purpose they are indicated with their recommendations for manufacturing per kg of made tea.

TABLE: 8.6 APPROPRIATE FUEL CONSUMPTION FOR DIFFERENT FUELS:

S.No.	Name of the fuel	Quantity per kg of made tea recommended
1.	Wood	1.5-2kg
2.	Briquetted fuel	1kg
3.	Coal	1 kg
4.	Leco	0.8kg
5.	TD	0.250kg
6.	Gas	0.100kg

Analysis at M/s Nirsan Planatations:

TABLE: 8.7 ANALYSIS OF FUEL CONSUMPTION AT THE BENCHMARKED INDUSTRY:

S.No.	Date	Quantity	Leaf quantity	Made tea (kg)	Cost /kg Rs.
1.	11/01/09	854 (B) and 400(W)	8326kg	2081	3.4/kg 2.0/kg
2.	15/01/09	825 (B)and 410(W)	8203	2050.5	
3.	21/02/09	525 (B)and 230(W)	5100	1275	

- Calculation for 11/01/09

  854 X 3.4 = Rs. 2903.60 (for Briquette)

  400 X 2.0 = Rs. 800.00 (For Wood)

  Total = Rs. 3703.60

  Fuel Cost /kg of made tea= 3703.60/2081 = Rs 1.77/ kg of made tea

  Fuel consumed = 1254/2081 = 0.66 kg

CHAPTER - IX

BENHCHARK FINDINGS & COST DETAILS

CHAPTER 9

BENCHMARK FINDINGS & COST DETAILS

9.1 BENCHMARK FINDINGS REGARDING THE PRODUCTION COST/ KG OF MADE TEA:

The Table 9.1 shown below indicates the production of one kg of made tea at M/s Nirsan Plantations.

TABLE: 9.1 PRODUCTION COST ANALYSIS:

S.No	Qty. of green leaf (kg)	Qty. of made tea (kg)	Cost Particulars	Consumption	Rate/ Unit (Rs)	Total cost	Cost/kg of made tea in (Rs)
1.	8326	2081	Electricity	1040units	4.75	4940.00	2.37
2.			Fuel	1254	2.95	3699.00	1.77
3.			Transporta-tion	50Kms	7.00	350.00	0.17
4.			Labour	10Nos	111/ labour	1110.00	0.53
5.			Consumables & Maint.	Rs 25,000 / month.	6250/ week	2083.00	1.00
6.			Jute bags	70 Bags	38.00	2660.00	1.27
7.			Office Salary	5 Nos	20000/ month	666.00	0.32
8.			Sampling Testing	5kg	70.00	350.00	0.17
9.			Misc.			500.00	0.24
Total							7.84

The above table shows the calculation of the production cost based on the site visit undertaken during 11/01/09. The cost indicated is excluding the cost of the raw material i.e. the green leaf bought from the small growers.

The cost of raw material fluctuates each week based on the auction price of the made tea from the manufacturing unit. It has been also found out that for manufacturing of one kg of made tea it requires four kg of green leaf (Recommended found by UPASI)

Analysis at Nirsan Plantations for calculation of raw material cost:

For 2081kgs of made tea from 8326 kg of green tea leaf (4kg of leaf makes 1 kg of made tea)

TABLE: 9.2 RAW MATERIAL COST ANALYSIS:

S.No.	Particulars	Amount(Rs)
1.	Tea sold at auction	70.00
2.	Manufacturing cost	8.00
3.	Raw material cost/4kg of leaf	70.00-8.00=62.00
4.	Raw material cost /kg of leaf	62.00/4.00=15.50 (including Profit)

As seen in the Table 9.2 the cost of the raw material for M/s Nirsan Plantations is Rs 15.50/kg of leaf purchased from the small growers in which the manufacturing unit has calculates its profit and the remaining is dispersed to the small growers based on the competition accruing in the market for purchase of green leaf.

9.2 BENCHMARK FINDINGS REGARDING THE PLANT COST:

To calculate the plant cost of M/s Nirsan Plantations the following data like the land space requirements, building space requirements along with the space utilized for each section of the manufacturing process are required:

These data's are compared with another industry M/s Darmona one of the leading tea manufacturing units of CTC teas in Nigiris whose layout is of a normal conventional tea manufacturing unit.

Thus to compare the plant cost of the benchmarked industry (M/s Nirsan Plantations) another leading industry named M/s Darmona Tea Industries is being considered for comparison for which the Table 9.3 shows the required data.

TABLE: 9.3 REQUIREMENTS FOR PLANT COST ANALYSIS:

S.No.	Cost Particualrs	Industry- I (Nirsan Plantations) In feet	Total area (Sq. ft)	Industry- II (Darmona) In feet	Total Area (Sq. ft.)
1.	Land space	213X42	8946	100X80	8000
2.	Building Space	213X42	8946	(100X80)+ (100X80)	16000
3.	Withering Space	64X42	2688	100X80	8000
4.	Rollong, Cuttiong & Fermentation	64X42	2688	80X40+ 20X80	4800
5.	Drying & sorting	85X42	3570	80X40	3200

The data's shown in the above table clearly indicates the benchmark findings between two tea manufacturing units where the building space required for M/s Nirsan Planations requires only 8946 sq.ft when compared to the normal conventional tea manufacturing unit which requires 16,000 sq.ft.

It also indicates that the space required by M/s. Nirsan Plantations for the various process to be undertaken in the manufacturing of tea less when compared to the Normal Conventional unit i.e. M/s Darmona tea industries. Based on this the plant cost is calculated and shown in the Table: 9.4

TABLE: 9.4 BENCHMARK FINDINGS AND PLANT COST DETAILS:

S.No.	Particulars	Section	Qty Reqd. for Industry I	Rate/ qty.	Total	Qty. Reqd. for industry II	Rate/ Qty	Total
1.	I section girders	Withering	8 Nos.	3200	25,600	12Nos	5,000	60000
2.	Floor	Withering	2688Sq.ft (Cement)	50/sq.ft	134400	8000 (Wooden)	200/ Sq.ft	1600000
3.	I section girders	Rolling, Cutting &Fermentation	8Nos	3200	25600	15N0s	5,000	75,000
4.	Floor	Rolling, Cutting &Fermentation	2688Sq.ft (Cement)	50/sq.ft	134400	4800	50/ Sq.ft	2,40,000
5.	I section girders	Drying & Sorting	7Nos	3200/Sq.ft	22400			
6.	Floor	Drying & Sorting	3570Sq.Ft	50/Sq.Ft	178500	3200	50 Sq.Ft	1,60,000
				Total	**5,20,900**			**21,35,000**

9.3 COMMUNICATION OF THE FINDINGS:

Collecting and analyzing the best practices data and projecting the operational implications are important and necessary, but are not enough to attain improved organizational performance. The benchmarking team has the responsibility to secure management's approval for the recommendations.

Hence the team's task is to communicate its findings in such a way as to obtain acceptance. To accomplish this, the team must ensure that management understands the findings, thinks the team is credible and accepts its recommendations. This could be achieved as follows:

9.4 DECIDING WHO NEEDS TO KNOW:

There are both formal and informal decision makers in every organization and there are customers, suppliers, staff and associates with whom the team works. From among these constituencies the team must decide who needs to know about its findings.

Here in this project wok undertaken the author recognizes that the UPASI and all other tea manufacturing units who have plan to construct a new manufacturing unit in Nilgiris has to be known about this findings.

9.5 PRESENTING THE RECOMMENDATIONS:

The presentation of best practices should be made with the complete benchmarking team in attendance. The team's recommendations should always be accepted. That is not to say that every benchmarking team's recommendations should be automatically accepted without challenge: however questions should be raised and answered and issues should be identified and resolved well before the final presentation. The author would like to present the recommendations to the owners of all tea manufacturing units and then finally present the findings to UPASI for further steps to be taken.

CHAPTER - X

PARETO ANALYSIS

CHAPTER 10

PARETO ANALYSIS

10.1 INTRODUCTION OF PARETO DIAGRAM:

- A Pareto diagram is a diagnostic tool commonly used for sparating the vital few causes that account for a dominant share of loss.
- This tool is named after Wilfredo Pareto, the Italian economist, who devised this tool first
- The Pareto diagram is based on the Pareto principle, which states that a few of the defects accounts for most of the effects.
- Pareto analysis is also called as 80/20 rule. It means only 20% of problems (defects) account for 80% of the effects.

10.2 WHEN DO WE USE IT?

Pareto analysis can be used in a wide range of situations where one needs to prioritize problems based on its relative importance

It can be used as risk assessment technique from activity level to system level.

10.3 HOW CAN WE CONSTRUCT IT?

A pareto diagram can be constructed using the following steps:

1. Obtain data
2. Arrange the data in descending order starting from the largest category to smallest
3. Calculate the total and percentage of the total that each category represents.
4. Compute the cumulative percentage
5. Draw a bar chart with two verticals axes. Along the left vertical axis, mark the measured values for each cause, starting from zero till the total number of causes. The right vertical axis should have the same height and should go from 0 to 100%. This axis displays the cumulative percentages.

6. Draw a bar above each item whose height represents the number for that cause.
7. Plot a cumulative percentage line

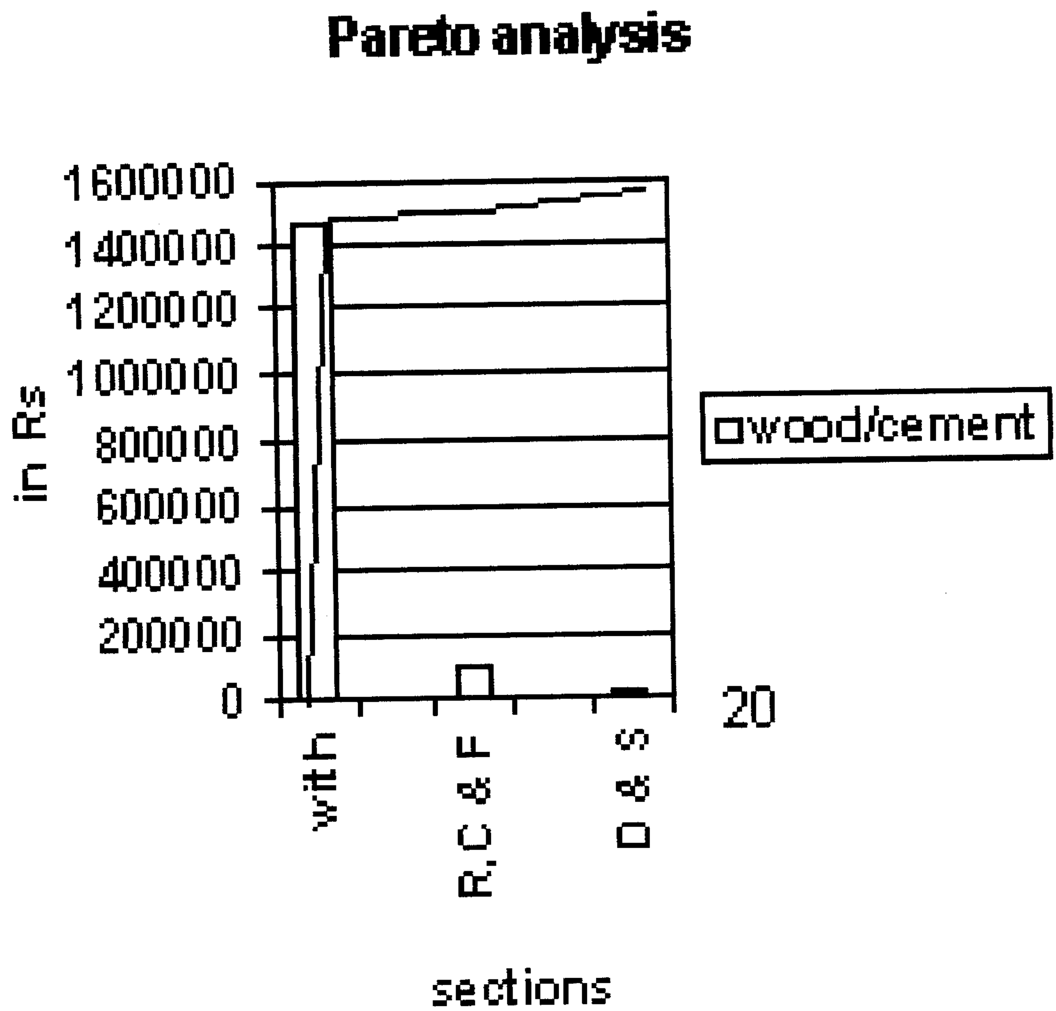

FIG 10.1 PARETO ANALYSIS FOR IDENTIFICATION OF THE VITAL FEW FROM THE BENCHMARK FINDINGS

The Pareto's diagram shows that the wooden structure used in the withering section is found to be the most vital. The other conventional manufacturing units are now able to realize that the non existence of the wooden structure would lead to the decrease of cost of the Tea Manufacturing Unit. They could also identify that the benchmarked tea manufacturing unit i.e. M/s Nirsan plantations was able construct a low cost tea manufacturing unit and could also satisfy the various recommendations provided by UPASI. Thus the Pareto's analysis was able to identify from the work that was undertaken by the author in helping out to identify the vital few i.e. the Wood floor used in the tea manufacturing unit

CHAPTER - XI

CONCLUSIONS & RECOMMENDATIONS

CHAPTER 11

CONCLUSION & RECOMMENDATIONS

While establishing a tea manufacturing unit, traditional methods may not be the most suitable for cost effective production. Entrepreneurs must resort to the newly identified technologies and methodologies in the construction of the tea factory. The major change recommended is the use of cement flooring in the withering section in lieu of the conventional wooden flooring. Other construction strategies include minimal earth work and single floor architecture. The findings lead to the fact that running costs of production are also reduced due to relatively lower consumption of fuel when compared to older methods. This is a result of enabling greater amount of fresh air circulation to the various segments of production. Supervising the functioning of the industry and its labour is much more convenient given the fact that the supervisor(s) are required to position themselves at one point of the floor to view all units. Climbing between floors and viewing only a section of the production are avoided in the new recommendations.

- Use single floor of shop floor construction
- Avoid wooden flooring in withering section, use cement instead.
- Have better aeration for the mechanical units.

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