THE 5S's CAMPAIGN FOR TOTAL QUALITY ENVIRONMENT-A CASE STUDY

A DISSERTATION

Submitted in partial fulfilment of the requirements for the award of the degree of

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MECHANICAL ENGINEERING

(With Specialization in Production and Industrial System Engineering)

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CANDIDATE'S DECLARATION

I hereby declare that the work which is being presented in the dissertation entitled "THE 5S's CAMPAIGN FOR TOTAL QUALITY ENVIRONMENT-A CASE STUDY", in partial fulfillment of the requirement for the award of the degree of Master of Engineering in Production and Industrial System Engineering, submitted in the Department of Mechanical and Industrial Engineering, University of Roorkee, Roorkee, is an authentic record of my work carried out over a period from September 2000 to January 2001, under the supervision of Dr. M. K. Khare, Professor, MIED, University of Roorkee, and Dr. N. B. Mehta, Manager, Trg./TQM, AML, Morbi.

The matter embodied in this dissertation has not been submitted for the award of any other degree.

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ABSRACT

Today quality is seen as an approach to improve the effectiveness and flexibility of an organization as a whole. Teamwork, participation and communication are key words in the process quality. Today neck to neck competition among industries and Govt. policy for globalization forces many industries to think how to stand in national and inter national market via. Providing the best qualitative product at the lowest possible cost. So many industries in India try to achieve ISO:9000 certificate and launch TQM program. Every company's pursuit of quality improvement must begin with the basics, namely the 5S's. The name stands for fine Japanese words: SEIRI (Sorting), SEITON (Systematize), SEISON (Sweeping), SEIKETSU (Standardization), SHITSUKE (Self-discipline) i.e organisze the work place, keeping it neat and clean, and maintaining the standardized conditions and dicipline needed to do the excellent job.

A textile unit was selected to apply these concepts. The existing processes were studied by keeping in mind the 5S's concept. The photographs were taken to analyze each and every section. This helped in designing the 5S's audit form. Based on audit report the improvements in needed sections were carried out.

Application of the 5S's concept resulted into less down time, more convenient work practices, participative culture which ultimately lead to higher productivity with almost zero waste. The concept can be conveniently applicable to different areas like hotels, hospitals, educational institutes etc.

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LIST OF ABBREVIATION

AML	Arunoday Mills Limited.
TQM	Total Quality Management
B/R	Blow Room
D/F	Drawing Frame
R/F	Ring Frame
SITRA	South Indian Textile Research Association
ATIRA	Ahmedabad Textile Industries Research Association

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Chapter 1

INTRODUCTION

1.1 ABOUT THE COMPANY

The Arunoday Mills Ltd.(AML), is a limited company, established in 1962 and production of hosiery yarn was started in 1965.It is famous for producing highly qualitative yarn range from 12 to 60 count. It has the latest technology, so company is famous for its qualitative product at national and international level. About 50% production is being exported to Australia, Taiwan, Bangladesh, Mauritius etc. The AML won quality export award so many times. At present company is producing about 12000 kg of hosiery yarn per day.

To stay in market against the neck to neck competition, the company took loan of 33 crores for modernization of the plant from technology renovation fund of Govt. of India for the textile industries. The company has spent Rs. 1.25 crores for CPP(Captive Power Plant) and about one crores for its humidification plant to produce the best quality yarn at the lowest possible cost by improving the overall productivity.

1.2 NEED OF THE PROJECT

AML has been working on to set up total quality environment within the plant. The top level management has been working on to set up the continuous improvement culture where everyone at all levels and in all functions is committed to integrate all effort in AML towards quality improvement. This work

is the outcome of the need felt to remain competitive in the national and international market. AML faces problems to stay in the market against the new EOU's in India., even though it has the latest technology to manufacture hosiery yarn for knitting industries. AML wishes to achieve its mission by providing maximum satisfaction to its all customers through the 5S's campaign to implement TQM within plant in future.

1.3 OBJECTIVE OF THE PROJECT

To establish TOTAL QUALITY ENVIRONMENT in AML by implementing the 5s's campaign to provide strong base for TQM implementation program.

Chapter 2

LITERATURE SURVEY: THE 5S'S - A FIRST STEP TOWARDS TOTAL QUALITY ENVIRONMENT

2.1 INTRODUCTION TO THE 5S's

Business is very much a team sport. Some people are managers, some are players, and some are support- but they all have to do their jobs if the team expects to win. On the best teams, each person knows what his job is and does it. The really good team is more than the sum of its players. Many companies are working so hard to promote total participation quality activities that involve everyone in a team effort. But, as the paucity of results demonstrates, this is not an easy thing to do. This is where the 5S's movement comes in. These 5S's stands for five Japanese words:

- SEIRI (SORTING)
- SEITON (SYSTAMATISE)
- SEISON (SWEEPING)
- SEIKETSU (STANDARDISATION)
- SHITSUKE (SELF-DISCIPLINE).

Not only is the 5S's movement indispensable to involve everyone, it is also an activity in which major progress is readily attainable. The 5S's are the first indicator, of how well things are being implemented, things are going well. It is

difficult for an outsider to see exactly how things are on the shop- floor, but the 5S's will give us an accurate picture every time. The 5S's give much emphasis on the basics. For examples, if you do not have enough oil in the machinery, or if what is there is dirty, you will notice that things stick. You will notice that the equipment starts to rattle and some of the attachments may even fall off, because a bolt was not tightened right a long time ago. And you will notice that you end up with a higher defect rate and lax management. These things tend to snowball unless they are caught early on.

The 5S's can be most effective in improving the management of any factory, there are also a number of other activities being promoted to forge better work teams and to improve working conditions. The company that can not even implement the basics of the 5S's will not be able to do any of the other things that management wants it to do. The 5S's are the embodiment of total participation joy and total participation know-how. Thus, it has been said that the 5S's are a barometer telling you how well a company is managed and a lodestone telling you how total worker participation is. The 5S's operate on "actions speak louder than words" principle. The most effective way to get things done is not to expound on how things ought to be, but to take a hard look at the realities and then to make the changes on the actual factory floor.

2.2 THE MEANING OF THE 5S's

The 5S's are intended to eliminate waste. Just as every word has its broader interpretation, so do the 5S's activities have their broader and

somewhat vague sense. Thus, it is important here to clarify what the 5S's are. The 5S's are explained here with its meaning.

1 S: SEIRI (Sorting/ Organization)

It is nothing but to identify necessary & unnecessary things in the department or sections. Here, much attention to be given on stratification management, and dealing with the causes.

Stratification by importance and deciding where to store things

Stratification management is the art of deciding how important something is and then moving both to cut down on non-essential inventory and at the same time, ensuring that the things that are essential are close at hand for maximum efficiency. Two things are important here: frequency of usage and things at proper places (see table-1)

TABLE 1: The crux of the organization

USAGE	FREQUENCYOF USAGE	STRATIFICATION
LOW	• Things you have not used in the past year • Things you have only used once in the last 6-12 months.	• Throw them out. • Store at a distance.
AVERAGE	• Things you have only used once in the last 2-6 months. • Things used more than once	• Store in central place in the work place.

	a month.	
HIGH	• Things used once a week. • Things used every day. • Things used hourly	Store near the work site or carry by the person.

It is just as important to have the things you do not need far from hand as it is to have the things you do need close at hand (See table-2). It is just as important to be able to through out a broken or defective part as it is to be able to fix it.

Table-2 Storing the things you need

Item	Storage
• Things you use especially often	• Keep them with-in easy reach
• Things in constant use	• Keep them easy to get out, easy to put away, and easy to understand where they should be
• Things which you use sometimes	• Be sure to put them back where they belong, which means a board with pictures, colour-coding, and more
• Files	• Number and colour-code them for both shelf and order

Once stratification and classifications are done, you are in a position to decide what you want to do with things that you do not use more than once a year, if that. Save them or throw them away? And if you decide to save them, how much of them do you need to save? And when you do this kind of major

house cleaning, it is not at all uncommon for you to find you have tons of junk on hand—tons of stuff you do not need. Do the house cleaning again, and you will find you still have tons of things you do not need. This is a never-ending process.

IDENTIFYING UNNECESSARIES

There are a number of places where things no body is using and no body needs seem to collect.

- Shelves and lockers: You will find a lot of things you do not need on the top or bottom shelves. Somehow, the backs of shelves and lockers seem to collect things that nobody ever uses, the surplus—and the broken.
- Bits, tools, jigs, and measurement devises: Very often you will find that you have larger stocks than you need of these things or that you even have the broken ones still lying about because no one even though to throw them out.
- Beside pillars and under the stairs: Because these are shadowy places, they tend to collect junk and not get cleaned out. Clean them out.
- Machinery, Stands, Racks and Carts: You will find that you have extra machinery, bearings, heads, stands, racks, and all the rest. There will be extra extension cords, tubing, pipings, lighting equipments, switches, and all of the other things that you thought you might need some day,

but have not needed for the last 5 years, and could not find even if you did need them. Get rid of them.

- Floors, pits, and partitions: Things fall or are placed on the floor for all kinds of reasons, and then they stay there. There are materials, work-in-progress, defective parts, fixtures, and almost everything else down there.
- Passages and corners: Like dust, things you do not need seem to gather in the corner. Beside the passage ways, between the passageways and the walls, and especially a little-use passageways are also convenient places for people to put things and forget them.
- Outside: Look near the fence. Look around the outside of buildings, look at the drainage pipes. Look at the eaves and along the paths. How much junk is there? And you can sure that anything out here is not going to be needed tomorrow.

The way to organize things according to usage. Typical activities (SEIRI):

- Throw out the things you do not need.
- House cleaning.
- Inspect covers and trough to prevent leakage and scatter .
- Clean the ground.
- Organize the warehouse.
- Eliminate grime and burrs.
- Deal with the causes of dirt and leaks.

The basic principle of sorting is ' ONE IS BEST" e.g. one set of tools/stationary, one page forms, one shift processing ,one notice board etc.

2S: SEITON (SYSTEMATISING / NEATNESS)

Neatness is a study of efficiency. It is nothing but to locate the things at specific places so that it can be available for the use at any time without delay. Put the right item at the right place within the right time limit , is the basic principle of the neatness. It will reduce search time or to put or retrieve any item at appropriate place.

PROMOTING NEATNESS:

The basic procedure of neatness is (a) Analyze the status quo, (b) Decide where things belong, (c) Decide how thing should be put away, and (d) Get everybody to follow the put away rules.

a. Analyze the status quo

Just making and arbitrary decision on where things go is not going to make you any faster. Instead, you have to analyze why getting things out and putting them away takes so long. You have to devise a system that everyone can understand. Otherwise, all your effort will be for naught.

Start by analyzing how people get things out and put them away, and why it takes so long. This is specially important in work places that use a lot of

b. Decide where things belong

In doing the 5S's activity, it is imperative that everything has both a name and location. These names should be simple and easy to understand. They should also be reinforced, e.g., by having them written on the tool boards, and even on the tools themselves.

In assigning storage space, designate not only the location, but also even the shelf. Decide where everything should be, and make sure that it is where it is. This is crucial.

c. Decide how things should be put away

This entire process is intended to make the work go smoother, because when every thing has a place and everything is in its place, there is less confusion and the work does go smoother. It helps to have diagrams and lights. In designing storage facilities, heavy things should be on the bottom, or on dollies so that they are easy to get at. Other things might be hung from hooks, and the things that are used most should be the easiest to get to.

d. Get everybody to follow the put-away rules

When you look for something where it is supposed to be, and it is not there, there are three possibilities: You are out of stock, somebody took it and has not put it back yet, or it is lost. But you do not know which possibility is true. To

different tools and materials, because time spent getting things out and some thing out or puts something away 200 times a day and each time takes 30 seconds, you are talking about 100 minutes – more than an hour and a half – a day. If the average time could be reduced to 10 seconds, you could save more than an hour. So that the organization and neatness is very helpful to standardize the workflow and the work process (see table-3).

Table – 3: Sample Analysis of Retrieval Times

Sr. No.	Work	Time	Problems
1	Ask name		1. Do not know what things are called. 2. Find out.
2	Retrieval		1. Not sure where things are kept. 2. Storage site far away. 3. Storage sites scattered all around. 4. Repeat trips.
3	Search		1. Hard to find because many things are there. 2. Not labeled. 3. Not there, but not clear whether it is out or some body is using it. 4. Unclear if space exists (No ledger and nowhere to ask) 5. One brought was defective.
4	Retrieve		1. Hard to get out. 2. Too big to carry. 3. Need to set or assembly. 4. Too heavy to carry.
5	Bring		1. No away to transport.

Notes:

1. Most of the time is spent in locating the item, and this is the most urgent issue needing improvement.
2. Everybody should know what everything is called.
3. Things need to be stored more efficiently.

solve all problems related to this, everybody must obey the put-away rules designed by the management.

ITEMS TO REMEMBER TO PUT THINGS AWAY

Whenever you put something down, you should remember the following items:

- Outlining and placement marks
- Stands, shelves, and dollies
- Machine tools and other tools
- Blades and dies
- Materials and the work-in-progress
- Oils
- Instrumentation and measurement devices
- Large items
- Small items and consumables
- Labeling and display supplies

3S: SEISON (SWEEPING)

Elimination of dust, or any unwanted things and maintain cleanliness in each section of any organization is the basic need of sweeping .It has said that there is no job that does not involve cleaning. Cleaning should be done by every one in the organization , from the managing director to the cleaner.

The mottoes of cleaning are: The three-step approach

With the increasing sophistication of modern industrial products, dust, grime, foreign substances, burrs, and other problems are more and more likely

to cause defects, breakdowns, and even accidents. Cleaning is the answer. Very broadly speaking, there are three steps to proper cleaning. First is the macro level activity of cleaning of everything and finding ways to deal with the over-all causes pertinent to the whole picture. Second is the individual level dealing with specific work places and even specific pieces of machinery. And third is the micro level, where specific parts and tools are cleaned and the causes of grime are ferreted out and corrected.

Work place and equipment cleaning

The following three steps that should be followed for this:

1. Divide the area in to zones, and allocate responsibility for each zone.
2. Decide what has to be cleaned, decide the order, and then do it. As the same time, it is important that everyone fully understand the importance of cleaning so that you can analyze the sources of the problems.
3. Revise the way the cleaning is done and the tools used so that those hard – to-clean places will be easy to clean.

Decide on the rules to be observed to keep things looking the way you want them to.

The mottos of cleaning are:

- I will not get things dirty.
- I will not spill.
- I will not scatter things around.
- I will rewrite things that have got erased.
- I will take up things that have come down.

Recently people have taken to quantifying the degree of cleanliness in the realization that this is the crucial to safety and quality. So the drive in many companies now is for ZERO GRIME, ZERO DUST and ZERO RUST.

4S: SEIKETSU(STANDARDIZATION)

Standardization means continuously and repeatedly maintaining your organization or sorting, neatness and cleanliness.

Highlights of Visual Management

The following briefly summarizes the highlights of visual management and makes them easier to visualize:

What is being managed? Where should people look?	What are important points?
What constitutes an abnormality?	What are the standards?
What are the tools used for inspection?	Is the inspection easy to do? (Including ease of evaluation)
What should be done?	What are the emergency procedures? What are long-term remedies?

Tools and Methods of Visual Control

It goes without saying that you need to use visual aids in visual control. To give some idea of the kinds of visual control displays that are needed, there are, for examples:

- Display to help people avoid making operating errors
- Danger alerts
- Indications of where things should be put.
- Equipment designation
- Cautions and operating reminders
- Preventive maintenance displays
- Instructions

The main points in creating such visual control displays are listed below:

1. Make them easy to see from a distance.
2. Put the displays on the things they are for.
3. Make them so that anyone can tell what is right and what is wrong.
4. Make them so that anybody can use them easily and conveniently.
5. Make them so that anybody can follow them and make the necessary corrections easily.
6. Make them so that using them makes the work place brighter and more orderly.

If you will think of these things when you create and revise the standards and the tools that people need to identify abnormalities, you will find that the work goes smoother and the output is better.

The emphasis here is on visual management and 5s standardization. It include the management standards for maintaining the 5s's :

*OK marks	*Safety label.
*Safety label	*Position mark
*Voltage label	*Wire management
*Oil level label	*Transparency

5S: SHITSUKE(SELF-DISCIPLINE)

Discipline means instilling the ability of doing things the way they are supposed to be done. The emphasis here is on creating a work place with good habits. Self discipline is important because it reaches beyond discipline. If a person is ' disciplined' to do something at one time there is a chance that he may not be disciplined next time. However, self-discipline guarantees the continuity of a daily routine.

The 5S's cannot succeed without discipline. If you want to do your job efficiently and error-free, you have to work on this everyday. You have to pay attention to the little things. You have to plug-away patiently, developing the right habits.

If you follow the following simple points, it will be possible to manage and maintain the most sophisticated system and to keep it running smoothly.

- Standardize (systematized) behavior if you want good results
- Correct communications and training makes for assured quality.
- Arrange it so that everybody takes part and everybody does something, and then work on implementation.
- Arrange things so that everybody feels responsible for what he/she does. People should verbalize their responsibilities each day, and they should act on them. And when they make a mistake, it is important that management point this out and make sure it is corrected.

- This is how you institutionalize good practices, and this is how you create a disciplined work place.
- Everybody working together makes for a stronger team and a stronger company.

This include the following activities:

- Develop habit formation and a disciplined workplace.
- One-minute 5S's practice daily.
- Individual responsibility.
- All together cleaning.
- Pick up: A game in which teams compete to see who can find and pick-up the most trash.
- Practicing good habits.

2.3 The 5S's as management philosophy

The times demand a new concept of the 5S's. People have taken to referring to the factory as the "showroom". On the employment side, it is becoming increasingly difficult for manufacturing companies that have dirty plants to attract he workers they need. Companies that have clean factories are organizing factory tours for their employee's families, and even for their customers. Management of the most of the companies realizing that the 5S's are central to its thinking and its management philosophy. It is coming to see that the 5S's are a key management technique.

In Japan, top corporate executives have cited the 5S's as their number 1 management priority. More and more Euro-American companies have tried to adopt Japanese management in recent years. And they are realizing that the 5S's are essential part of this management.

2.4 PURPOSES OF THE 5S's

Because the 5S's seem so obviously important, many people make the mistake of concentrating on the individual terms as though these were some kind of good-luck charm. But it must be remembered that the 5S's are actually a means to achieving specific ends, and the 5S's to be implemented with this objectives in mind.

Safety and the 5S's

For decades now, the two words organization and neatness have featured prominently on banners and news- letters even at small companies, because safety is so important, and because organization and neatness are so important to safety, it is necessary to repeat these two terms time-after-time to make sure that the message is received by every one. But what this really means is that you have to pay attention to the little things. Are you wearing your hard hat and safety shoes? Are you being careful when you transport things? Are the paths clear? That is why people have emphasized the importance of an orderly workplace.

In addition to this things, the 5S's are also important to personal safety and health for everyone in preventing fires and slippage accidents due to oil-leaks, in preventing pollution from fillings and fumes, and in preventing the other things that are so dangerous to human health and safety. The work place that is conscientious about the 5S's doesn't have to keep harping on safety, and it has a fewer industrial accidents than the factory that only emphasizes fool-proofing equipments and procedures.

EFFICIENCY AND THE 5S's

The 5S's are actually what you do to ensure that you will be able to do your job at peak efficiency. The famous chef, the skilled carpenter, and the great painter—they all take care of their tools. There are no rusted knives, no saws with teeth missing, and no matted brushes. They know that the time taken to maintain their tools is not the time wasted-that save for more time because their tools are in good conditions.

Some companies have instituted 3- minute 5S's periods. Everybody knows what he or she is supposed to do, and they know that they have only 3 minutes to do it. And they are all working on the 5S's at the same time. You will be surprised at how much can be accomplished if your people have had practice in the 5S's and they know what they are supposed to do. It is only 3 minutes, but it means vastly better efficiency in the long run.

BREAKDOWNS AND THE 5S'S

There is a common " Monday Morning Syndrome" at some manufacturing plants. This is where sludge-clogged oil drains overflow on Monday morning, where the machinery seems to stick on Monday morning, and where hydraulic and pneumatic equipment. Pressure levels are low on

Monday morning. All of these things happen because the company doesn't practice the 5S's during the week.

People have the same problem. When they are doing something everyday, they get into routine. Practicing the 5S's- making sure that you have a neat work place, that things are not in way, but where you can get them when you need them, and creating "a good place to work" will save money in the long run. It will improve your quality, raise efficiency, enhance safety, and cure the Monday-morning syndrome of defective products and injured workers.

TQM AND THE 5S'S

TQM is the art of managing the whole (total) to achieve excellence. TQM means doing things right the first time, every time, with no allowable error. The 5S's concept can provide the strong base to these things. TQM is process oriented but the 5S's are the result oriented. One cannot construct the excellent building of TQM without the strong foundation of the 5S's. During the plantation of TQM-TREE we want the flowers like- product and process system excellent, human resource excellent, customer oriented system, continuous improvement culture and management leadership (see Fig.-1). But it needs the strong container having the clay. It needs the water flowing through the tube of enthusiasm and the clouds of total quality environment. The 5S's are very easy to understand and implement as compared to TQM implementation program. So that, many companies realize that the 5S's is the basics for the TQM program.

WORK-STUDY AND THE 5S's

Work-study is the best technique to improve the productivity. But it does not improve the quality of product. The only single person, i.e. work-study engineer, implements work-study while the 5S's give much emphasis on group efforts, and participative culture. Work study needs special knowledge and skill, and it can apply in some specific areas, while the 5S's are very easy to understand, and can apply to the whole organization at a time. In most of the companies, the implementation of the Work study principles are generally opposed by the trade union, while the 5S's campaign is always welcome by the trade union.

2.5 WHY the 5S's?

The 5s's movement give much emphasis (12) on to organize the workplace, to keep it neat, to maintain standardized condition, and to maintain the discipline that is needed to do a good job .As there is a direct linkage (8) between quality and productivity, the 5S's is the unique solution to increase quality and productivity. At IFFCO, Kandla (Gujarat) in 1996 they succeeded to increase the overall productivity by 12%. The management could save Rs.25 lacks by the 5S's program. Powell T.C. (1995) pointed out that to stand in national and international market TQM can help to cut down the unnecessary costs to increase the productivity via employee's team spirit and moral. This is the basic thing behind the 5S's campaign. Zero waste and zero grime can be achieved through the 5S's(11), which give tremendous cost reduction in terms of waste.

The most of guru's of Japan (3) strongly believed that without giving much emphasis on the 5Ss the possibility of success of TQM program will be very low. Ahire S.L. (1996) noted down that quality management programs (1) in both large and small-scale industries could not give constant results after one to two years. This is the proof that any quality management program must have concrete foundation like the 5S's. The 5S's(5) campaign give much emphasis on group reorganization, as 48% of Indian executives (9) believed that it is the main technique used to motivate employees to improve quality. The most of Indian industries failed (10) to launch TQM program because they could not know the root of the problems.

The following fruitful results one can achieve through the 5S's campaign in any organization:

- Preventing accidents.
- Reducing downtime.
- Enhancing operational control and processes.
- Convenient work practices.
- Higher productivity.
- To achieve zero waste program.

2.6 PROBLEM IDENTIFICATION

When the business atmosphere was very tough for AML in 1994, the top-level management tried to set up quality environment within the plant. Higher investment was made in technology management to produce the world-

class hosiery yarn at the lowest possible cost. In 1996, the management of AML launched TQM program without giving strong platform i.e. the 5S's to it. Although company could achieve some good results in 1996 as compared to 1995 (See Annexure-1). Suggestion schemes and quality circles were succeeded and good atmosphere of trust cycle was set up. Due to major changes in top-level management and lack of commitment the atmosphere of trust cycle was destroyed from 1997.

At present management of AML faces many problems like:

- Lack of interest in quality circles
- Resignation by most of skilled workers due to job unsatisfaction.
- Higher accident rate in each sections.
- More defectives in each sections.
- No suggestions from workers to improve the work processes etc

So, after observing the symptoms of the problems, it has found that the unique solution is to launch the 5S's campaign in AML, It will be helpful to set up and maintain standard operating procedures for creating a healthier climate in AML. The rework of the scrapped TQM program can be done after success of the 5S's campaign in terms of cost reduction through productivity improvement and zero waste target through the 5S's.

2.7 METHODOLOGY

Following methodology was followed while launching the 5S's campaign in AML:

- Define the project objective.
- Birds-eye-view of the existing processes in each sections.
- Map present sections as per the 5S's concept.
- Analysis of each section through photographs.
- Design the 5S's audit form and the 5S's auditing.
- Development of the excellent 5S's sections.
- The 5S's awareness program.
- Conclusion and future scope.

Chapter 3

THE 5S's CAMPAIGN IN AML

3.1 GENERAL PRODUCTION PROCESSES

The general production processes of each sections in spinning mill i.e. the journey from raw material to the finished product (see Figure-2) is explained below.

1. MIXING AND BLOW ROOM

Cotton from the same district or even from the same field varies considerably in quality through a difference in the characteristics of the soil in which the plant grows. Also the quality of the staple depends on the amount of exposure to sunlight, natural moisture and certain other factors over which there is no control .So also there exists a range of variation as regards staple length and colour of cotton etc.

The main objects of mixing are:

A. To neutralize the natural variations in the cotton by mixing different varieties

B. To allow the cotton to assume its normal conditions and absorb natural moisture, which gives the fiber better strength.

C. To obtain a certain quality of yarn at as economical cost as is possible by mixing lower grade cotton with a slightly higher grade cotton and vice versa.

Blow room is the first process from where the manufacturing procedures of yarn begin. Cotton reaches the mills in a compressed bale form. It is the function of the blow room machinery to open, clean it and convert into sheets known as 'laps'. Blow room line is the one, which is able to form a regular and compactly build lap of the required weight, with the maximum cleaning efficiency. Cleaning efficiency, waste losses, NEP generation, lap rejection% are the main factors to be assessed in a blow room. To eliminate .lap forming unit in a blow room, trauma chute line has been installed in AML. Its production is 58 laps of 20.5 kg per 8 hrs (100% efficiency). The following TABLE-A shows the some points to be remembered during mixing and its possible outcomes.

TABLE-A Points to be remembered during mixing process

Sl. No.	DO NOT MIX	RESULT
1.	Harsh and soft cotton	Great unevenness & irregularity of yarn
2.	Long and short staples	Increase waste & produce uneven yarn
3.	Dirty and clean cotton	Partial clean, clean fibre over-beaten & damaged resulting in weak yarn
4.	Strong and weak cotton	Soft places in yarn, lack of uniformity of yarn

2. CARDING:

Carding is one of the most critical and delicate processing stage and is of eminent if not decisive importance for the success or failure of spinning mills.

The carding machine produces a sliver, which meets the highest expectations in respect of cleanliness and regularity. Neps elimination is about 93% in this section.

OBJECTIVES OF CARDING:

A. Opening of the tufts into individual fibers.

B. Elimination of impurities, short fibers and neps.

C. Distribution of the fibers to form on even web.

D. To coil the sliver into the can.

What carding should not do?

A. Break the spinnable fibers.

B. Should not increase the neps..

C. Should not drop spinnable fibers under the licker in cylinder.

MMC, Mark IV and v CROSROL, DK 740 TRUMAC and Trutzschler , DK 760 machines are available in AML.

3. COMBER LAP FORMER:

Combing increases the mean length (by numbers) of cotton fiber by 17-23% and reduces short fibers content (by numbers) by 13-18%. Comber also improves the length uniformity and nep contents of cotton fibers.

The objects of combing operation are:

a. To remove short fibers and upgrade cotton.

b. To remove neps and other impurities (nep removal efficiency 65-77%)

c. To strengthen and parallelisation of the fibers

d. To spin cleaner, finer, uniform and storage yarn

e. To improve general appearance of yarn.

Laxshmi Reiter (E7/4) and Lap former E2/4A machines are available in AML.

4. DRAWING FRAME (D/F):

Drawing frame is a process, which comes immediately after carding. The feed material is card sliver, which is the most irregular because the fibers are altered with cris-cross manners .In the quality point of view draw frame is vital process. D/F exhibits minimum influence on the characteristics of cotton fibers. Mean length and short fiber contents improve marginally whereas nep content does not show any change in drawing process.

Objectives of D/F :

A. Parellelise of cris-cross fibers of card sliver with one another and align them to the excess of the sliver through the process of drafting.

B. Improve the regularity in weight per unit length over considerable length of material through the no. Of slivers from different cards.

C. Thoroughly mix different types of fibers, so as to give a homogeneous blending.

D. .Lay the slivers in the cans uniformly with coils forming clear central holes.

The main operation in the process is drafting. The latest draw frames in AML are VAUK SH 802/E and RSB 851 and Padmatex 720 IE.

5. SPEED FRAMES / SIMPLEX:

The purpose of this section is to prepare a roving of required hank on a well-built bobbin for the ring spinning.

In this drafting, twisting, and winding operations are carried out at a time by machine. In AML, the available machines are LRGS, LRLF 1400 and machine capacity is 108 or 120 bobbins per m/c. One operator attends two machines at a time.

6. RING FRAME SECTION:

After preparing roving at simplex frame, the next process is ring spinning i.e. spinning. The aim of a process is perfect drafting, perfect straightening and parallelisation, perfect deposition of fibers along the axis of roving, perfect quality in length. Spinning is the process of converting the fibers material into the form of continuous strand called yarn with required no. of fibers in the cross section and having requisite no. of twist/unit lengths. The main process involved are drafting, twisting,, winding and building.

Ring frame is the final stage to spin the yarn so that the yarn must be without any fault . There are two types of R/F are available in AML : LR DJ5 and LR GS-1.

7. WINDING:

Package formation, removing of spinning faults from the yarn and waxing are the main purposes of this section. Ordinary RJK and Auto coner,

Savio, PADMATEX 138, Schlhfhorst-238 are the main machines available in AML.

8. PACKING SECTION:

Packing plays an important role in preserving the quality of yarn and avoid several unnecessary complaints. All cones are checked to find different types of faults. After inspection cones are packed in polythene or polypropylene bags and then packed in the carton and then strapped properly.

3.2 ANALYSIS OF EACH SECTION AS PER THE 5S'S CONCEPT :

By keeping the 5S's concept in mind, the overall analysis of man, machines, methods and the whole system was carried out in each sections of the AML.

3.2.1 Birds-eye-analysis of each section :

MIXING AND BLOWROOM :

Findings :

- Direct stocking of raw material on floor. This must be avoided because shop floor in section is not neat and clean.
- Location of the bale(raw material) to be fixed up to open it . At present it is opened and then pushed by operator, which will damage the quality of raw material.
- Metal strips after opening of the bale and jute bags being directly dropped on floor, space for it also not fixed.
- During opening of the bale no hand gloves are being used by

operator to open and handle the metal strips, which may effect the safety principle.

- In B/R , after mixing the raw material is being feed by operator. During loading about 10% of raw material dropped on shop floor.
- During removal of the waste , it being directly dropped on floor and then loaded to handle it. This increases the time and creates problem of cleaning.
- Lapped roll directly placed on the dirtiest floor.
- Lapped roll is being handled to old comber section by operator on his head. This effect its quality.

COMBER LAP FORMER :

Findings:

- Waste boxes of all comber machines are always opened. To close it handles are not available in some machines, which create problem for 3rd S.
- Near m/n no. 1,3,4, waste is always being dropped.5th S). Waste box is not available on each machines.
- Front shutters of the machine are always found opened and not fitted as per codification (5th S).
- Side cover of the machine are always in open condition (5th S), which create problem for 3rd S.
- In most of the machines (about 80%), pressure gauges are not in working condition.

- In most of the machines , the plastic cover touch the detaching roll, which effects the proper working of the machine.
- In the most of the machine (about 50%), the top detaching rolls are defective.
- About 90% of machines having broken window glass of the waste box, which create problem for 3rd S.
- In most of the machines sensors are not in working condition. Result is that even no fault machine stops frequently.
- Suction fans in waste box of the most of the machines are not in working condition.
- Leakage of air is high.

DRAWING FRAME :

Findings:

- Variation in r.p.m. of two loaded cans on Vauk machine.
- Loaded can with sliver are not arranged in proper sequence.
- Space for output of machine to Simplex , empty can from Vauk to comber, can from comber to Vauk and empty can from simplex to Vuak are not fixed.
- Empty cans from simplex are being temporary stored in the gangway.
- Sometimes material handling is being done manually.
- Faulty loading of can on Vauk for output. Result is friction between the two cans, which reduces the output speed and

effects the quality of can itself.

- Can support rollers are not set properly, which increases the friction.
- There is no existence of the work place layout in this section.
- Operators do not know the on line setting facilities available in machine to find out the causes of stoppage of the m/c. Result is that the down time per machine is very high.
- About the average 25% down time per machine.(Vauk).

SIMPLEX :

Findings:

- Lot of unnecessary items laying in the section.(1st S).
- Slivers are not loaded properly on machine, a lot of variation was found. (5th S).
- Waste box not used first at a time. (5th S).
- Manual loading and unloading of bobbins on machine instead of using material handling trolley.
- No cover for metal racks to store empty bobbins and the rovings. (3rd S).
- Metal grills to absorb waste are always jammed. (3rd S).
- Back side of the machine shutter is not available , the result is problem for 3rd S.
- During starting of the machine a lot of waste flying in the air, which creates problems for 3rd S, on the operators health and the quality of in process material.

RING FRAME (R/F) :

Findings:

- Side covers of the most of the machines are always opened.(5th S), it creates problems of 3rd S and maintenance people.
- Cleaning system is not good. During cleaning near machine waste entered in machine which damaged the quality of in process material.
- During cleaning of machine by maintenance staff (four workers), waste from machine parts directly dropped on floor and then recollected by cleaner.
- Waste collection jute bags are damaged, one should provide the metal can for the same.
- All bobbins of various colors are first dropped in one metal box and then it is sorted out. (1st S).
- Big metal can of empty bobbins of simplex is being handled by operator without using the material handling trolley.
- Machine hard waste is directly dropped on floor and then recollected to send the waste room.

WINDING :

Findings:

- Some unnecessary items laying near the walls of the section.
- Material handling trolley always laying in the aisle. (5th S).
- Some bobbins found inside the area of the winding machine.

- Paper cones are always laying here and there.(5^{th} S).
- Some bobbins of output of R/F during loading in container of the winding machine, always dropped on the floor.

PACKING:

Findings:

- Some unnecessary items are laying in section.
- Output of winding is directly stored on floor, the wooden plate form to be designed.
- Systematic work place layout is required for 2^{nd} S.

MILL PREMISES:

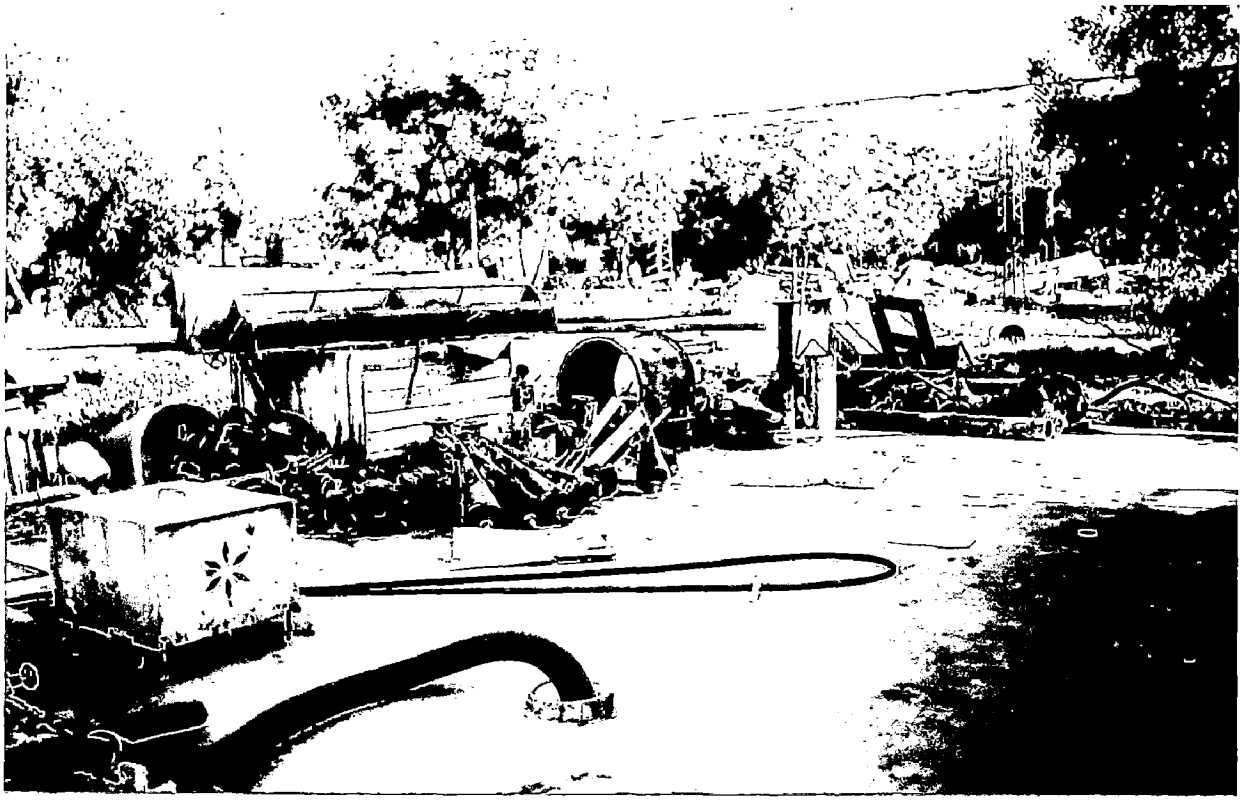
Findings:

- Some old pipes and spares found near generator room- 2.
- Old spare and usable items lying near power house 1 and 2.
- Old spares are lying and some unnecessary items found in compressor room-2.
- Some motors lying here & there in work shop.
- Old canteen: Unhygienic, Foul smell, no cleanliness.
- Main gate area: (A) Washing of cars near car shade causes dirtiness; needs some other place for washing. (B). Poor cleaning and huge fluff deposition is observed in old cycle stand which requires weekly cleaning. (C). So many waste and other items, pipes lying scattered near cycle stand.
- Road condition is poor from main gate to packing department

- Several items lying here and there, need removal and storing at proper places near ground in between compressor room – 2 and packing go down and nearby packing go down.
- Near water tank, pipes, fire buckets, poly begs found here and there.
- Road near water tank required to be cleaned weekly.
- Near generator – 1 area many waste items and old generators found.
- Near cotton godown waste items lying scattered.
- Many unnecessary items lying on roads around cotton godown.
- Waste yard near block – 33, wastes are stored here and there causing fire risks.
- Scrap Yard : No system for storing waste materials, need systematic storage and disposal system.
- Cleanliness poor near new training room and back side of the canteen.
- Cotton waste boras lying on both sides unattended near road from scrap yard to new canteen
- Near block – 3 waste boras and other waste materials lying unattended
- Cables and other electrical items, waste materials lying near frond side of store.
- Behind the engineering office unused and waste cables lying.

3.2.2 Analysis of different sections through photographs:

Analysis of each sections in AML was very important during the project to know and explain to any body , the problem in various sections related to sorting (1^{st}S),systematizing (2^{nd}S), sweeping (3^{rd}S), standardization (4^{th}S) and self discipline (5^{th}S). In this analysis different types of photographs were taken at various locations of AML , which will be very helpful to analyze the condition of AML before and after the 5S's campaign. It will be the best tool to present the facts during awareness program via lecture arrangement for the 5S's campaign.



SECTION: -

LOCATION: OUTSIDE PREMISES NEAR CPP.

PROBLEM OF : SEIRI (Sorting)1STS.

FINDINGS:

- Lot of unnecessary items lying e.g. Material Handling trolleys, bobbins, wooden and metal wastes, gears, ele. motors and pumps etc.
- Total cost of about Rs. 50 laks lying around the mills premises.
- About 50% items can be reworked.
- No existence of storage and retrieval system.

LOSS:

- Loss in terms of wastage of resources.
- Land productivity reduces.
- Rework items lying outside premises will be converted into the scrapped items and scrapped items to be converted into rejects.
- Effect the cleanliness and the impression on the visitors.

SECTION: B/R (waste).

LOCATION: Besides the wall of B/R.

PROBLEM OF : SEIRI (Sorting) 1st S.

FINDINGS:

- Lot of unnecessary items lying e.g. plastic pipes, metal sheets, metal rods etc.
- Waste bags are lying near each walls.

LOSS:

- Obstacles for operators.
- Effect cleanliness of the section.
- Space productivity reduces.
- Effect safety of the operators.

SECTION: SIMPLEX.

LOCATION: Side of machine number-4 , LR 1400.

PROBLEM OF : Sorting of bobbins (1^{st}S.)

FINDINGS:

- Waste and empty bobbins are always mixed.
- Bobbins are not stored as per specification/ color code.

LOSS:

- Increase search time and sorting time.
- Storage capacity reduced.

SECTION: Comber.

LOCATION: Near wall of machine number-33.

PROBLEM OF : SEITON (Neatness) 2nd S.

FINDING:

- Wooden waste box are not at its appropriate places.
- Open type rack.
- No label on rack to store gears in rack.
- Gears are not arranged properly.
- Very difficult to put and retrieve required gears.
- Lot of unnecessary items found. e.g. bobbins, scrapped, gears inside the racks.
- Cleaning is very poor.

LOSS:

- Increase search time to store and retrieve the items.
- Maximum utilization of available storage space not possible.
- Cleaning time increased due to open rack.

SECTION: Drawing Frame

LOCATION: Near control panel.

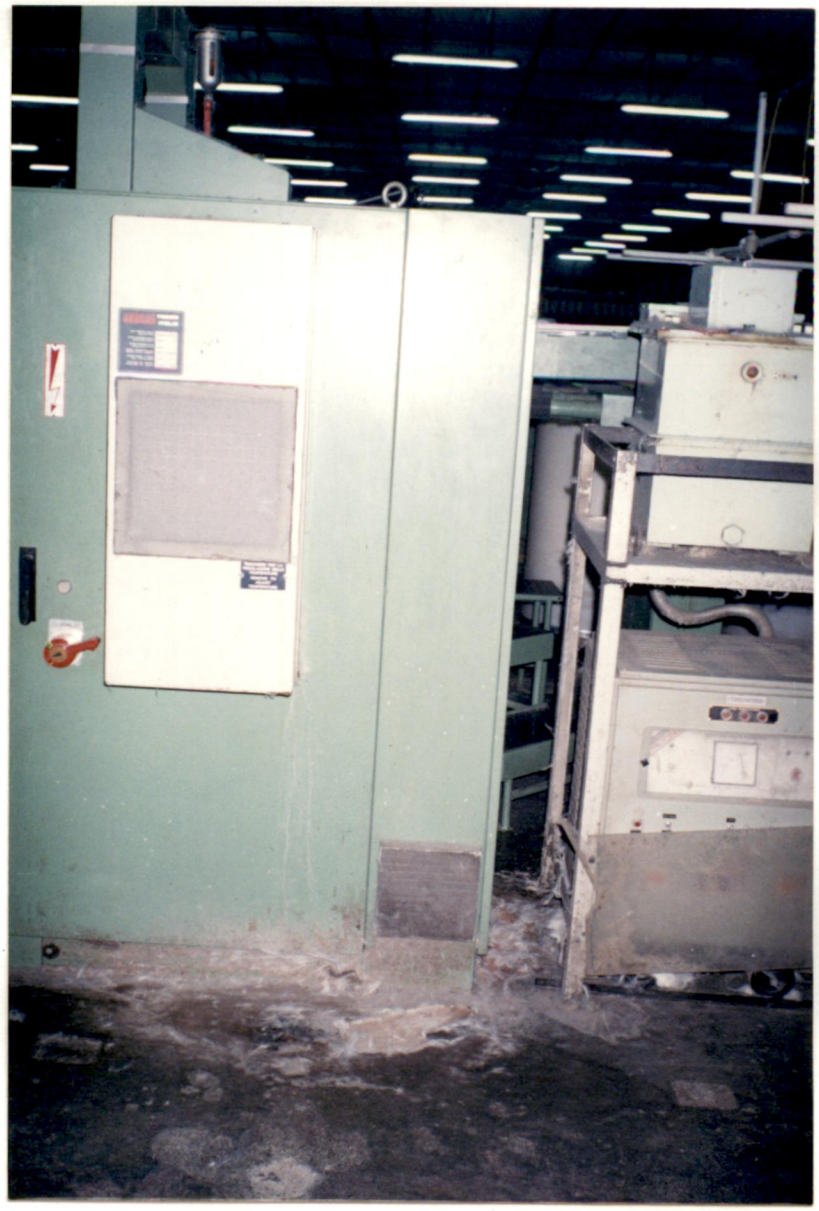
PROBLEM OF: SEITON (Neatness) 2nd S.

FINDINGS:

- Empty and loaded can to and from comber section are lying any where.
- Output of comber and empty cans from simplex lying and temporary stored any where.
- No existence of work place layout.
- In wooden cupboards no existence of neatness and label visual management.

LOSS:

- Confused work place.
- Lot of confusion for operator.
- Obstacles for material handling of cans.
- Material handling time increases due to lack of neatness.



SECTION: Drawing Frame

LOCATION: Near Vauk machine.

PROBLEM OF : SEISON (Sweeping) 3rd S.

FINDINGS:

- Dust and cotton waste near machine.
- Cooling net for machine jammed by cotton waste.
- Machine cleanliness is poor.

LOSS:

- Flying fluffs of waste effects the quality of in process material.
- Sensors of machine can not work properly.
- Machine down time increases.
- After long time cooling system may fail , electric motors may burn out.
- Reduction in operators efficiency and moral level.

SECTION:COMBER.

LOCATION: Near the wall of block number-3.

PROBLEM OF: Sweeping (3rd S).

FINDINGS:

- The dirtiest place.
- Lot of pan splitting..
- No cleanliness found near and in the water base.

LOSS:

- Effects operator health.
- Negative effects on visitors.
- ISO: 9000 is difficult to achieve.

SECTION: Drawing Frame

LOCATION: Near vauk number-1

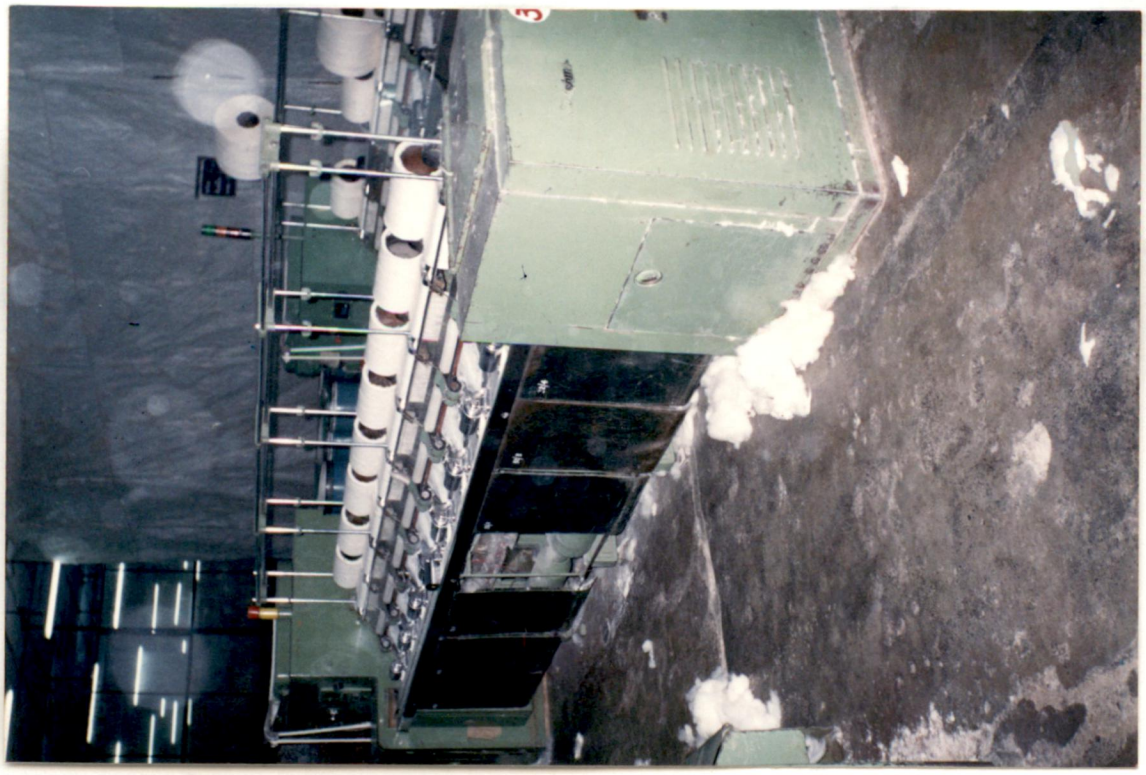
PROBLEM OF : SEIKETSU (Standardization) 4th S.

FINDINGS:

- Loaded and unloaded cans are mixed and located at the same places.
- Compressed air tube lying on floor.
- Sweeping is poor.

LOSS:

- Increase search and material handling time.
- Obstacles for operator and material handling.
- Space productivity reduced.
- Lake of neatness causes confusion for operators.



SECTION: COMBER.

LOCATION: Near machine number-32.

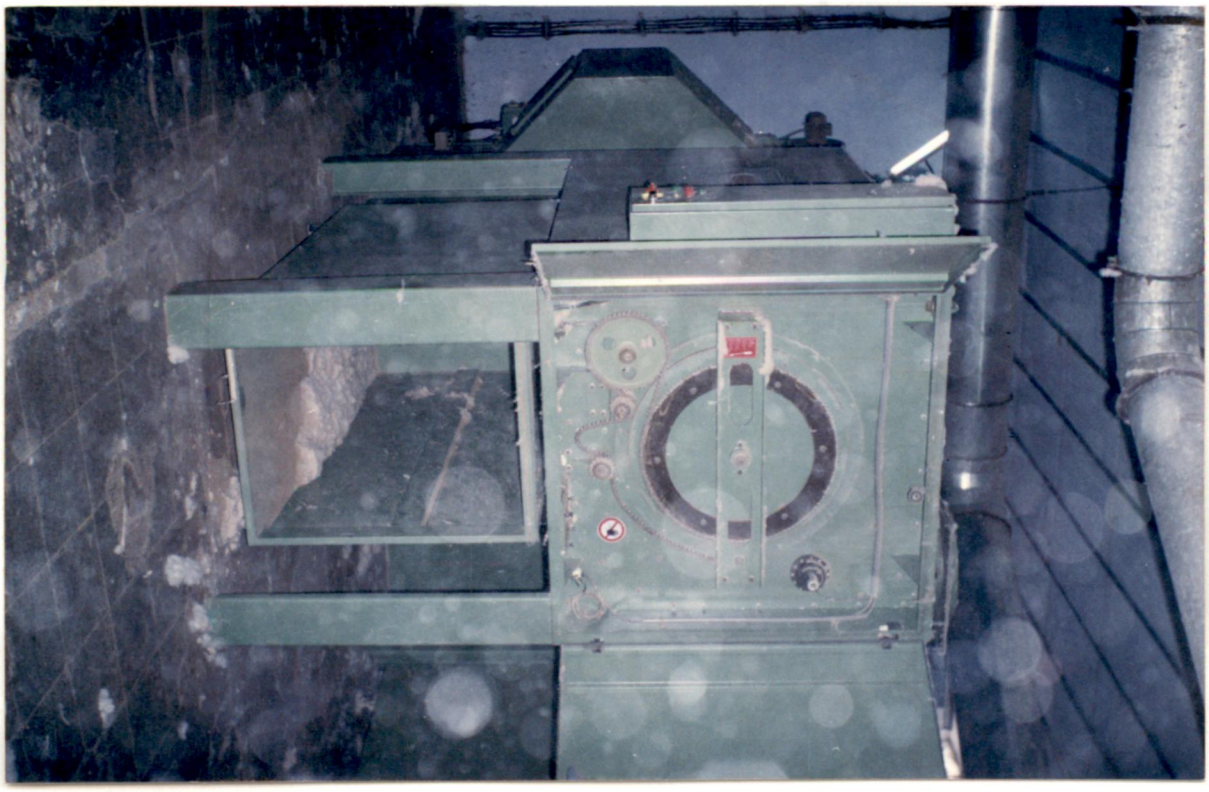
PROBLEM OF : SHITSUKE (Self-discipline) 5th S.

FINDINGS:

- Cotton waste directly dropped on the floor.
- Front shutter of machine not closed.
- The sequence of closing the shutters not followed.
- Cleaning near machine found poor.

LOSS:

- Effects quality of in process material.
- Increase sweeping time.
- Effects machine cleanliness.
- Flying fluffs entered into machine and creates problems for machine efficiency.
- Machine down time increases.



SECTION: CARD WASTE ROOM.

LOCATION: Side of machine.

PROBLEM OF: Self-discipline (5^{th} S).

FINDINGS:

- Side doors of machine are always opened.
- Waste collection box shutters are not closed.

LOSS:

- Reduction in machine efficiency.
- Effects machine cleanliness (3^{rd} S).
- Break down may takes place after long time.
- Waste collection time increases.

3.3 THE 5S'S AUDITING

3.3.1 Design of the 5S's Audit Form

By using the basic principle of organization or sorting i.e. ' one is best', the audit form (ANNEXURE-2) was designed for auditing of all section in AML. So, only one form is required to do audit of all sections per month for the six months of duration.

3.3.2 THE 5S'5 Audit in Each Section

By using the designed audit form (ANNEXURE-2), audit was carried by on 12/11/2000, 8/12/2000 and 10/1/2001.The details is given in the following TABLE-B.

AUDIT DATE : 12/11/2000.

AUDITED SECTIONS: 1-Mixing,2- B/R, 3-Carding, 4- Comber lap former, 5- D/F, 6-Simlpex, 7-R/F, 8-Winding, 9- Packing, 10- Out side premises.

RATING; 0- poor, 1-average,2-good,3-very good, 4- Excellent.

TABLE-B: Audit report of each section on 12/11/2000.

Sl. No.	PARAMETERS	SECTIONS									
		1	2	3	4	5	6	7	8	9	10
1	Cleanliness (roof, wall, floor)	2	1	1	2	1	1	2	3	2	0
2	Machine cleanliness (machine, guard /covers, oil stains)	1	1	1	1	0	1	3	3	-	-
3	House keeping (fly and fluff, spares, waste and	0	0	2	2	1	1	2	2	2	0

	other)										
4	Humidity plant (diffuser grill, return air grill)	4	4	3	2	2	2	3	3	-	-
5	Fire fighting equips (fire buckets/ Extinguishers)	2	1	0	1	0	1	2	3	3	2
6	Electrical installation (motors, distr. Board, tube lights)	2	1	2	2	1	1	3	3	-	-
7	Spitting (corners, wall, near machine)	1	0	2	1	0	1	2	2	3	0
8	Status of unnecessary items lying (I^{st} S)	1	0	1	2	0	0	2	1	3	0
9	Material transport (trolley condition. Safety)	1	-	-	2	1	2	2	3	3	-
10	Information on machine (production chart, equipment, maintenance activity)	2	0	1	2	1	1	3	3	-	-
11	Floor condition	2	1	2	1	1	2	3	3	3	-

B. On 8/12/2000 and 10/1/2001, audit was carried out in the poorest performance sections. The details is given below :

AUDIT DATE : 8/12/2000 and 10/1/2001
SECTION : D/F and SIMPLEX.

PARAMETER NO.	RATING			
	DRAWING FRAME		SIMPLEX	
1	2	3	3	3
2	3	4	2	3
3	2	4	3	4
4	3	4	4	4
5	4	4	1	3

GIC282.

6	2	4	3	4
7	0	2	1	1
8	4	3	0	3
9	4	4	3	4
10	3	3	3	3
11	2	4	3	4
DATE	8/12/2000	10/1/2000	8/12/2000	10/1/2001

3.4 DEVELOPMENT OF THE EXCELLENT 5S'S SECTIONS

3.4.1. Selection of the poorest performance sections:

The D/F and simplex sections were found the poorest performance sections related to the 5S's. So these sections were selected for developing it as the excellent 5S's sections in AML.

3.4.2 Data collection

After selecting the poorest performance for the 5S's campaign, the following data was collected. It will be very helpful for the 5S's campaign implementation program.

DRAWING FRAME :

- **MACHINE DETAILS:**

MACHINE NAME	NO. OF MACHINES	M/CHOUR RATE (Rs/Hour)
VAUK SH 802 E	4	386
RSB	1	300
DRG-1 PADMATEX	2	276

- Delivery speed (vuak): 60m/min.
- Output of empty can to comber: 100 mins. Per can of 6000 m of length of sliver .(1m= o.05 hank.)
- No. of operator / machine : one.

Material handling : - No. of trolley – 01, Handling capacity : 3 cans (comber)/ trolley and 4 cans (simplex)/ trolley.

CUPBOARD DETAILS:

Sl. No.	TYPE	SIZE (INCH)			REMARK
		LENGTH	WIDTH	HEIGHT	
1	Wooden	19	14	72	Usage for storage of operator's clothes & gears for maintenance.
2	Wooden	38	16	66	
3	Metal	72	18.5	72	

METAL GRILLS AND HUMIDITY WINDOWS:

ITEM	NO.	SIZE (m)LX W
GRILLS	7	0.71x 0.56
H. WINDOWS	1	0.60x0.60

TOTAL NO. OF TUBELIGHTS : 33

DOWN TIME OBSERVATION:

After designing proper down time sheet for D/F section (ANNEXTURE-8), total sixty observations in two shifts were taken randomly on different machine of Vauk. The average down time per vauk per output of lot (2 cans at a time) was found 25%.

The details given below:

DOWN TIME SUMMARY (D/F) :

MACHINE OBSERVED : VAUK SH 802 E.

TOTAL NO. OF OUTPUT(2 CANS AT A TIME)OBSERVED : 60.

MACHINE NO.	NO. OF OBSERVATIONS PER SHIFT		
	Shift-I	Shift-II	Shift-III
1	12	06	-
2	12	03	-
3	11	04	-
4	08	04	-
TOTAL	43	17	-

Average processing time per output(2 cans at a time) : 13 mins.

Average down time per output (2 cans at a time) : 3.25 mins.

% of downtime : 25 %

REASONS OF DOWN TIME :

SR. NO.	REASONS	CONTRIBUTION	REMARK
1	Sliver breaks	10.25 %	May include many reasons:.Comber section, tension in sliver due to improper location of cans (2^{nd}S),variation in humidity % It require major research work.
2	Joint in input from comber section	8.25 %	Comber section is totally responsible
3	Loading and unloading cans on vauk	5.00 %	Reason is related to 2^{nd}S and 5^{th}S.
4	Operator not attending machine.	1.5 %	Reason is related to 5^{th}S (self discipline)
TOTAL		25 %	

B. SIMPLEX SECTION:

MACHINE DETAILS:

MACHINE	NO'S	NO. OF SPINDLES	AREA	FLYER SPEED	M/C HOUR RATE
LF 1400	8	120	16.46m X 43.96m	1000	200
LRGS	4	108	14.63m X 3.96m	1400	190

STORAGE DATA (RACK):

Total no. of racks:12

Sl. No.	RACK SIZE (m)			NO.'S	REMARK
	LENGTH (m)	WIDTH (m)	HEIGHT(m)		open racks, no label on it, flying fluffs entered into it
1	2.31	0.79	1.93	3	
2	2.13	0.79	1.93	8	
3	1.55	0.79	1.68	1	

GRILLS AND HUMIDITY WINDOWS :

PARTICULAR	TOTAL NO.	SIZE (LXW)(m)
GRILLS	21	0.71X0.56
	06	0.44X0.44
H. WINDOWS	22	0.60X0.60

MATERIAL HANDLING FACILITY:

Material Handling trolley for empty bobbins: 3, size: 1.27mX0.71m.

Material Handling trolley for roving : 8, capacity:120 roving/trolley.

NO. OF CANS:

SL. NO.	COLOR	NO. OF CANS	CAN DIA.(MM)
1	Yellow	243	400
2	Blue	317	400
3	Orange	173	400
4	Green	30	400

5	Yellow with gr. Str.	130	400
6	Dark pink	130	400
7	Light pink	125	400
8	White	303	400
	TOTAL	1451	

NO. OF BOBBINS (SIMPLEX):

SR. NO.	COLOR	NO. OF BOBBINS
1	RED	2264
2	YELLOW	2830
3	ASH	3962
4	GREEN	3396
5	ORANGE	3396
6	BROWN	2264
7	COFFEE	1132
8	WHITE	3962
9	BLUE	3396
10	PINK	3962
11	LIGHT PINK	850
TOTAL		31414

DOWN TIME SUMMARY(SIMPLEX):

MACHINE OBSERVED: LR-1400

TOTAL NO. OF LOTS OBSERVED(120 ROVINGS) : 1

MACHINE NO.	NO. OF OBSERVATIONS PER SHIFT		
	Shift-I	Shift-II	Shift-III
1	1	1	-
2	2	-	-

3	1	2	-
4	-	1	-
9	2	-	-
10	2	1	-
11	2	1	-
12	1	1	-
TOTAL	11	7	-

Average processing time per lot (120 rovings): 75 mins.

Average down time per lot(120 rovings) : 15 mins.

% of down time : 20 %

REASONS OF DOWN TIME :

SR. NO.	REASON	CONTRI-BUTION	REMARK
1	Cut in input	3.33	Due to numbers of breaks in input from drawing section
2	Sliver breaks	8.33	May include many reasons:drawing section, tension in sliver, location of input can, variation in humidity, pressure variation (5-6 kg/cm^2)
3	Machine top jammed	6.66	Related to $3^{rd}S$
4	Operator not attending the machine	-	Related to self discipline
5	Other	1.66	Research work to be done.

3.4.3 AWARENESS PROGRAM

To develop awareness among employees related to the poorest performance sections i.e. D/F and simplex , the awareness program was launched. The details given below :

3.4.3.1 Design of the 5S's pocket book

The small pocket book was designed in both languages (Gujarati and English) and distributed among all employees. With the help of it one can understand the 5S's + 1H of the 5S's campaign in these sections.

3.4.3.2 Lecture arrangement

One lecture per day was arranged during the time period of 3/12/2000 to 7/12/2000 to explain the motive behind the 5S's campaign in AML.

3.4.3.3 Brain storming sessions

Brain storming sessions were conducted to know the problems and probable solutions to develop the excellent 5S's sections (D/F and simplex). Audit report of these sections were distributed among all participants. The details given below :

A. Brain storming details :

Subject : How to implement the 5S's campaign in the Drawing Frame and Simplex sections ?

Sl. No.	Date	Time		Venue	No. of Participants	No. of Ideas Generated
		From	To			
1	11/12/00	15.30	16.30	Trg. center	17	14
2	11/12/00	16.00	17.00	Do	21	19
3	15/12/00	13.30	15.00	Do	16	08

B. List of selected ideas from brain storming sessions :

After screening , the following ideas were selected to implement the 5S's campaign in the Drawing Frame and Simplex sections :

- To design and implement the work place layout for Drawing Frame section as a part of 2nd S.
- To redesign the 5S's pocket book.
- To arrange industrial visits of some 5S's bench marked industries.
- To set up system for removal of unnecessary items from each sections as a part of 1st S.
- To divide the section into zones to assign individual responsibility for the 5S's.
- To declare the best 5S's practice award per month for employee.
- To set up good maintenance system.
- To modify the racks to store rovings and empty bobbins in simplex.
- To repair or modify floor condition for better machine handling.
- To use visual management for cupboards in the both sections.

- To locate spittoons in Drawing Frame and simplex as a part of 3rd S and 5th S.
- To start the 5S's suggestion scheme.
- To design the 5S's display board to know the daily position of 5S's in those sections.

3.4.4 The 5S's organization chart

For better implementation of the 5S's campaign in these sections, the 5S's organization chart was designed (Annexture-3).

3.4.5 Implementation steps

To develop confidence and achieve fruitful results, the following implementation steps were taken in the Drawing Frame and Simplex sections :

- Design and implement work place layout in D/F section for neatness (2nd S). (ANNEXTURE-4)
- Redesign and distributed the 5S's campaign pocket book in English and Gujarati languages.
- Modified racks in simplex section with cost benefit analysis for 3rd S (ANNEXURE -5).
- Managed to repair shop floor for better material handling.
- Used visual management for cupboards in D/F.
- Scrap / Rework card was designed and implemented to set up the system for storage and retrieval.

- The 5S's suggestion box and display board was designed and located in Drawing Frame and Simplex sections. (ANNEXURE-7).

3.4.6 Highlight of The Results

A. DOWN TIME REDUCTION (D/F) :

BEFORE	AFTER	REDUCTION
25 %	17 %	08 %

Available time per day : 22.5 hours.

Actual available time per day : 1350 mins.

No. of working days per year : 360 days.

Actual available time per year : 486000.

Saving in time (8% 0f 486000 mins.) :38880 mins.

Machine hour rate (vauk sh 802 E): RS. 386 per hour.

Saving per year per machine : RS. 2,50,128.

Total saving per year : Rs. 2,50,128 X 4 machines.

= Rs. 10,00,000---------- (1)

B. DOWN TIME REDUCTION (SIMPLEX) :

BEFORE	AFTER	REDUCTION
20 %	13 %	07 %

Actual available time per year : 48,6000 mins.

Saving in time (7 % OF 48,6000 MINS.): 34020.mins.

Machine hour rate (LR-1400) : RS. 200 per hour.

Saving per year per machine : Rs. 1,13,400 X 8 MACHINES*

= Rs. 9,07,200 per year ---------- (2)

*Excluding old machine number 5,6,7,8.

TOTAL SAVING PER YEAR : (1) + (2)

= Rs. 19,07,200 .00

C. INTANGIBLE RESULTS :

- Enhanced employees moral and participative culture.
- Teamwork developed.
- Trust cycle among employees could be generated for suggestion scheme and quality circles.

D. AUDIT REPORT BEFORE AND AFTER THE 5S's CAMPAIGN IN THE DRAWING FRAME AND SIMPLEX SECTIONS :

Parameter No.	Section					
	D/F			SIMPLEX		
1	1	2	3	1	3	3
2	0	3	4	1	2	3
3	1	2	4	1	3	4
4	2	3	4	2	4	4
5	0	4	4	1	1	3
6	1	2	4	1	3	4

7	0	0	1	1	1	1
8	0	4	3	0	0	3
9	1	4	4	2	3	4
10	1	3	3	1	3	3
11	1	2	4	2	3	4
DATE:	12/11/00	8/12/00	10/01/01	12/11/00	8/12/00	10/01/01

TOTAL RATING POINTS	SECTION		POSITION OF SECTION AS PER RATING	
	D/F	SIMPLEX	D/F	SIMPLEX
BEFORE (12/11/00)	08	13	BELOW AVERAGE	AVERAGE
AFTER (10/01/01)	38	36	VERY GOOD	VERY GOOD

3.4.7 COMMENTS :

- The 5S's concept appears to be attractive, but deploying the concept in India is difficult as it takes a very long time, to be fully ingrained in an organization culture and the management being result driven, loses faith on the concept quite quickly. Thus there is a lack of continued commitment to the 5S's philosophy and practice.
- The 5S's concept is very easy to understand but very difficult to apply, because it requires active participation by every one in the organization.
- Management expects significant result in monetary gains within a year of its implementation whereas the benefits of the 5S's

implementation, whereas the benefits of the 5S's implementation at such an early phase are intangible.

- Unless our society becomes quality conscious, the 5S's concept will be only bandwagons. As long as quality and productivity does not become a way of life (entire society adopt it) , the 5S's concept will only be in books.
- Lack of faith, mutual trust and confidence has led to the 5S's concept failure.
- For another decade or more, the success story of the 5S's in Indian industries will be far from true.
- The 5S's concept must be applied holistically , so that its principles and practices reach every corner of the organization.
- It must be based on a decentralized approach, that provide empoverment at all levels, especially at the front line, so that enthusiastic involvement and common purpose are realities, not slogans.
- Foundation of basic ethics must underlie all the 5S's efforts.

Chapter 4

CONCLUSION AND FUTURE SCOPE

The project objective was to launch and implement the 5S's campaign for setting up total quality environment. The total saving of nineteen lakhs was done in terms of down time reduction in the D/F and simplex sections. The 5S's implementation requires top level management commitment, perservence and determination. It requires constant effort. The main difficulty to launch the 5S's campaign is that the most of top level persons believe that the 5S's are not powerful tool for quality improvement program and cost reduction.

In this project, the scope was limited to the manufacturing sections only. This project can be extended to the offices also. One can do the research work in the following areas :

- The linkage between the 5s and TQM.,
- The linkage between the 5s and ISO:9000.,
- The linkage between the 5s and quality and productivity,
- The 5s campaign in :
  - hotels,
  - hospitals,
  - educational institutes,
  - All cities & villages of India.

At last, one can say that the 5S's is the magic stick to improve the overall productivity of India to put our nation as a super power in the 21st century.

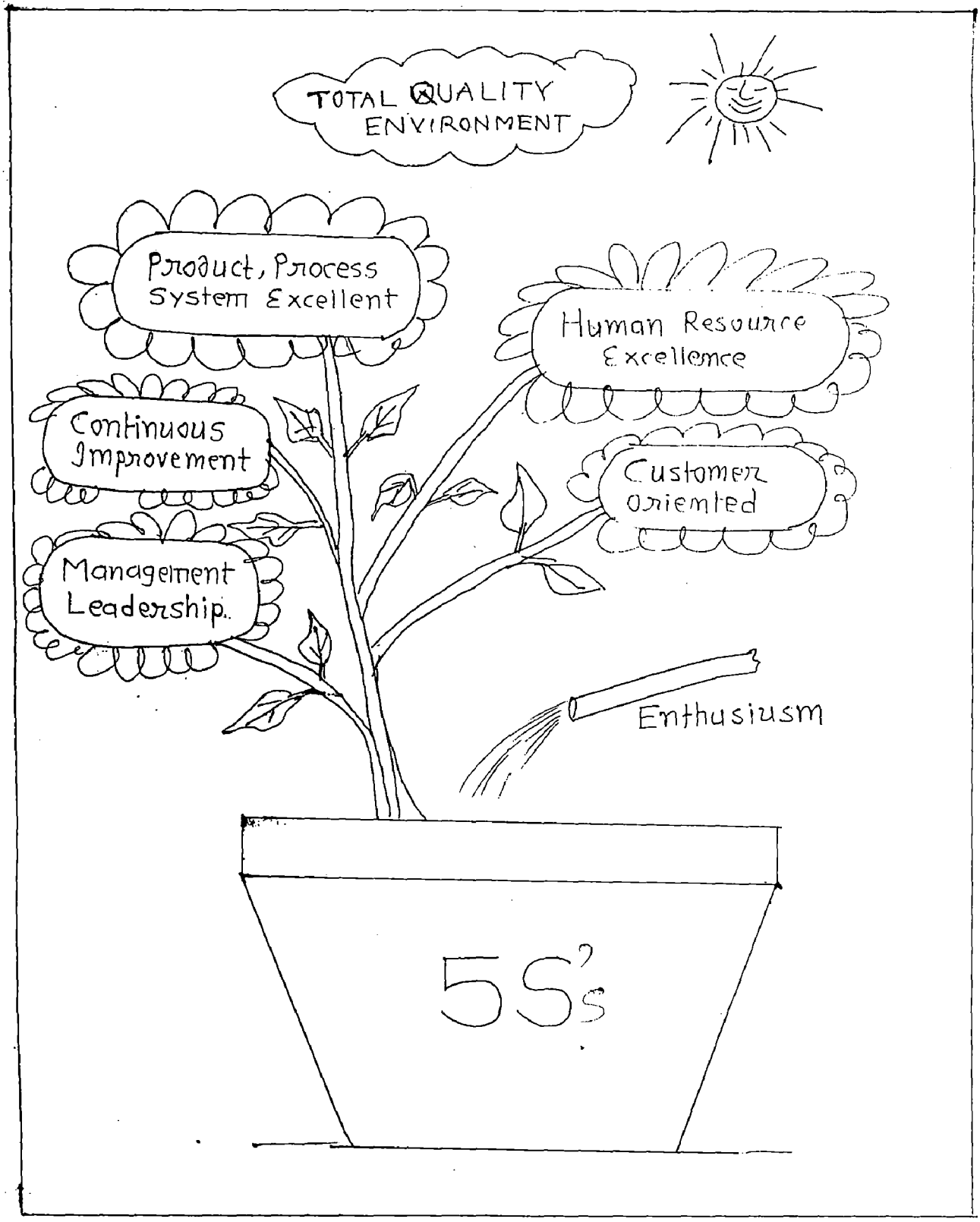


FIG.1 THE 5S's AND TQM

ANNEXURE –1

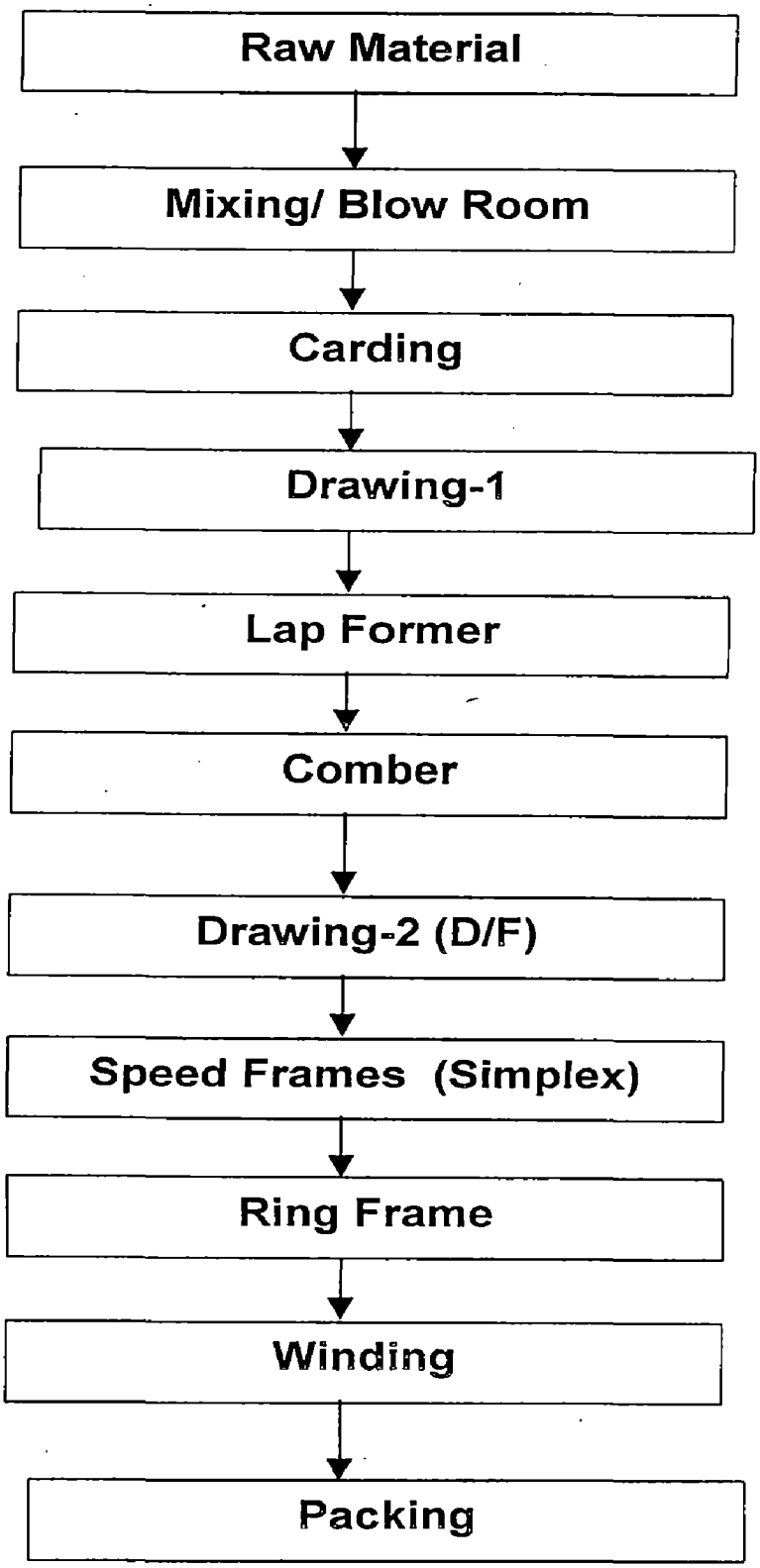
PARAMETER RELATED TO THE 5S'S

Sl No.	Parameter	Year			Six Month Average(March To August'2000)
		1995	1996	1997	
1	Hard waste % on R/F production (#1%)	1.41%	1.27%	1.32%	1.34%
2	Comber soft waste (#0.50%)	0.99%	0.83%	0.90%	0.86%
3	Total Number of accidentants per month	36	22	26	24
4	Total Number of motors burnt*	23	19	14	15.00
5	R/F production efficiency (#95%)	---	--	90.40%	90.40%
6	Winding production efficiency (#65%#)	49.62%	54.64%	55.31%	55.76%

- Savio m/c: 26HP, R/F G-5 : 45 HP (35 KW)

Standard norm (%) as per ATIRA (6)

Fig. 2 Journey from Raw Material to Hosiery Yarn



ANNEXURE - 2

5-S AUDIT REPORT

AML, Morbi

SECTION :
ZONE/BLOCK NO :
AUDITOR :
YEAR :

➢ RATING CATEGORIES

Poor	**0**
Average	**1**
Good	**2**
V.Good	**3**
Excellent	**4**

SR. NO	BRIEF DESCRIPTION OF PROBLEM	RATING				
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
	Date					
	Total points gained					

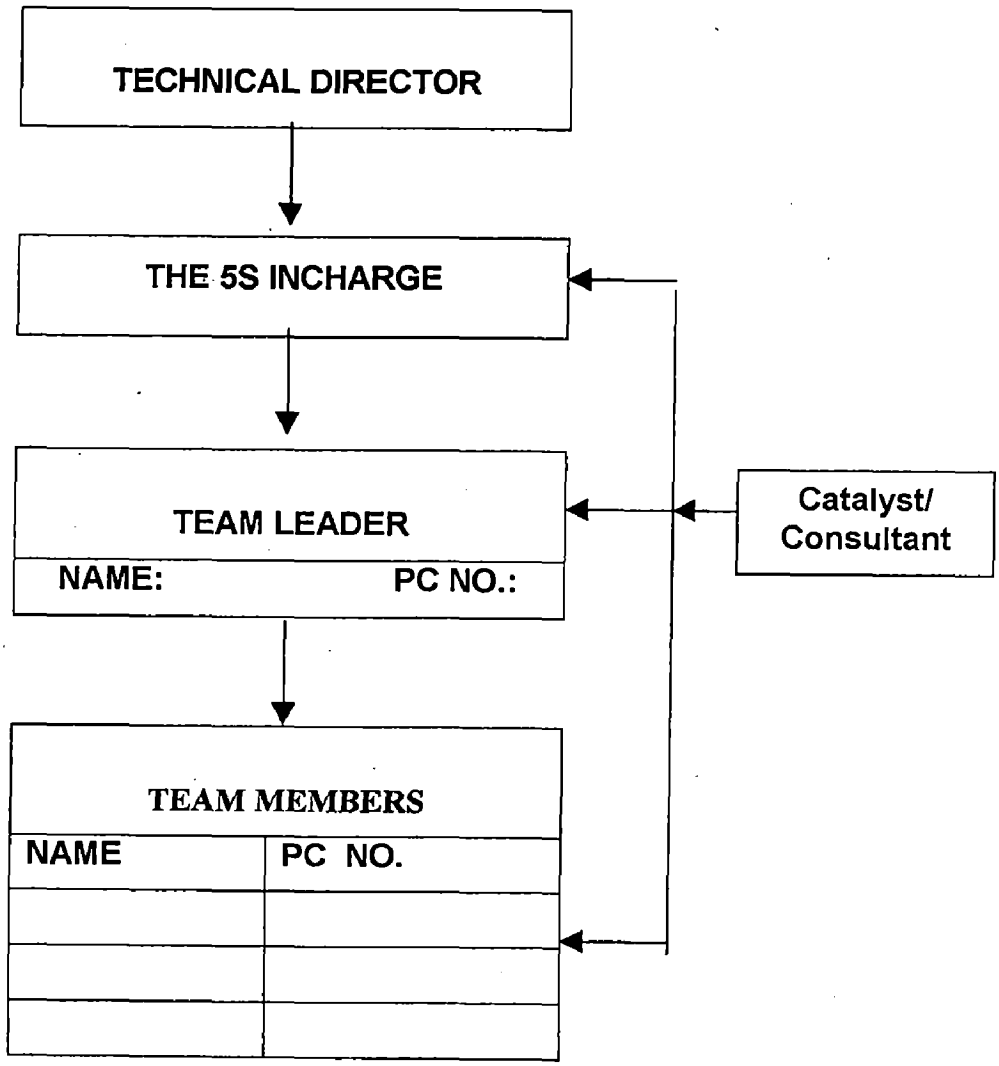
Total points Required for	**Avg**			
	Good			
	V. Good			
	Excellent			

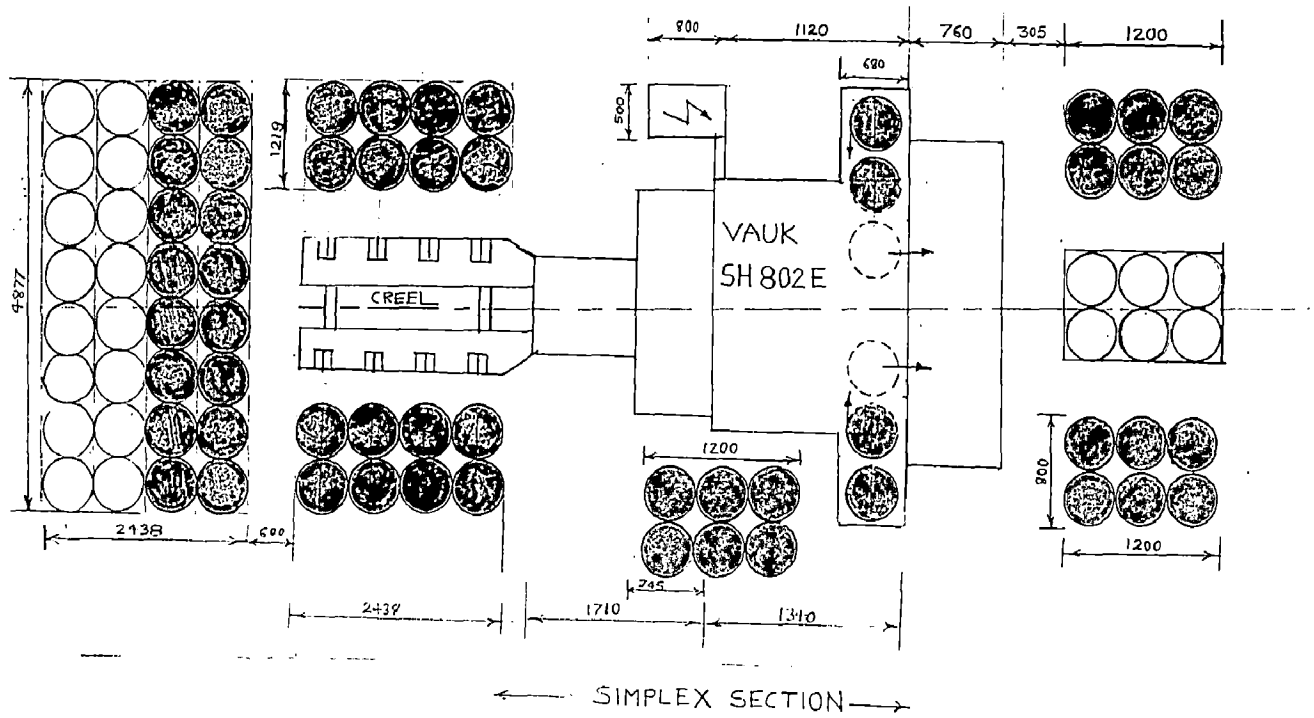
5-S In-charge

" He believes work should be efficient, neat & clean, and well organized"—The Gita

ANNEXURE - 3

THE 5S ORGANISATION CHART FOR THE BENCH MARK SECTION





→ OUTPUT OF VAUK TO SIMPLEX

→ EMPTY CANS FROM SIMPLEX TO VAUK

→ INPUT CANS FROM COMBER TO VAUK

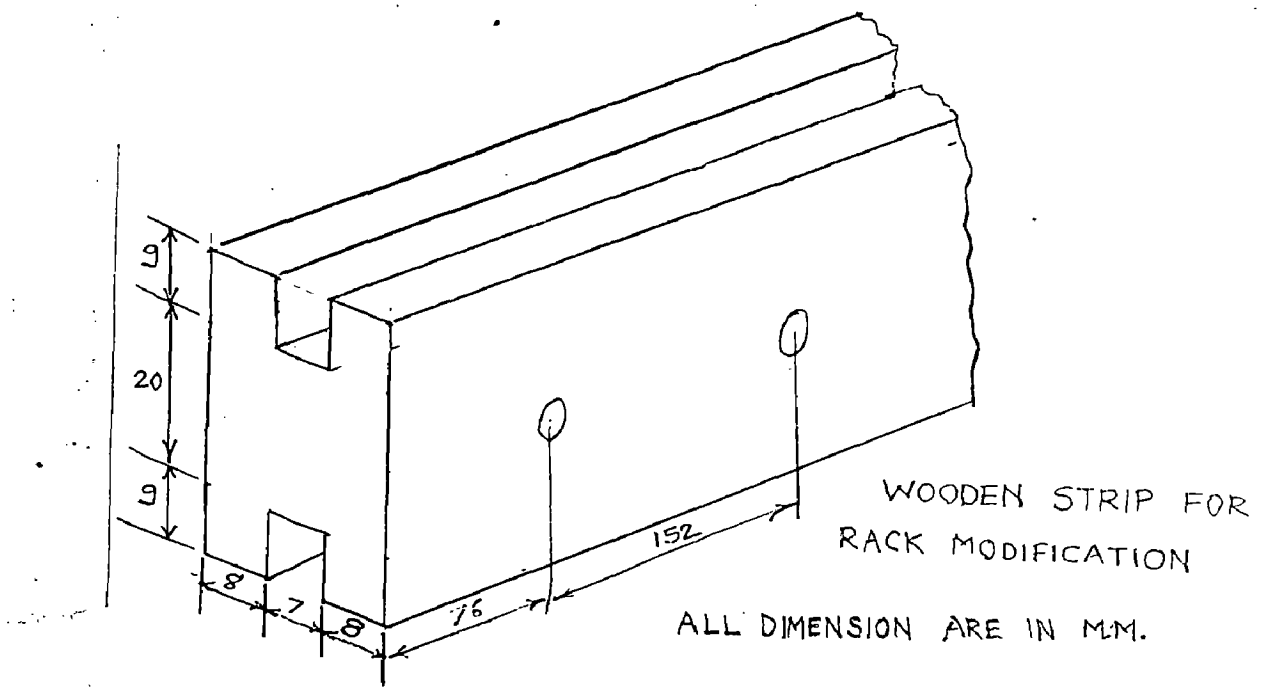
→ EMPTY CANS FROM VAUK TO COMBER

NOTE ALL DIMENSION ARE IN MM

WORK PLACE LAYOUT (D/F)

ANNEXURE-5

MODIFICATION OF RACKS (SIMPLEX) WITH COST ESTIMATING



Rack Size : 2.44m x 1.83m (L x W)

Storage Capacity : 464 bobbins/rack

Total No. of Racks : 3

Sl. No.	Item	Unit Cost (Rs.)	Total Cost (Rs.)
1	Wooden strip	Rs. 32.80/m	Rs. 240
2	Glass (5 mm thick)	Rs. 247/m^2	Rs. 1242
3	Handles and fasteners	Rs. 15/handle Rs. 1/fastener	Rs. 30 + 45
4	Labour charges	Rs. 20/hr	Rs. 80
		Total Cost (Rs.)	**1637/Rack**

Total Cost of Modification (Three Racks) : Rs. 4911.00

Average Cleaning Time/Bobbin : 1.00 mins.

Saving in time due to modification of rack : 23 hours/shift

Labour charges for cleaning bobbins : Rs. 10/hour

Total saving in labour charges per year : Rs. 2,48,000/year

ANNEXURE-6

REWORK / SCRAP CARD

REWORK / SCRAP CARD

AML , MORBI.

SECTION: DATE:

ITEM NAME AND CODE :

UNIT COST (Rs.) :

QUANTITY: ----------KG.----------NO'S----------CM./M.

BRIEF DISCRIPTION:

TIME SPAN GIVEN FOR REWORK / SCRAP :----------

1. TEAM LEADER----------

2. SECTION HEAD :----------

REWORK / SCRAP INCHARGE

ANNEXURE-7

5S's DISPLAY BOARD

5S's TODAY

SECTION :
DATE :
TIME :

SHIFT :

5S's	ZONES (RATING)					
	1	2	3	4	5	6
SORTING						
SYSTEMISE						
SWEEPING						
STANDARDIZATION						
SELF-DISCIPLINE						

TEAM LEADER

5S's INCHARGE

ANNEXURE – 8

DOWN TIME SHEET (D/F)

MACHINE NO. : **DATE:**

OBSERVED TIME : FROM----------TO----------

OBSERVED BY :

OPERATOR :
SHIFT : I /II/III

OUTPUT : TWO CANS PER MACHINE AT A TIME.

OUTPUT NO.	OUTPUT TIME (MINS)		TOTAL OUTPUT TIME (MINS)	DOWN TIME (MINS) WITH REASONS					TOLAL DOWN TIME PER OUTPUT
	From	To		1	2	3	4	5	

REASONS:

1. Sliver break.
2. Can changing to load input to vauk.
3. Operator not attending the m/c.
4. Joint in input from comber.
5. Other if any.

ANNEXURE - 9

DOWN TIME SHEET (SIMPLEX)

OBSERVED TIME : FROM ----------TO---------- DATE :

OBSERVED BY :

MACHINE NO. :

SHIFT : I/II/III :

OPERATOR :

STOPAGE NO.	STOPAGE TIME		IDLE TIME (MINS)	REASONS				
	FROM	TO		1	2	3	4	5
TOTAL IDLE TIME								

REASONS:

1. Sliver breaks.
2. Cut in input.
3. Machine top jammed.
4. Operator not attending m/c.
5. Other if any.

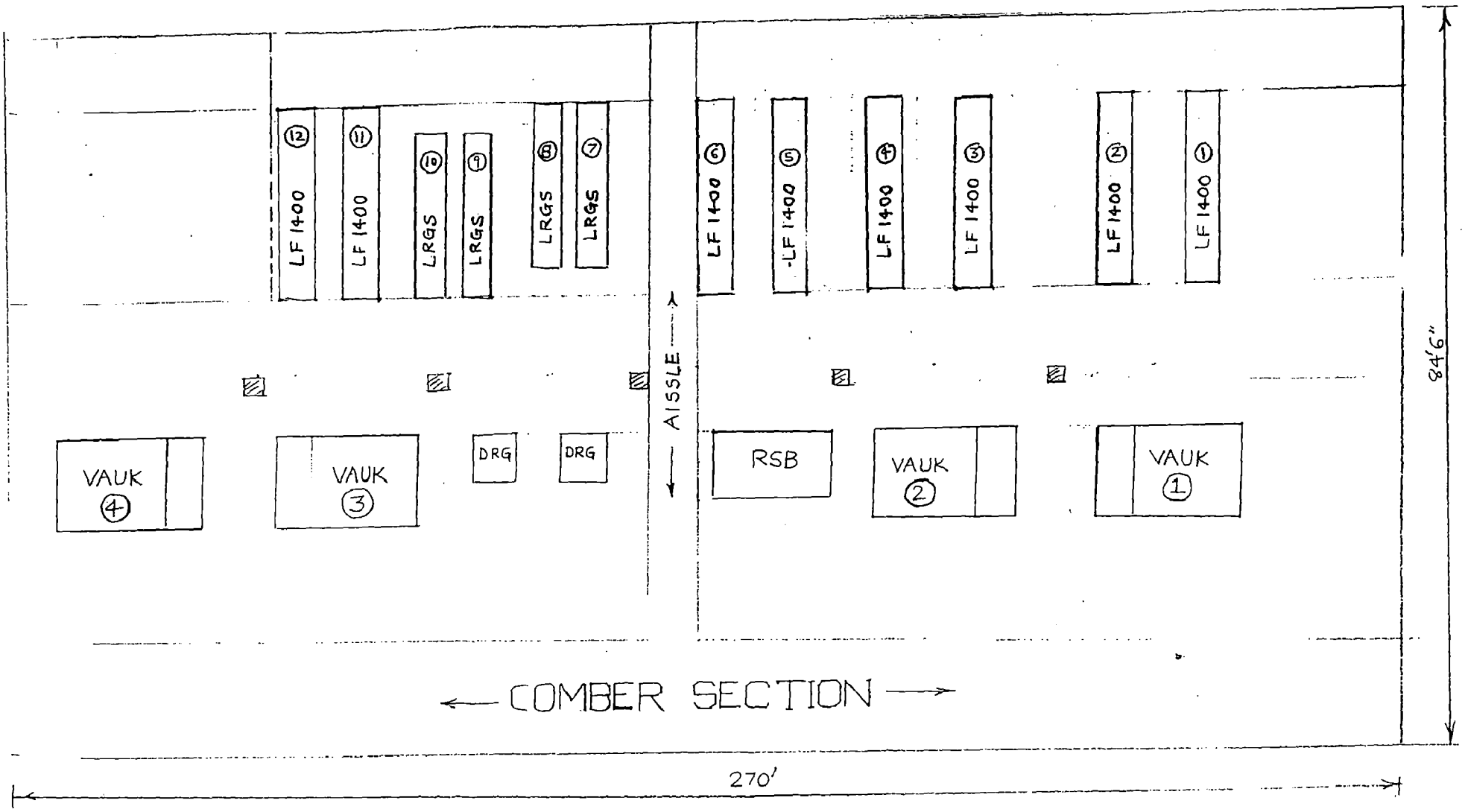
ANNEXURE - 10

CLEANING WORK SCHEDULE FOR 3rdS

SR. NO.	DETAILS	TOTAL NUMBERS.	MAN HOURS FOR TWO TIMES CLEANING DAILY	REMARK
1	**Grill**	169	6	
2	Toilet block in plant	4 (2+2)	3	
3	Toilet block(office, training room, store)	3	1	
4	Waste baskets	10	1	
5	Water Room	4	3	
6	Spittoons	30	3	At present very less in noumbrs.
		Total	**17 hours.**	

No. Of persons required: 3

One person for sr. no. 2,3,and 6 and other for the remaining work.


LF 1400 ⑫
LF 1400 ⑪
LRGS ⑩
LRGS ⑨
LRGS ⑧
LRGS ⑦
LF 1400 ⑥
LF 1400 ⑤
LF 1400 ④
LF 1400 ③
LF 1400 ②
LF 1400 ①
AISSLE
VAUK ④
VAUK ③
DRG
DRG
RSB
VAUK ②
VAUK ①
84'-9"
← COMBER SECTION →
270'

SIMPLEX:

D/F :

ANNEXURE - 12

FEEDBACK FORM (HRM)
AML, MORBI

Dear Sir,

Kindly rank our organisation to know the climate for HRD (Human Resource Development)

1. Excellent 2. Very Good 3. Good 4. Average 5. Poor (Please mark)

S. No.	Climate	1	2	3	4	5
1	Management Attitude towards you					
2	Management's willingness to invest time and other resources					
3	Top management's efforts to identify and utilize your potential					
4	Top level management's perspective on enjoyment of your work					
5	Reward mechanisms are good in our organisation					
6	Guiding of juniors by seniors for future responsibility					
7	Mutual trust among employees					
8	Delegation of authority					
9	Team spirit in our organisation					
10	Organisation's attitude towards employee welfare					
11	Communication system in our organisation					
12	Employee attitude towards solving problems					
13	Medical facility given to you					
14	Promotion policy in our organisation					
15	Transparency in decision making in our organisation					
16	Existence of a Psychological climate for development					

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