

WORK TERM-II REPORT

(July 91 — Jan , 92)

CARRIED OUT AT :-
**PUROLATOR INDIA LTD.
PARWANOO**



Submitted by :
PUNEET TALWAR
Roll No. 154/87

Teacher Co-ordinator :
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**DEPARTMENT OF MECHANICAL & INDUSTRIAL ENGINEERING
THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY
(DEEMED UNIVERSITY)
PATIALA - 147 001.**

LETTER OF SUBMITTAL

$$Q = \left(\frac{T_1 - T_2}{R} \right)$$

To

Mr. Tikka Jagjit Singh,
Industrial Co-ordinator,
Centre for Industrial Liason & Placement
Thapar Institute of Engineering & Tech.,
Patiala-147001.

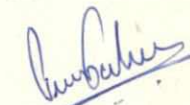
Dear Sir,

I hereby submit this Project Report for the second Work Term carried out at Purolator India Limited, Parwanoo.

PIL Parwanoo is primarily engaged in manufacturing of Automobile Filters including Air, Fuel and Lube Oil filters.

This report has been prepared by me and has not received any previous academic credit at this or any other institution.

Yours sincerely,



(Puneet Talwar)

154/87.

ACKNOWLEDGEMENT

I find it a matter of honour to present this report to my institution. I am enteremely thankful to Mr.Sunil Kaul for continously taking interest in my work and rendering valuable guidance.

I am also very thankful to Mr.A.K.Malhotra (Manager Quality Control) who with his many years of experience imparted me knowledge which helped me to get out of many problems when ever they occured.

I owe my thank to Mr.R.D.Yadav, Manager Production and Mr.Anil Sharma, Assistant Manager Production,for their help and guidance in the course of my training.

My special thanks are due to Mr.R.Kakkor (Manager Engineering) for his constant encouragement. I am also obliged to Mr. Vishwajeet Sharma (Engg.Quality Control) and Mr.Ajat Shatra (system Analyst) who helped me out of every problem when approached through out my training.

I am also grateful to all the members of Production, Quality Control, Engineering and Personnel Departments with whom I was closely associated for various projects assigned to me during my tenure of training.

And last but not the least special mention should be made here for Mr.Tikka Jagjit Singh and Mrs.Geeta Sachdev Manager Personnel,who got my training arranged with PIL Parwanoo.

SYNOPSIS

This report submitted as Work Term-II report which I carried out at Purolator India Limited (Parwanoo) from July, 1991 to Jan., 1992.

After orientation in various departments including Production, Quality Control and Engineering. Mr. Anil Kaul (Manager-Operations) assigned me a project in Production Department, with the aim of identifying the bottle necks in the production line (Main Line-II) and also to find out utilisation of both the Main Line-II and Mico Line. These work took about one and a half month. After this I was given the task of Paper Consumption Analysis. Its aim was to find out how much quantity of Filter Paper is being consumed and how much of it is going waste.

This study gave out such results that I was then told to use statistical techniques for the 'Pack Wt.'. Then onwards I was shifted to Quality Control Department under Mr. A.K.Malhotra (Manager Quality Control). In this control charts were drawn and capability Analysis of the coating plant were done. After this capability Analysis of some other operations were also done which included, Automatic Adhesive dispenser, Side sealing

Machine, FCO and centrifuging machine.

All these reports were submitted to Quality Control Department where the results and action to be taken was discussed.

These analysis marked an end to my work in Quality Control Department and then I was assigned a project in Engineering Department relating to computerisation of RMC and Bill of Materials, under Mr.R.Kakkar. There was some existing programme in D Base 3+ relating to Bill of Materials which was not being used. Some modifications were done in that programme and also a programme was made to generate RMC report.

Overall I had good exposure to various departments of the Industry and while working as a part of the organisation I gained confidence and valuable knowledge - which I think will help me through out my career.

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A COMPANY PROFILE

THE COLLABORATORS

The collaborators of Purolator India Limited are Purolator, Inc., USA. This Company is today world's oldest and leading manufacturer of filters, filtration equipment. It is also in the transportation business and has world's largest courier services.

The Company began its story in 1923 when James A. Abels started a small garage in New York City. His initial products were oil filters designed to clean dirt and metal parts from automobile engine oil. These filters were names Puro-O-Lator, a combination of the words "pure-oil-later", which described the condition of oil after being flowed through the filters.

Today this Company is not only in the business of manufacturing filters for industrial and automotive applications but also for gas, radiator and oil caps manufacturing. In addition, a wide range of filtration products are manufactured lfor general industrial, aerospace, medical and water purification applications.

Purolator, Inc. is represented today in 23 countries world over. Some of its plants with international affiliations in Canda, Venezuela, Israel, India, England, France, Germany, Itlay, Spain and Maxico etc.

THE GROUP

This Group is a creation of Mr.D.C.Anand who had a vision of uplifting the Indian automotive ancillary sector to world standards. As a starter Gabriel India Limited was established in 1961 at Mulan in Bombay in Collaboration with the world's largest independent manufacturer of shock absorbers - the Gabriel Division of Maremont Corporation, USA. Gabriel India makes a complete range for just about every application in the automotive sector.

Making rapid strides, Gabriel India diversified during 1979 and set up a multi crore project to manufacture engine bearings in collaboration with Federal - Mogul Corporation, USA, acclaimed leaders in engine bearing technology the world over. Anand engine bearings are manufactured in Parwanoo. Today, the turn over of shock absorbers and bearings stands at an impressive figure.

The Group's next item of manufacturing was gaskets. Victor Gaskets started rolling out in 1963. The gaskets manufacturing facility was set up in Nasik. In 1976 Perfect Circle piston rings were added to our Group's product range. Both gaskets and piston rings were set up in collaboration with Victor Products and Perfect Circle Divisions of Dana Corporation, USA - the world's oldest and largest manufacturers of a wide range of automotive parts.

The Indian automotive market had been missing quality filters to cater to the needs of growing sophistication in the engine manufacturing technology, hence came the idea of setting up of Purolator India in 1966 to manufacture filters for automotive and Industrial application.

Together with the above manufacturing facilities, the Group has been responsible for developing a large vendor and ancillary net work. The acknowledgement for its growth goes to its people. This is reflected in the care the Group takes to nurture skills and talents of its people by offering them growing career and not mere jobs. The Group has also made commendable contributions towards responsible citizenship. Over the years, it has played a leading role in uplifting the community life in Parwanoo.

Under the leadership of Chairman Mr. D.C.Anand and our trained and committed human resource to back, the companies are poised for substantial growth and diversification. The Group is bearing up to meet the challenges of new generation vehicles and transfer of automotive technology from world leaders.

PUROLATOR INDIA LIMITED (PARWANOO)

Purolator has roots in this country since 1966. Under a license and technical collaboration programme with Purolator, Inc.USA, it established its first plant in Delhi during 1966. Initially the manufacturing facilities were set up to cater to the growing needs of engine manufacturers and automotive sector for quality filters. Its products showed tremendous market acceptability.

During 1970, it entered into a long term association with a leading fuel injection equipment manufacturers for supplying its filters for their equipments. Since then it has never looked back. By 1975 it had established as a leading filter manufacturing Company and were producing annually over two million filters for varied applications.

With constant developments in its product range and distribution channels, the Company immediately sensed need of expansion as well as verticle integration for stricter control on quality. Consequently Facilities for in-house adhesive manufacturing, paper impregnation were set up in Gurgaon.

During 1979, the plant at Parwanoo was geared up to produce 3 million filters annually and thus the total production of filters rose to nearly 5 million annually. The following

years saw recessionary trends in the automotive sector, which was utilised by the Company in consolidation of its operations. The creation of Industrial Products Group at Gurgaon in Haryana was a land mark. The Company diversified its base into engineering pollution projects, chemicals industrial filter applications and a sophisticated press shop. Simultaneously the consolidation operations resulted in establishing the plant at Parwanoo (HP) as the most modern and biggest of its type in the country.

Today our plant at Parwanoo produces over 7 million filters annually with a range of over 400 different types. Apart from filters for diesel locomotives and automotive engines, the Company specialises in the large scale manufacture of filters for earthmoving equipment, aviation refuellers, industrial and agricultural engines, chemical industry extra.

At Gurgaon in Haryana, they have successfully diversified and set up following facilities:

**Press Assembly &
Machine shop:**

This facility has successfully developed and produced critical items required for Parwanoo plant. It has undertaken manufacturing of filter assemblies for new generation vehicles. This unit specialises in manufacturing

of oil filter assemblies for applications in Defence, tractors, heavy vehicles etc. Press Assembly & Machine Shop is now gearing up to take non filter applications requiring sophisticated Press Shop technology.

Anfilco Group:

This Group undertakes manufacturing of filters for industrial applications like pharmaceutical, electronics, computers, air conditioning and ventilation systems, photography atomic energy, air com-pressors, stationary engines extra.

Anchemco Group:

This facility is diversification into the chemical industry. Backed by a team of polymer chemists, the Group manufactures and markets a product mix comprising PVC compounds, pehnolic resins, PVA emulsions and corrosion inhibitors for applications in industries like chemical, packaging, printing inks, hand tools etc.

**Engineering
Pollution
Projects:**

This Group has done original work in designing and commissioning systems

for filtration of large supplies for drinking water, demineralisation and softening of water for thermal power stations, petro-chemical complexes, fertiliser plants as well as for waste water treatment systems.

Paper Impregnation Plant:

This facility undertakes resin coating on raw filter paper. Since last few years it has also started marketing finished filter paper packs duly slit and pleated.

CORPORATE PHILOSOPHY

- * To encourage honesty and sincerity.
- * To provide for growth and opportunity from within to all employees to the limit of their desire and ability.
- * To encourage the evolution of a code of conduct that brings out the best in people in their interaction with each other.
- * To encourage fairness but firmness in dealing with people at all levels.
- * To communicate our policies and objectives to all levels of our employees.
- * To encourage innovation and entrepreneurship.
- * To strive for responsible citizenship.

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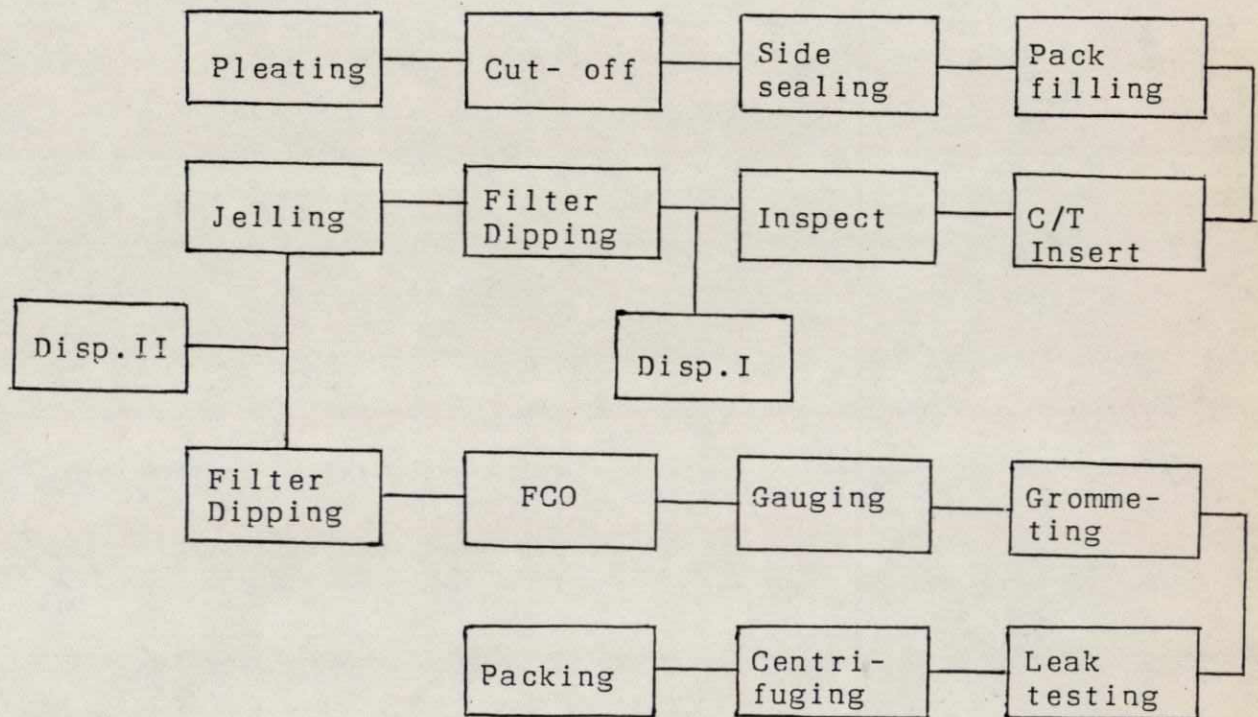
ORIENTATION

It is necessary to know about the functioning of the factory, about products it is manufacturing, about the process by which the product is being manufactured before becoming the part of the organisation and work in it and get adapted to the environment both physically and socially.

For this purpose orientation was done in different departments of the concern. It gave me an insight into the working of the organisation and in knowing the types of input being given to get the output.

In the first phase of orientation I was sent to production Department headed by Mr.R.D.Yadav (Manager) and Mr. Anil Sharma (Assistant Manager). The whole shop floor has been divided into two plants. Plant 1 and Plant 2. Plant 1 consists of mainly two Assembly lines namely Mico-line (Main line 1) and End Cap line (Main line 2). The basic operations of both the assembly lines are same but since Mico people are more quality conscions. Therefore 100% leak testing is done and also

packing is on automatic packing machine. The main operations on mico line are :-



Mico line is for the production of fuel filters which are supplied only to mico Industries Limited and consist of three types of filters of different diamensions (PI-3208, PI-3222, PI-3553) packing of PI-3208 and PI-3222 is automatic but for PI-3553 it is manual as the packing machine is not flexible for such a small size.

The other assembly line which is End Cap Line or Main Line-2 is used for, as the name suggest, filters which contains mettalic cap on its top and bottom

side. This is used for many different variety of filters manufactured for different Automobile Industries such as Telco, Mahindras & Mahindras, Ley Land, Escorts etc. These come in different dimensions and also differ somewhat in design like different number of plates, different paper grade etc. The operations are same as in case of mico line but only upto Gauging. After that there is manual packing but for testing samples are drawn tested and on its basis lots are accepted or rejected. Some other part numbers which can not be produced on these line have special machines for them installed in the plant for example sealing in case of filters having bowls, and enceptionaly large filters which can not be used in own.

In plant 1 there are again two assembly lines one is called also line (for locomotive filters) and other End disc line. Also line produces filters only for locomotives (PI-1418). Most of operation in this are manual except for pleating. In this paper is cured just after pleating after that other operations are performed manually. This group produces about 400 filters daily.

Second assembly line i.e. End disc line produces that filters which have paper disc instead of

mettalic cap on its top and bottom side. Rest of operations are almost same except for method of dispensing(i.e.Applying adhesive) is different. Previously filters firstly used to be cured and then end disc was applied on rotary. Now these two operations are being done simultaneously with the help of fixtures.

This was all about the assembly lines in the plant. Some of the filters are manufactured by ancillories situated nearby who take care of job work of purolator. Also some of the packing is also done by them.

About the Process:

A filter consists of filter paper, outer body (or outer retainer) a center tube, End cap or End disc and other attachments for mounting of filter in the automobile.

The most important of these is the filter paper which is the main filtering element wether it is, Fuel filter, Oil filter or air filter.

This filter paper has to go through certain process before being used. Firstly after receiving a raw paper from it is coated with resin by passing the

paper through a heat zone and is impregnated with resin. That jumbo reel is brought to the plant and cut to the required sizes and supplied on the different lines, where the paper is loaded on 'MARATHON', a machine which does the pleating of paper and this pleated paper is passed through a heat zone (150°C) so that pleats should stay in position. Then it is cut to required size that depends upon the filtering area required for the particular filter and it is different for different filters. Then on side sealing machine the sides of the pleated paper (which is called 'pack') are sealed with aluminium strip. Then this 'pack' is inserted in the 'outer body' which is again made of hard paper, and 'centre tube' is inserted in it. Then this assembly (consisting O/B, pack, C/T) is dipped in the 'End cap' filled with adhesive (geon), and passed through the oven at $130-140^{\circ}\text{C}$ which makes the adhesive hard and end cap sticks properly to the assembly properly. Then again filter is dipped in another end cap this time on the opposite side i.e. the Bottom cap. And again passed through an oven with temperature 170°C which on one hand makes the adhesive hard and also curing of filter paper is done. With this operation the strength properties are increased and filtering efficiency increases and resin level in paper comes to

the specified level. Then at the outlet of this oven filter is cooled down and passed through a gauge to confirm if any one is over size. Then grommeting is done on both sides of filters, and then the filters are leak tested and then sent for packing.

The last two operations i.e.(grommeting and leak testing) are only done on Mico-line while another cases only samples are taken out for leak testing. Packing on Mico-line is done Automatically while on other it is done manually.

This way my orientation in production department was completed and then I was sent to Quality Control Department.

This department has Mr. A.K.Malhotra as Manager and Mr. Manjit Prabhakar as Assistant Manager. This department has been further divided into three groups:

- 1) Receiving Inspection.
- 2) In process Inspection.
- 3) Quality Auditing
 - a) Product Auditing
 - b) Process Auditing

Receiving Inspection:

Purolator being an assembly unit, it purchases about 100 percent components from outside sources with vendors located at Parwanoo, Chandigarh, Delhi and Gurgaon. 70 percent of the vendors are located at Parwanoo itself. As vendors are back bone of the company therefore Receiving inspection plays a very important part.

Vendors supply the parts according to the specifications given to them by the company. When a lot is received from vendor it is inspected for the conformance of quality standard of the product with that of specification given by the company. Some of this inspection is done at vendor's place while other is done in the plant itself as most of the testing facilities are available within the plant. For this inspection a sampling plan IS: 2500 is used in every part but there is difference in level of inspection in case of critical, Major and Minor defects. Acceptance or rejection is taken as per appropriate AQL.

They also have a vendor Rating system which takes into consideration various elements like lots accepted and rejected value of the component, delivery of material previous rating etc.

There are many experiments which are carried out to test whether material used for a particular product conform to the companys quality standards.

Rubber components: They are tested for their hardness, tensile strength, Elongation and also Ageing (at 100⁰C for 72 hours). Electroplating. It is tested for plating thickness, test for chromate.

Outer Body: It is checked for its printing its distance from top, colour, height, length, Hole dia, perforation angle, centre to centre distance.

End Cap: They are checked for any crack, wrinkles, Burns, Dent, O.D., I.D., Flatness Inscription etc. Bowls crack, Pin holes, wrinkles, Material fault, Dent damage, O.D., sheet thickness etc.

Similarly there are various tests for other components for checking there different characteristics.

In Process Inspection: Earlier this was being done by Quality Control Department but now it has been handed over to production department. It is usually done by worker himself, he is responsible for bad quality in process, also considering the process capabilities. Check sheets have been provided to check the various venables

in different components.

Audit Inspection:

In this sampling inspection is done on the lots ready for despatch there are different tests like test for leakage, performance and other visual tests.

Performance test is done by running the filter for particular number of hours. This depends upon the type of the filters. As earlier said in case of Mico 100% leak testing is done. After that again a sample is checked for leak testing if something goes wrong the entire lot will be re-leak tested. All this was covered under product Auditing.

Process Auditing is also done to check if a particular defect is coming what are the reason for that. Process Auditor reports about the problems leading to the defect and hence the cause of the defect is rectified.

~~This completed my orientation in the~~
Quality Control Department. These were two main departments i.e. Production and Quality Control where I was sent for orientation as my most of the work was concentrated in these two departments only. About the working of rest

of the departments which were Engineering, Materials
I came to know slowly as my training progressed.

After the completion of my orientation
I was given a project in production for calculating the
capacity of the Main Line-2.

PROJECES

CAPACITY UTILISATION

AIM:

The aim of this project was to calculate the capacity of Main line 2 and also find out how much of it is being utilised and identifying the bottle necks in the production line so that they can be improved upon to increase the productivity.

INTRODUCTIONS:

Main line 2 produces the filters of different sizes varying both in a height and diameter. The assembly line consist of various operations which are performed to produce filter as an end product as described earlier. This Assembly line consist of total of about seventeen operations. For the calculation of capacity there was need of time standards for every operation. And then to find out the reasons for not getting that capacity production, study was done to look into the causes of not getting the production that should be. For these two exercises, the Time study and Work sampling were carried out.

Time study is work measurement technique for recording the times and rates of working for the elements of specified job carried out under specified conditions, and for analysing the data so as to obtain

necessary for carrying out to job at a defined level of performance.

For time study job is broken down into elements. An element is a distinct part of a specified job selected for convenience of observation, measurement and analysis. Elements should be easily identifiable, with definite beginnings and endings so that, once established, they can be repeatedly recognised. Generally the smallest element can be timed is about 0.04 minimum (2.4 second). Manual element should be separated from machine element.

For the determination of sample size or number of readings that must be made for each element, given a predetermined confidence level and accuracy margin.

For 95 percent confidence level and 15 percent accuracy, formula for calculating number of readings is

$$n = \left(\frac{40 \sqrt{n' \sum x^2 - (\sum x)^2}}{\sum x} \right)^2$$

n= sample size.

n'=number of readings taken in preliminary study.

E= sum of values.

x= value of readings.

Next part is Rating. It is the assessment of worker's rate of working relative to the observer's concept of the rate corresponding to standard pace. And the standard performance is the rate of output which qualified workers will naturally achieve without over exertion as an average over the working day or shift, provided that they are motivated to apply themselves to their work. This performance is denoted as 100 on the standard rating and performance scales.

The purpose of rating is to determine, from the time actually taken by the operative being observed, the standard time which can be maintained by the average qualified worker and which can be used as a realistic basis for planning, control and incentive schemes.

The rating factor is used for calculation of Basic time.

$$\text{Observed time} \times \frac{\text{Rating}}{\text{Standard rating}} = \text{Basic time}$$

$$0.2 \text{ min} \times \frac{80}{100} = 0.16 \text{ min.}$$

$$\text{Basic time} = 0.16 \text{ min.}$$

The basic time (0.16 min) represents the time of element would take to perform if the operative

were working at the standard rate, instead of the faster one actually observed. In actual practice the multiple observed time $\times$ Rating taken over a large number of readings for various reasons as :-

- * Variation in work content of the element.
- * Inaccuracies in noting and recording observed times.
- * Inaccuracies in rating.
- * Variations due to rating to the nearest five points.

Now when we have with us the Basic time i.e. observed time $\times$ observed rating and recorded them on a specifically designed study sheet the next step is to calculate the standard time.

For this during the study other elements should also be noted down which are occasional and their frequency of occurring and their duration should also be noted down.

But this is not all the total work content is defined as the amount of work done to complete a job but in time study it bears a little different meaning which is :-

Basic time + relaxation allowance + any allowance for additional work - e.g. part of contingency allowance which represent work.

Even when the most practical economic and effective methods have been developed, however, job will still require the expenditure of human effort and some allowance must therefore be made to enable a worker to attend to his personal needs, and other allowances may also have to be added to the basic time in order to give the work content.

Relaxation allowances are an addition to the basic time intended to provide the worker with opportunity to recover from the physiological and psychological effects of carrying out specified work under specified conditions.

It has two major components.

Fixed allowances and variable allowances:-

Fixed allowances are composed of:-

- i) Personal need allowance - 5 percent of basic time.
- ii) Basic fatigue allowance - ienerally 4 percent of basic time for a person who is carrying out the job while seated,who

is engaged on light work in good working conditions and who is making normal use of hands, legs and senses.

Variable allowances are added to fixed allowances when working conditions differ markedly for those stated above.

Mostly these allowances are calculated from the tables on the basis of points.

Sometimes it is necessary to incorporate allowances other than relaxation allowances in the compilation of standard time. They are

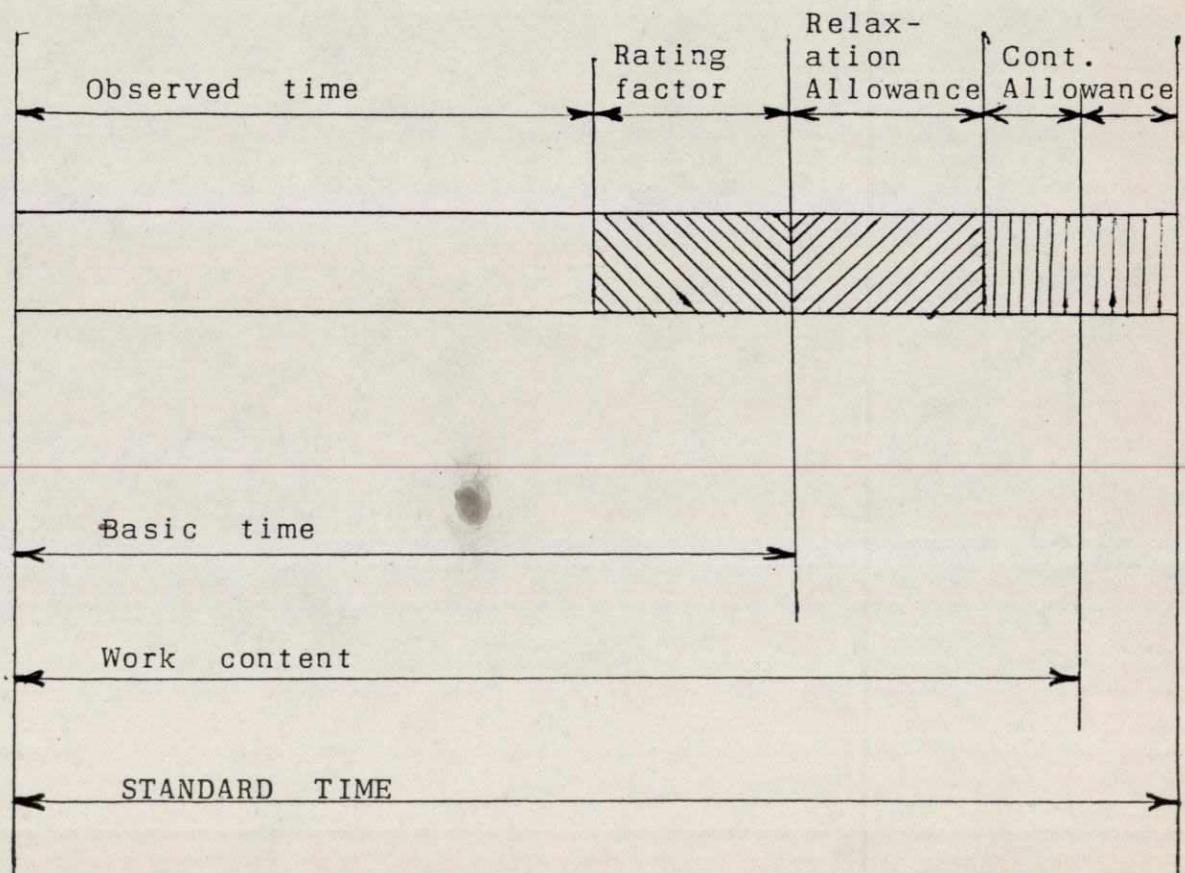
Contingency allowances is a small allowance of time which may be included in a standard time to meet legitimate and unexpected items of work or delays, the precise measurement of which is uneconomical because of their infrequent or irregular occurrence.

It provides for all unavoidable delays as well as for occasional and minor extra work.

Contingency allowance should not be greater than 5 percent, and should only be given in cases where the study man is absolutely satisfied that the contingencies can not be eliminated and they are justified.

There are other special allowances which may be given for any activity which are not normally part of operation cycle but which are essential to the satisfactory performance of the work e.g. start-up allowance, shut down allowance, dismantling allowance, charge-over allowance, Reject allowance, excess work allowance, learning allowances, training allowances, small batch allowance.

After adding the required allowances to the basic time then we reach at standard time. It is the total time in which a job should be completed at standard performance.



This was the procedure how standard time is setup for a job.

WORK SAMPLING:

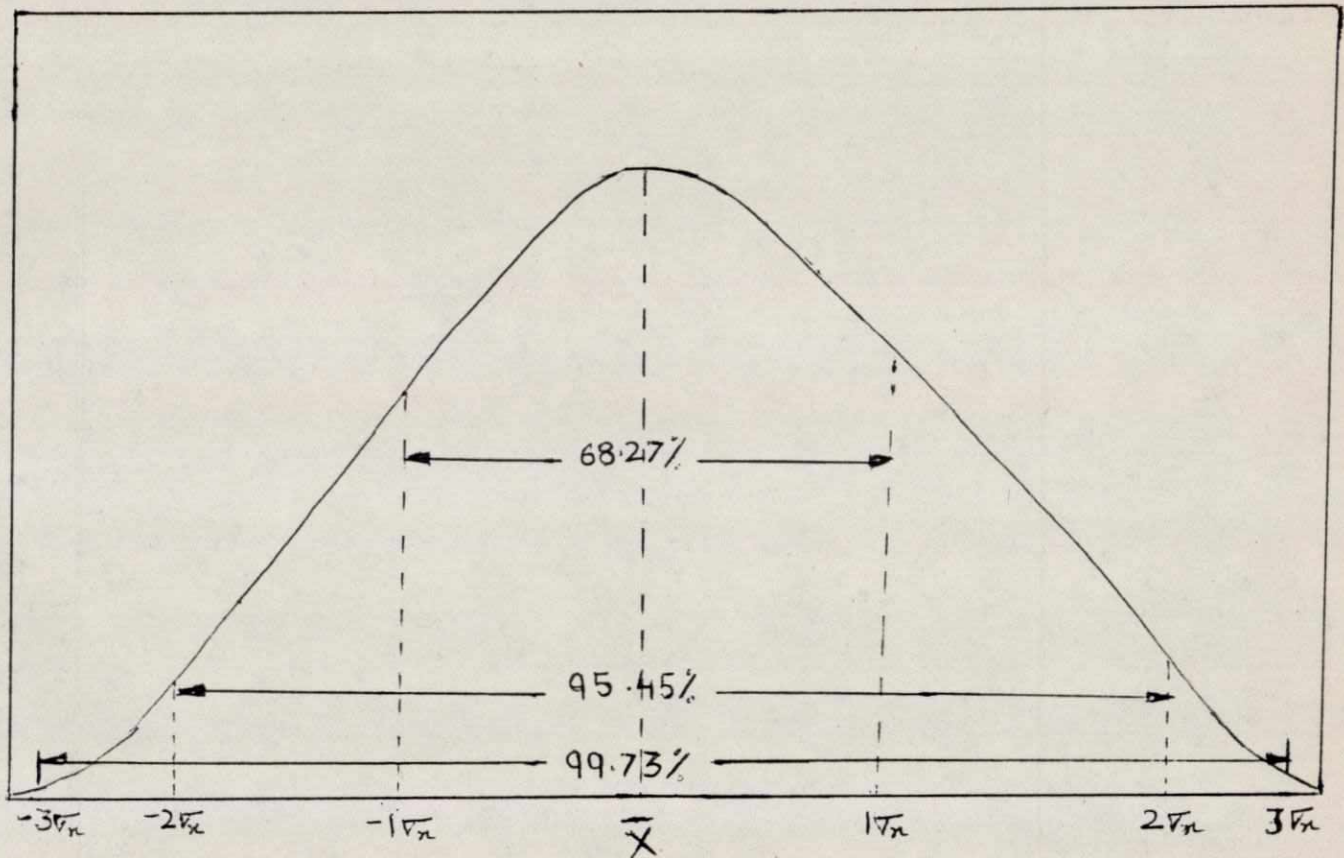
It is method of finding the percentage occurrences of a certain activity by satisfical sampling and random observations.

It is used to obtain a complete and accurate picture of the productive time and idle time of machines in a specific production area, it would be necessary to observe them continously all the machines in that area and to record when any why any of the machine were stopped.

As it is not possible to do this unless a large number of workers are employed on this task alone.

Therefore, next method has to be adopted, that of making tours of the factory at random intenals, noting which are stopped, and noting the cause of each stoppage. This is basis of the work sampling techniques. When the sample size is large enough and the observations made are in deed random, there is quite a high probability that these observations will reflect the real situation, plus or minus a certain margin or error.

We should have certain level of confidence in our observation, with some error (plus or minus). This is given by normal distribution curve.



95 percent confidence level or 95 percent area under curve = $1.9\sigma_p$

99 percent confidence level or 99 percent are under curve = $2.58\sigma_p$

99.9 percent confidence level or 99.9 percent are under curve = $3.3 \sqrt{p}$

If we take a large sample at random we can be confident that in 95 percent of the cases our observations will fall within $\pm 1.96 \sqrt{p}$, and so on for the other values.

As values defining the confidence level for our observations, we have to decide on the margin of error that we can allow for these observations.

For this there is statistical method, in which formula used is

Where

P = standard error of proportion.

P = Percentage of idle time.

q = Percentage of working time.

n = number of observations of sample size we wish to determine.

Before we can use this formula, however, we need to have atleast an idea of the values of P and q. Thus first step is to carry out a number of random observations in the working let us assume some 100 observations were carried out as a preliminary study at random,

and that these showed the machine to be idle in 25 percent of case ($p=25$). We thus have approximate value for P and q , in order now to determine the value of n , we must find out the value of $\sqrt{P}$

Let us choose the confidence level of 95 percent with a 10 percent margin of error (that is we are confident that in 95 percent of the cases our estimates will be + or - 10 percent of the real value).

At the 95 percent confidence level

$$1.96 \sqrt{P} = 10$$

$$\text{Therefore } \sqrt{P} = 5 \text{ (app)}$$

$$\text{Now } \sqrt{P} = \sqrt{\frac{Pq}{n}}$$

$$\text{Therefore } 5 = \sqrt{\frac{25 \times 75}{n}}$$

Therefore $n = 75$ observations.

If we reduce the margin of error to 15 percent, we have

$$1.96 \sqrt{P} = 5$$

$$\sqrt{P} = 2.5$$

$$\text{Therefore } 2.5 = \sqrt{\frac{25 \times 75}{n}}$$

: 30 :

or $n = 300$ observations.

To ensure that observations are made at random. Random table is used and we can keep of changing timings of visit daily so that more clear picture can be obtained.

PROCEDURE (Carrying out studies)

For the calculation of the capacity time standards were needed. Since there were no existing standards so the first step was to establish time standards. For this purpose whole of the assy line was eritically observed for a week to know how every operation is being carried out and also the rough idea about the rate at which the operation was being performed, so that there should n't be much difficulty while rating particular operator.

Thus the list of operations was made, and also manpower against each operation was noted, as shown.

Study sheet was prepared.

Since there were many part numbers that were being assembled on that assy line and it was difficult to study all operations of each part number, therefore,

three categories were made - small, medium and large taking into consideration their height and diameter. Then study was started. For performance rating Westing House system of Rating was used. Since the cycle of operation was very small therefore, in some cases it was not possible to time the whole cycle accurately as the cycle time was 3-4 sec. In that cases five cycles were joined together to form one cycle. And the Basic time taken for actual one cycle was calculated based upon the performance rating. Then after taking five readings the total number of observations needed were calculated by formula as explained before.

Then total number of observations were taken. During these observations, elements other than regular elements and their observation were also noted. So that they can be included in calculation of standard time. After taking all observations average basic time of all observations was taken for calculation of standard time. Also the average basic time of occasional element was taken.

Then Relaxation allowance was calculated from the ILO tables. And were added in the total basic time and hence the standard time of one operation was calculated.

Same procedure was applied for all other operations and observations were taken for the FILTERS belonging to all the three categories. Observation on three part numbers belonging to each category were taken. Then average of their standard time (which were nearly equal) was taken to represent standard time of that category.

Now we had with us standard time of every operation on Main line 2 and for all the three categories i.e. small, medium and large. And I also knew the manpower of each operation being performed. This way Ideal capacity of each operation was calculated, as shown, for all three categories.

Now after we had with us the ideal capacity of each operation and hence we knew the ideal capacity of the line for the three categories which was obviously greater than the actual production they were getting daily.

Second phase of this project was to find out the reasons why they were not getting the capacity production. For this snap-study (work sampling) was carried out. For that firstly study sheet was prepared bearing the names of operations to be visited along X - axis, and time at which the observations are to be made along

Y - axis. The timings at which visits had to be made were selected randomly with the help of random numbers table. Confidence level of 95 percent and the standard error of 10 percent was taken for the calculation of number of observation was taken. Then preliminary study was done and for that 50 observations were taken. At every visit the mode of operation was noted down in front of every operation e.g. whether it is being performed setting up, gone for personal needs, waiting for supplies from previous work station or shortage of material etc.

Then the total number of observations needed were calculated from the formula as explained earlier. The study was continued to take the rest of the observations, which took about one week before the study was completed. Then the data was used to calculate the percentage utilisation of the operations and to highlight the reasons for not getting the capacity production. A graphical representation of operation utilisation is shown.

This completed the study part of the project. Next part was of results of conclusions.

RESULTS AND CONCLUSIONS:

The results obtained from time study are

as shown in the sheet attached. From which we can see in all the three cases i.e. large, medium and small, C/T insertion and O/B stitching is restricting the production which could otherwise be increased very much. And in case of picking outer Retainers (O/Rs), the operator is free for about fifty percent of time and same is the case with the operator at Marathon.

It was clear from the results that there was need of modification in c/t insertion and o/b stitching operations. It can be seen that ideal capacity presently for

Large Category	= 5200
Medium Category	= 6400
Small Category	= 7400

Now coming to utilisation part as results showed there is 67 percent utilisation of the present capacity of Main Line 2.

Operation 'Picking from Jeller' has got the least utilisation that is due to two main reasons. Firstly, 12% of time operator is away due to no supplies and for same percent of time he/she is substituting for some other worker that too because of same problem i.e. line balancing. Other machines which had the same low

utilisation were Marathon and cut off. It was found that 35 percent of time the marathon machine was idle because it has produced 'packs' in excess which were not being consumed at next station i.e. 'side sealing'.

'Pack filling' operation was found being performed for 90 percent of time, which had the highest utilisation and if allowances are added it comes out to be 95 percent. That was because it was a total manual operation and was continuously being substituted by one operator or other. Same was the case with c/t insertion. Both were being substituted by operator from 'Inspection' or 'cut off'.

All these results were discussed with Mr.Anil Kaul, Mr.R.D.Yadav and Mr.Anil Sharma so that necessary action could be taken in increasing production by utilising the available man-power and getting capacity production. All the bottle-necks were made clear which included the reason for low utilisation of machines as well as high cycle time of some operations like 'Pack filling', 'O/B stitching' and 'c/t insertion' in case of filter belonging to 'large' category. This completed the project and results were submitted to all concerned. After this study of Main Line-2, I was told do same study on Mico-line i.e. finding out percentage utilisation of various machines and operations on that line. Mico-

line consisted about 20 operations in all. Study was made on the same lines as that of main - line 2. This study took about, on the whole twenty days. It was found that its utilisation was 76 percent which was more than Main line 2. This finished the first phase of the project which included capacity calculation of Main Line and utilisation of both Mico line and Main line 2. Comparative results of two Assembly lines as shown.

O P E R A T I O N S	S T A N D A R D T I M E (secs)			I D E A L C A P A C I T Y		
	PER DAY			PER DAY		
	LARGE	MEDIUM	SMALL	LARGE	MEDIUM	SMALL
MARATHON	1.7	2.3	1.8	16235.	12000	15333.
CUT OFF	4	3	3.2	6900	9200	8625
SIDE SEALER	4.3	3.2	3.1	6413.6	8625	8703.2
PICKING BARs	2	---	---	13000	---	---
PACK FILLING	4.3	3.7	3.7	6413.6	7459.4	7459.4
CAT INSERTION	5.3	3.2	3.7	5207.5	8625	7459.4
GAUSSTICHING	5	3.8	3.4	5520	7263.1	8117.6
CND CUTTING	4.2	2.6	2.4	6571.4	10615.	11500
INSPECTION	4.5	3.5	3.1	6133.3	7085.7	8703.2
DISPENSER-1	3.3	2.4	2.4	8363.6	11500	11500
FILTER- DIPPING -1	4.8	4.3	3.6	5750	6410.6	7666.6
PLACING IN JELLER	2.8	1.6	1.5	7057.1	17250	10400
PICKING FROM JELLER	1.8	1.5	1.5	15333.	10400	10400
DISPENSER-2	3.3	2.4	2.4	8363.6	11500	11500
FILTER DIPPING-2	4.8	4.3	3.6	5750	6410.6	7666.6
PLACING IN FCG	2.8	1.6	1.5	7057.1	17250	10400
GAUSING	3.2	2.2	2	8625	12545.	13000

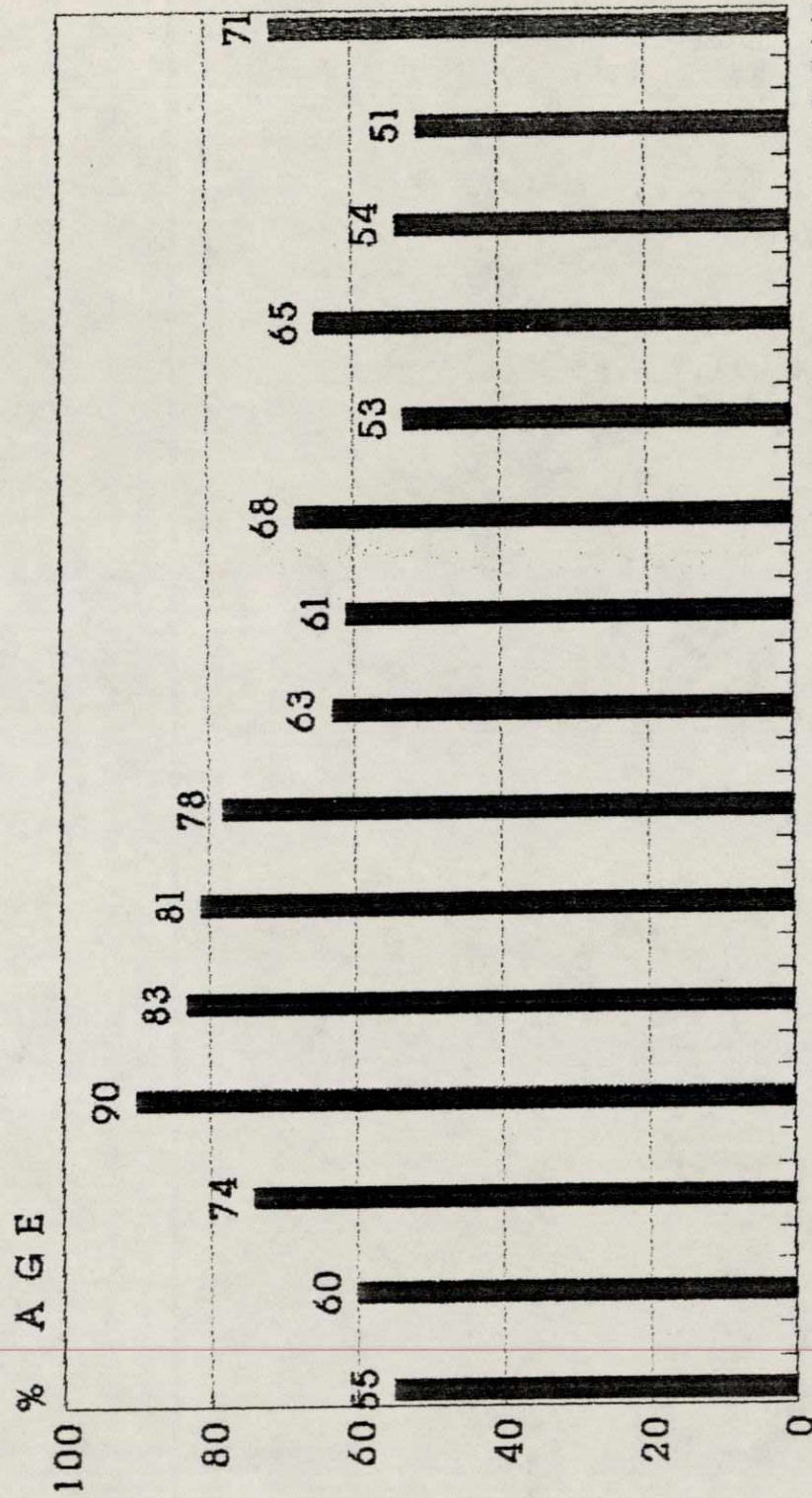
O P E R A T I O N S																
REASONS	M. THON	CT. OFF	IS. SEAL	PACK. F	CT. INS	STICK	INSPECT	DISP-1	IF. DIP-1	P. IN. J	P. FRM. J	IF. DIP-2	DISP-2	P. IN. FCB	GAUGING	
NO. OF TIMES OPERATION BIENG PERFORMED (IN % AGE)	---	55.00	160.00	174.00	190.00	193.00	181.00	178.00	163.00	161.00	160.00	153.00	65.00	154.00	51.00	71.00
DOWN		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SET UP		5.00	0.00	5.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REPAIRS		0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
EXCESS		35.00	126.00	0.00	0.00	0.00	0.00	0.00	113.00	3.00	0.00	3.00	4.00	117.00	3.00	0.00
NOT BIENG PERFORMED (IDLE)																
SUPPLIES		0.00	0.00	0.00	2.00	2.00	0.00	0.00	3.00	2.00	2.00	3.00	4.00	2.00	6.00	5.00
SUBSTITUTING		0.00	0.00	4.00	3.00	2.00	4.00	10.00	5.00	0.00	0.00	112.00	11.00	10.00	14.00	5.00
PERSONAL		1.00	1.00	4.00	2.00	5.00	4.00	5.00	5.00	0.00	6.00	9.00	7.00	7.00	9.00	6.00
AWAY		2.00	2.00	1.00	1.00	5.00	2.00	4.00	5.00	10.00	6.00	112.00	5.00	0.00	10.00	5.00
TALKING TO																
SUPERVISOR		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00
WORKER		1.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00	3.00	2.00	0.00	0.00	1.00	1.00	0.00
IDLE		1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00
WAITING		0.00	2.00	2.00	2.00	3.00	0.00	3.00	0.00	3.00	6.00	7.00	5.00	0.00	7.00	6.00

% AGE UTILISATION OF MICO - LINE

		M.TON	CT.OFF	S.SEAL	P.FILL	C\T INS	10\B CUT	STICH	INSPECT	DISP-1	F.DIP-1	F.DIP-2	DISP-2	GAUGING	PICK	GROMETTING	LK.TESTING	CENT.FUGE	INSPECT	MVC	PACKING
		1	1	2	3	2	1	2	1	1	3	3	1	1	1	1	4	2	2	1	3
NO. OF TIMES OPERATION BEING PERFORMED (IN % AGE)	MAN POWER->	46.00	50.00	73.00	79.00	71.00	83.00	75.00	92.00	79.00	75.00	72.00	75.00	74.00	96.00	94.00	65.00	83.00	84.00	85.00	74.00
NO. OF TIMES OPERATION NOT BEING PERFORMED (IN % AGE)	B.DOWN	---	---	---	---	1.00	---	2.00	---	---	---	---	---	---	---	---	---	---	---	5.00	---
	SET UP	1.00	---	2.00	---	---	---	---	---	1.00	---	---	---	---	---	1.00	---	---	---	---	---
	REPAIRS	1.00	---	4.00	---	---	---	---	---	---	---	---	---	---	---	---	---	2.00	---	5.00	---
	EXCESS	50.00	48.00	2.00	1.00	---	8.00	9.00	1.00	16.00	---	---	16.00	---	---	---	1.00	---	---	---	---
	SUPPLIES	---	1.00	---	1.00	3.00	1.00	1.00	1.00	1.00	0.50	4.00	5.00	15.00	2.00	2.00	4.00	3.00	2.00	4.00	8.00
	PERSONAL	---	---	6.00	6.00	8.00	3.00	4.00	---	1.00	7.50	7.00	---	3.00	1.00	2.00	6.00	1.00	7.00	---	6.00
	AWAY	1.00	---	11.00	11.00	14.00	3.00	8.00	1.00	1.00	12.00	13.00	1.00	4.00	1.00	1.00	14.00	3.00	4.00	0.50	7.00
	TALKING TOO	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	SUPEVISOR	1.00	---	---	---	---	1.00	---	1.00	1.00	2.00	1.00	0.50	---	---	---	0.50	---	---	---	0.50
	WORKER	---	---	---	0.70	2.00	1.00	1.00	---	---	---	1.00	1.00	1.00	---	---	3.00	---	2.00	---	0.50
	IDLE	---	---	1.00	---	---	---	---	---	---	---	---	0.50	3.00	---	---	3.00	---	---	---	---
	WAITING	---	1.00	---	1.00	1.00	---	---	4.00	---	3.00	2.00	0.50	---	---	---	0.50	1.00	1.00	0.50	4.00
	HELPING	---	---	1.00	0.30	---	---	---	---	---	---	---	0.50	---	---	---	3.00	---	---	---	---
	IDLE/INT	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	7.00	---	---	---

OPERATION UTILISATION

MAIN LINE 2

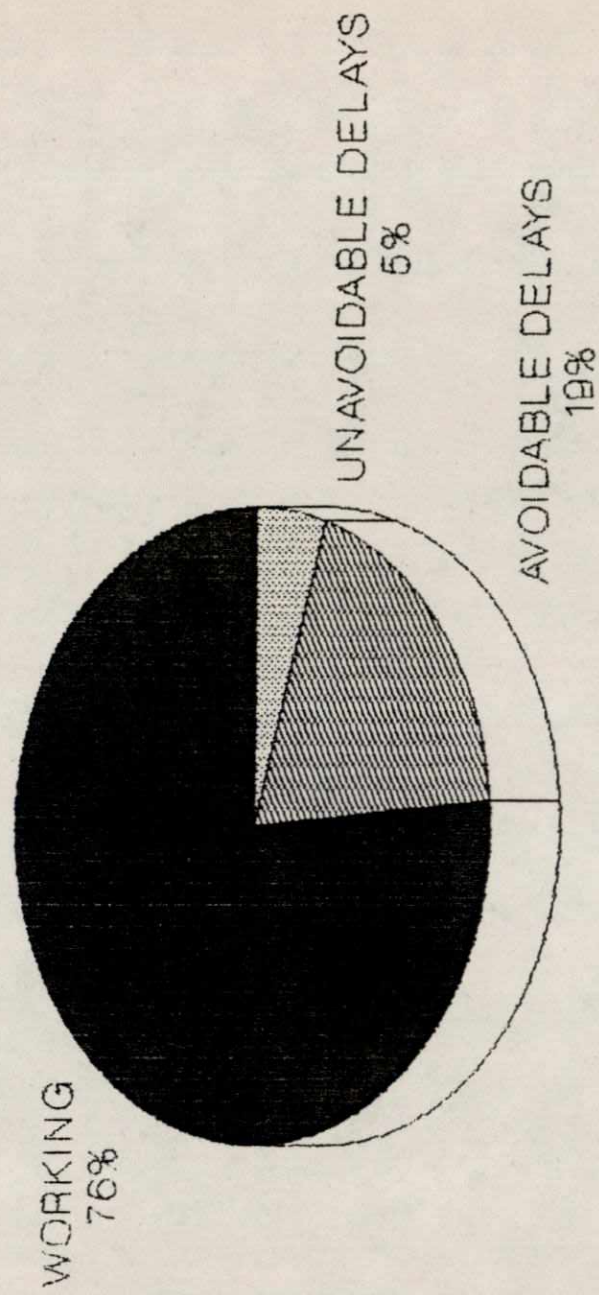


M.T., C.O., S.S., P.F., C/T, ST. INS, D-1, F.D.I, P.F.J, F.D.2, D-2, P.I.F.G.A.U.G.

OPERATIONS

% AGE UTILISATION

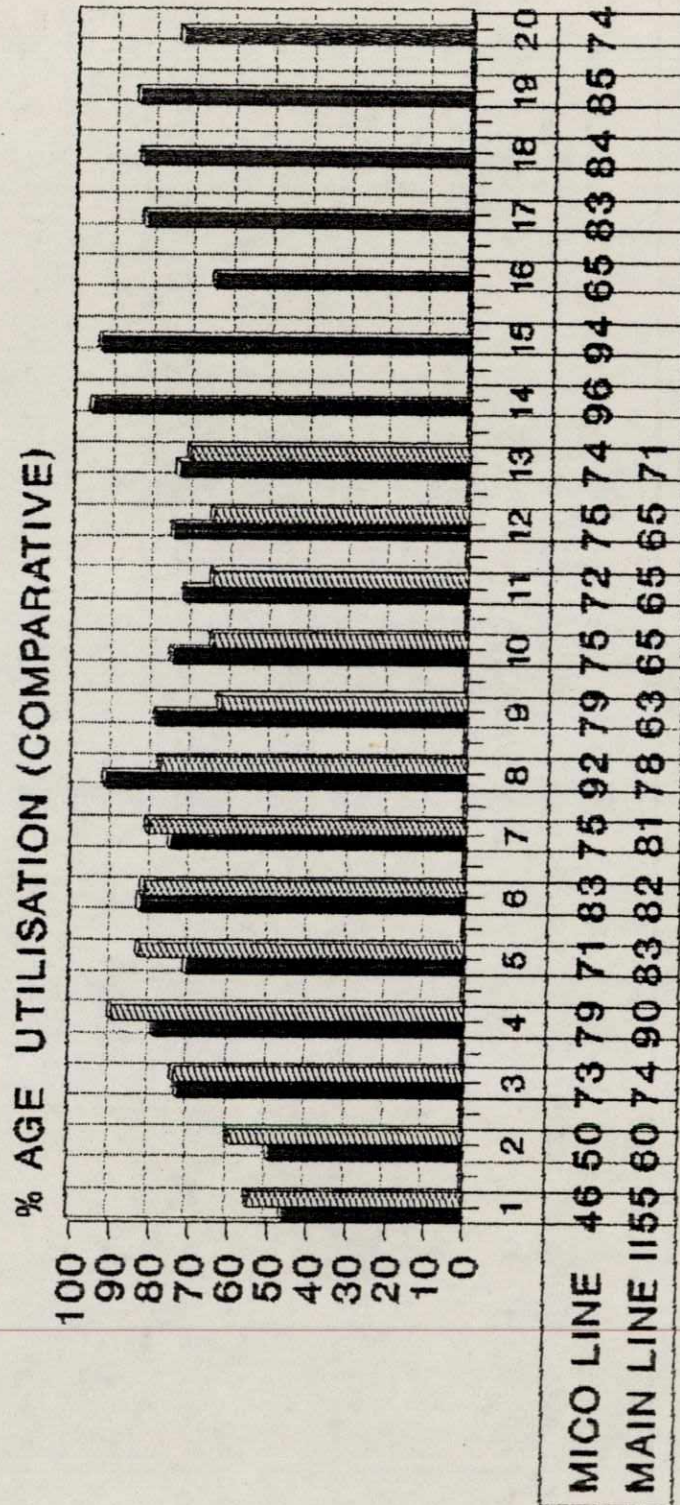
MICO LINE



DELAYS

OPERATION UTILISATION

ML-2 & MICO LINE



OPERATIONS ---->

■ MICO LINE ▨ MAIN LINE II

1,2,3,4....20 ARE OPERATIONS

PHASE TWO

Aim: Aim of this assignment was to calculate capacity of the three machines on Mico line i.e. Leak testing, centrifuging and Packing machine and also draw the Multiple Activity chart for centrifuging operation as there were two machines and one worker, to get ideal sequence of operations to be performed on two machines.

INTRODUCTION:

Leak testing machine is used for testing the filters by dipping in oil before being packed. 100 percent leak testing is done in case of mico filters. One machine can handle at a time six filters and there are four such machine, that means at one time, twenty four filters can be leak tested. Next to it is centrifuging machine which is used to extract the oil from the filters which got in while testing the filter for leakage. One machine can handle twelve filters at a time and there are two machines which are being handled by one worker. After centrifuging filters are conveyed to packing machine which packs the filter in a carton and then those cartons are picked up and placed in a large carton, manually.

PROCEDURE

Firstly study was done on leak testing

MULTIPLE ACTIVITY CHART

MACHINE(S) : 2

WORKER(S) : 1

OPERATION : CENTRIFUGING

% AGE UTILISATION

LOCATION : Mico - LINE

MACHINE(S)

MACHINE A : 100 %

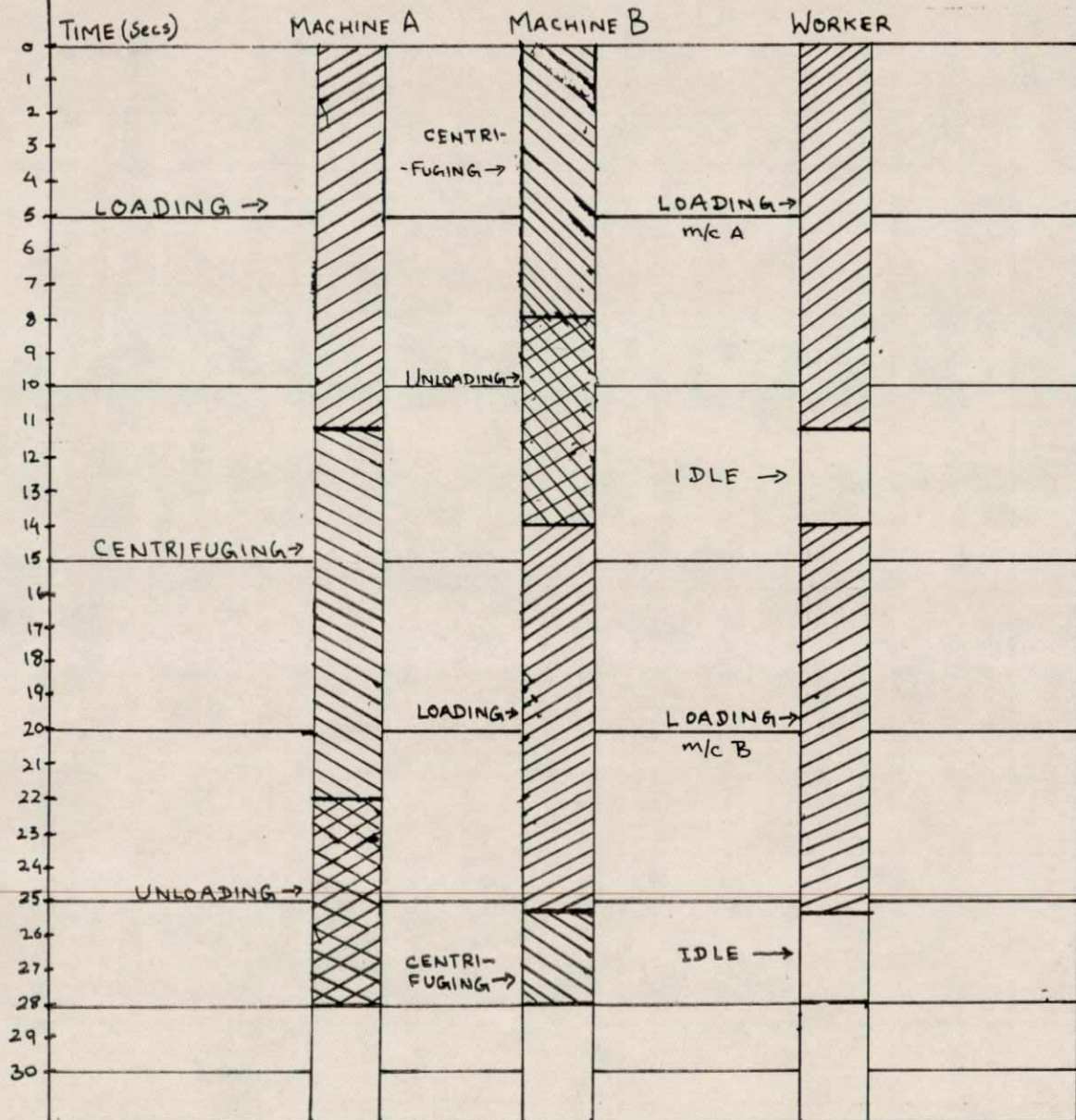
MACHINE B : 100 %

CHART NO. : 1

SHEET :

WORKER : 81 %

DATE : 18/9/91



PAPER CONSUMPTION ANALYSIS.

AIM; This project was aimed at study of different grade filter paper being consumed daily so that the point of wastage could be located and improved upon. This was generally carried out on two grades i.e.No.72 and J012.

INTRODUCTION:

Filter whether small or big has one component which is the most important i.e. Filter paper. Different filters have different paper grade of filter paper according to the design specified for that particular filter. These filter paper have been grades which bear standard names like No.72, JO 12, No.83 etc. They all vary in their GSM and resin content.

As the study first was concentrated on Mico-line as it produces on average 13000 packs daily i.e. on an average about 300 kg. of paper is consumed daily in single shift. Therefore, this time automatically becomes the local point of over study to begin with. This assembly line which produces PI-3208, PI-32228 and PI-3553 consumes paper grade No.72 only. Pack - It is term used for pleated filter paper which is to be filter contains.

PROCEDURE:

A format was prepared having columns

as shown. O/Stk pertains to the balance paper of previous day i.e. old stock. As filter paper comes in rolls. Rolls issued to Mico line were weighed in the morning i.e. at the start of shift. Also previous days stock was also weighed thus giving us the total weight of paper on the line at the beginning of the shift.

Now there is standard 'Pack weight' associated with each part number as specified by the design. As in our case it was 22.32 gms. (for PI-3208) and 5.21 gms (for PI-3553). But this is not so in every case as there is some variation. So to know the average pack weight being consumed 50 packs were weighed every hour and then their average was taken to represent the actual pack wt. observed during the day. After end of the shift balance paper left on floor, unused, was weighed thus giving us the total weight of the paper consumed. Also the know the number packs run, therefore, we could calculate the paper consumed as per pack weight. So we get two different values of the paper consumed i.e. one by directly weighing the paper issued and paper left back and other by Actual pack weight X Number of packs run.

Difference of these two values gave us the total wastage. Though some of the wastage was explainable due to do some defects and rejected packs, some

was unexplainable. The latter attracted the major attention. Also the duration from standard was calculated. Let us take first reading for example:

Old stk - (A)	= 118 kg.
Paper Issued (B)	= 250 kg.
Total paper issued (A + B)	= 368.0 kg.
Balance paper on floor (C)	= 85.6 kg.
Net paper consumed	= 282.4 kg(A + B - C)
Packs Run (in that shift)	= 13400.
Actual Pack wt. observed (E)	= 19.8 gms.
Paper consumed as per pack wt. (D X E)	= 265.32
Wastage : F = (A+B-C) - (DxE)	= +17.08 kg.
Out this explainable : 4.0(S/Wt)+ 3.0(R/D)+ 1.3	= 8.3 kg.
Unexplainable	= 8.78
Also standard pack weight for PI-3208	= 22.32 gms.
Standard consumption (G) 22.32 x 13400	= 299.0 kg.
Wastage as per standard (A+B-C) - G	= - 16.6 kg.

That means there is an under consumption as compared to standard. This way the study was carried out for twenty days.

RESULTS & CONCLUSIONS:

These analysis revealed two very important

aspects where on one hand there is alarming wastage, i.e. on an average about 25 kg. of filter paper daily. Of which about 10 kg. is explainable due to reject and rest was un-explainable. This gave us indication that process has to be looked after.

On other hand this study revealed that overall there is an under consumption of filter paper as compared to standard consumption i.e. Actual pack weight (20.15 gms) was less than the standard pack weight (22.32 gms.). These results when discussed with the concerned people including Manager (Quality Control) it was decided to carry out a detailed study and assess the process capability of filter paper coating plant (situated at Gurgaon) so that it can be improved upon. There on I was shifted to Quality Control Department under Mr.A.K. Malhotra for carrying out further study.

GSM VARIATION ANALYSIS

MONTH-NOV-91

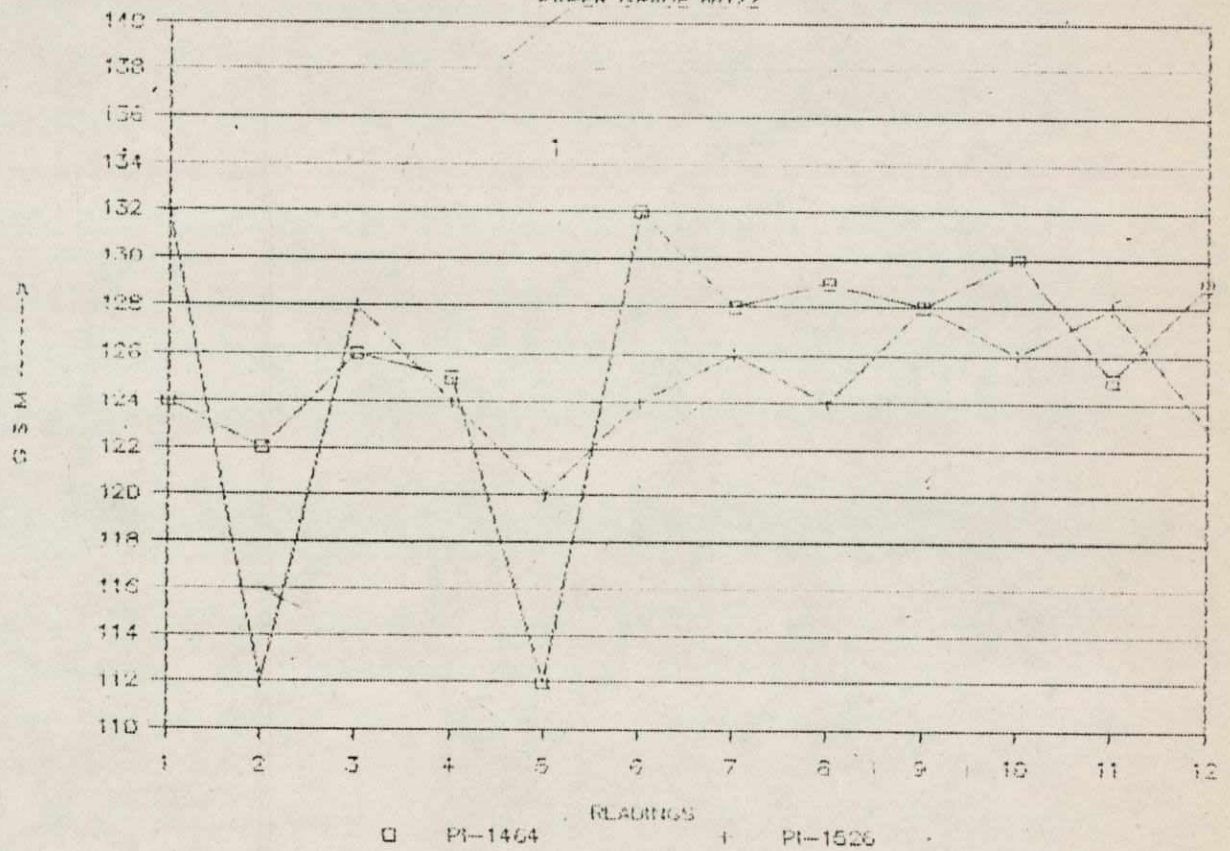
S.NO.	PAPER	AVG.STD.	AVG.ACT.	%	STD.CON.S.	ACT.CON.S.	VAR.
	GRADE	GSM	GSM	DIFF.	KGS	KGS	KGS
1	N072	123	128	+4.06	7580	7845	265
2	J012	176	175	-0.53	7497	7487	-10
3	OTHERS	-	-	-	6863	6863	-
					21940	22195	255

OVERALL IMPACT = 1.16%

PIL PWN-MOR

C S M STUDY

PAPER GRADE NO72



PROCESS CAPABILITY ANALYSIS

When paper consumption analysis gave results, it was decided to apply statistical Quality Control techniques so that process should be brought under statistical control.

AIM

This project was aimed at computing the process capabilities. In the beginning it was aimed at Filter Paper which was later on extended to various operations including side sealing, Dispensing, FCO and Centrifuging.

INTRODUCTION

In this Process Capability Analysis various SQC tools were used including Frequency Distribution Curves, Control Charts (both variable and Attributes), Pareto Diagram, A Frequency Distribution gives a 'bird's eye view' of the pattern of variation in a set data. First of all it tell us where the most of observations duster around. It also shows the over all scatter of the observations. We can also know whether it is having only one piak of concentration or more than one.

CONTROL CHART

Is a chart on which the values of the

quality characteristic being controlled are plotted in sequence. The charts consists of a central line and two statistical limit lines called upper control limit and lower control limit, which indicate Natural Variation for a sample '**statistics**' being plotted.

Sample constituting rational subgroups are taken at intervals as the manufacture proceeds and suitable '**statistics**' computed from the sample measurements are plotted on control chart.

Product streams can be divided into homogenous groups with reference to time or other characteristics, ensuring that Products in the group have been made under conditions of statistical control. Rational subgroup is a sample which represents a homogenous group. Assignable causes cause variation between groups. Control charts check whether the variation between groups measured by Subgroups difference is in conformity with the variation within subgroup control limits are usually placed at mean = ± 3 standard deviation. The standard deviation represents the variability within a rational subgroup.

In order to ensure that the production of defectives (not conforming to specification) is minimised, we have to exercise control over a large level as well as variability. For controlling the average level,

the appropriate chart is $\bar{x}$ chart where the subgroup average ($\bar{x}$) are plotted in time sequence. Similarly for controlling the variability, the chart to be used is Range for R - Chart where the statistic plotted is the sample ranges (R). Assuming that the measurable characteristic follows Normal Distribution the formulas for the Control limit in the $\bar{x}$ and R charts are given as follows:

Chart for	Central line	Upper control limit	Lower control limit.
Average $\bar{x}$	$\bar{\bar{x}}$	$\bar{\bar{x}} + A_2 \bar{R}$	$\bar{\bar{x}} - A_2 \bar{R}$
Range R	$\bar{\bar{R}}$	$D_4 \bar{R}$	$D_3 \bar{R}$

Where

$\bar{\bar{x}}$ = Average of Sample Average.

$\bar{\bar{R}}$ = Homogenised Average Range.

For routine operation of control chart $\bar{\bar{x}}$ is to be replaced by target value A_2, D_3, D_4 , are constants are constants depending on a subgroup size for a given data, we have

Subgroup size	= 5
A_2	= 0.577
D_3	= 0

$$D_4 = 2.1150$$

$$D_2 = 2.326$$

After we have plotted the ranges on the chart, we shall detect the abnormally high ranges which are likely due to some assignable cause all range values should fall within limits. If any range violates the limit, it is an indication that it does not belong to the set of remaining range values. In that case eliminate that observation and re-examine the control aspect for the remaining observations. This procedure known as 'Homogenisation' of ranges is continued till we are left with a set of ranges which falls within the latest revised control limits. Average of the remaining ranges is called "Standard Average Range".

In this process more than 25% of the points (observations) are to be discarded, this indicated process is very much disturbed and these should not be used for future control.

Long run average value of $\bar{R}/\sigma$ where σ is the population standard deviation stabilises at a constant value denoted by ' d_2 ' which again depends upon the subgroup or sample size. So standard deviation is provided by $\frac{\bar{R}}{d_2}$ i.e. $\sigma = \frac{\bar{R}}{d_2}$

Some procedure of homogenisation is applied for sample averages i.e. for $\bar{x}$ chart.

PROCESS CAPABILITY:

When a process is truly under full technical control, the charts for both the means and ranges will show complete homogeneity. The pattern of variation of individual products can then be taken to be stable and a measure of the variation is given by the standard deviation (σ) of the individuals, estimated by $\bar{R}/D_2$ from control chart data. The process is then capable of producing practically every item within plus or minus 3 standard deviations from the objective means. The width (6σ) which is inherent variability of the process is given a special name 'Natural Tolerance'.

If the Natural Tolerance, of the process is smaller than the specified tolerance, almost all the items produced will meet the specifications if the process is appropriately controlled. In this case specification can be squeezed.

If natural tolerance is equal to the specified tolerance careful centering of the process is all the more important and if no defectives are to be allowed, the process average should be maintained at the specification mean. Any departure from the standard either

in average or variability is bound to raise the rejection rate.

If Natural tolerance is greater than the specified tolerance, production of an appreciable quantity of defectives is inevitable even if the process average is centered at the specification mean. Any adjustment in the process will lead to further a variability.

It may be economical to work at a level where scrap of waste can be reduced at the cost of an increase in rework with an eye of total economy. The optional settling for central value that minimise total loss on account of scrap and rework is given by

$$u = \frac{U+L}{2} + \frac{\sqrt{2}}{U-L} \left(\log_{10} \frac{L_u}{L_o} \right) \cdot \frac{1}{0.4743}$$

Where U and L are Upper and Lower specified limits, 6J is the Process capability and L_u and L_o were the monetary losses due to oversize and under size respectively.

Also it will worthwhile to investigate whether failure to comply with the specifications necessarily implies that the product would be unable to serve the purpose for which it was designed, leading to the possibility of realning the specified tolerances to the extent of Natural Tolerance.

Alternatively it may be examined whether it would be economical to effect a fundamental change in the process to reduce the variability so that all products conform to the specifications. It may also be examined whether this job can not be done on another machines capable of holding precise tolerance, or can be accomplished through buildable changes and in improvements in the process.

THE ANALYSIS:

COMPONENT: FILTER PAPER (PACK):

As the previous study revealed that there is under consumption of filter paper in pack weight, less than the specified standard, therefore, further analysis was done under SQC. A sample size of 5 was selected to be taken hourly observation were taken by taking 5 packs (consecutive) from the Assembly line and weighting them. And also GSM of the on going paper roll was noted. GSM of any paper refers to the weight of one square meters of paper. In this case, which was taken for No.72 grade paper, specified GSM was 170 - 175 and specified pack weight was 22.32 gsm. These observation were plotted side by side on the control chart was shown. This study was carried out for ten days in which 365 readings were taken in all. From these

$\bar{x}$ was calculated which came out to be 20.3 gsm., And $\bar{R}$ was 1.2. Then the data was homogenised by taking out Ranges being outside the upper control limit (Range).

It was found out of the Low pack weight, than the specified, was due to low GSM of paper. That means either the raw GSM is low or process average at coating stage.

RESULTS AND CONCLUSIONS:

PART NO. - PI - 3208

No. of Pleats = 34 Paper Grade = N072

Specified Pack Weight = 22.32 gsm

Actual Pack Weight ($\bar{x}$) = 20.3 gsm

Average GSM = 162

Range ($\bar{R}$) = 1.2 gsm.

σ = 0.4

PROCESS CAPABILITY ($\pm 3\sigma$) = ± 1.2

INFERENCE :

1. Process is well under statistical control.
2. There is under consumption of 2 gsm/pack (App.10%).

3. Process is capable of delivering pack weight within ± 1.2 gsm. ($\pm 5\%$).

RECOMMENDATIONS :

1. Specified limits should be revised.

or

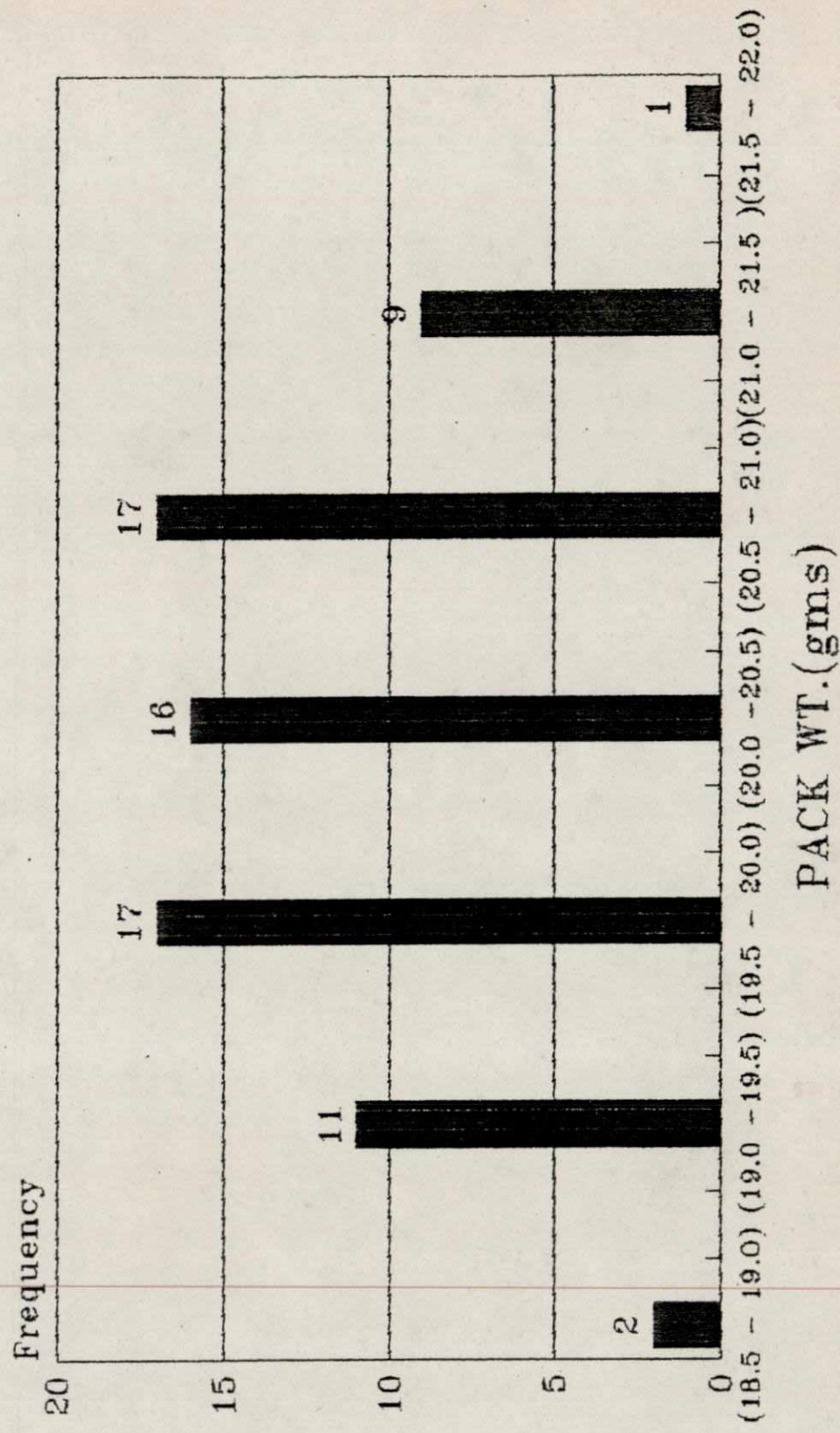
2. Process average should be increased.

a) At coating stage.

b) Raw paper GSM.

To meet the specified limits.

FREQUENCY DISTRIBUTION FOR PACK WT.(in gms)



OPERATION: Dispensing
 m/c Automatic Adhesive Dispenser.

For applying adhesive to End Cap a pneumatically controlled Automatic Adhesive Dispenser is used, which is connected to a metering unit that controls the amount of adhesive to be dispensed. This study was also done on Mico. line (PI-3208). The specified weight of adhesive was 9.2 gms. less adhesive than the specified cause loose bending of the cap and more adhesive over flows the cap and make the filter dirty.

THE ANALYSIS:

Same procedure was applied as it was in case of filter paper i.e. 5 observations were taken every hour. For that firstly 5 End Caps were weighed empty and then they were weighed after dispensing. Thus weight of the adhesive dispensed was calculated and plot on the chart. This study was also carried out for ten days.

Since viscosity of the adhesive also changes with temperature so this trend was also taken care of. During the period of study three observations daily one each in morning, after-noon and evening were taken, to get an idea how visconsity is changing during the day, because it also controls the glow of adhesive. These

observations were taken with the device called Ford Cup. In this, the cup (with a hole of bottom) is filled with the adhesive and let it pour down through the note and time taken by adhesive to flow down is noted and viscosity is noted as t secs/Fd cup. It was seen that as the temperature increases during the day the viscosity decreases.

It was found as the viscosity changes during the day therefore worker have to change there setting through the additional control valve at the dispensing end. Also as there is change in the level of drum it also effect the metering unit.

RESULTS & CONCLUSIONS:

PI No. 3208

Specified Adhesive Weight. = 9.2 gms.

Actual Pack Weight. ($\bar{x}$) = 9.3 gms.

Range ($\bar{R}$) = 1.5 gms.

$\checkmark$ = 0.32

Process Capability ($\pm 3\checkmark$) = ± 0.96

INFERENCE :

- 1) Process is not under Statistical Control.
- 2) There is over consumption of 0.2 gms/Filter.
- 3) Process is capable of delivering with in ± 0.96 gms.

Specified wt. : 9.19 gms.

Quality Assurance				Control Chart For Variables				MONITORING		Product/Component		Operation		Characteristic											
☐ S ☐ P ☐ C								☐ $\bar{x}$ ☐ $\bar{R}$ ☐ $\bar{x}$		☒ $\bar{x}$ ☐ $\bar{R}$ ☐ $\bar{x}$		3208 / TOP CAP		Dispensing - I		Adhesive wt.									
x_1	9.0	9.2	11	6.9	7.9	9.5	9.6	9.9	8.9	7.4	9.9	8.5	8.8	9.0	9.1	10.3	9.6	9.4	9.0	8.2	10	9.0	8.1	8.3	9.4
x_2	8.8	9.0	12.5	7.0	8.1	9.6	9.0	9.3	8.3	7.9	11.3	9.0	9.3	8.9	9.2	9.6	9.1	9.0	9.1	8.1	9.6	10	8.9	9	9.0
x_3	8.8	10	11	7.0	8.8	9.5	10	10	8.3	7.3	10.9	9.0	9.2	9.5	9.0	10.0	9.0	8.5	9.0	8.4	10	9.5	9.0	9.2	8.5
x_4	8.8	10.9	10.6	9.0	7.2	9.6	9.2	8.9	9.9	7.8	12.1	10.9	9.9	9.0	9.1	9.6	9.2	9.0	8.0	7.6	9.1	9.6	8.1	8.7	9.0
x_5	8.8	9.8	10.5	6.5	8.4	9.2	9.3	8.9	9.7	8.3	11.0	9.0	10.0	9.0	8.5	9.7	9.3	9.1	9.2	7.7	9.7	9.0	9.8	9.0	9.1
R	0.2	1.9	2	2.5	1.6	0.4	1.0	1.1	1.6	1.0	2.2	2.4	1.2	0.6	0.7	0.7	0.6	0.9	1.2	0.8	0.9	1.0	1.7	1.1	0.9
$\bar{x}$	8.85	9.8	11.1	7.3	8.0	9.5	9.4	9.4	9.7	7.7	11.0	9.3	9.4	9.0	8.9	9.2	8.9	8.9	8.0	9.7	9.4	8.8	8.9	8.9	

Hand-drawn control chart showing mean ($\bar{x}$) and range (R) data over time. The chart includes control limits and various annotations such as "Setting changed", "Adhesive level low in drum", and "Adhesive level too low in drum".

Time	9:00	10:00	11:00	12:30	2:30	9:00	10:00	11:00	12:00	1:30	2:30	3:00	3:45	9:00	10:00	11:00	12:00	2:00	2:45	3:15	9:00	10:00	11:00	12:00						
Date	30/9/91					3/10/91					3/10/91					4-10-91					4-10-91					5-10-91				
Name																														

Control Chart For Variables

MONIT-
ORING

☒	$\bar{x}$
☐	$\bar{x}$
☐	x

☒ F

Product/Component

3208/ TOP CAP

Operation

Dispensing - I

Characteristic

Adhesive wt.

REMARKS

FOR $\bar{X}$ Chart

$$\text{Control Limits} = \bar{\bar{X}} \pm A_2 \bar{R}$$

$A_2 = 0.577$
When sample size is 5

FOR R Chart

$$UCL_R = D_4 \bar{\bar{R}}$$

$D_4 = 2.115$
When sample size is 5

$$LCL_R = D_1 \bar{R}$$

$D_3 = 0$
When sample size is 5

$$\overline{R}_{1,2} = 1.4$$

$$UCL_{\bar{p}} = 2.115 \times 1.4 = 2.9$$

$$LCLO = 0$$

$$\bar{X}_{revised} = 9.14$$

$$UCL_{\bar{x}} = 9.14 + 0.577 \times 1.4$$

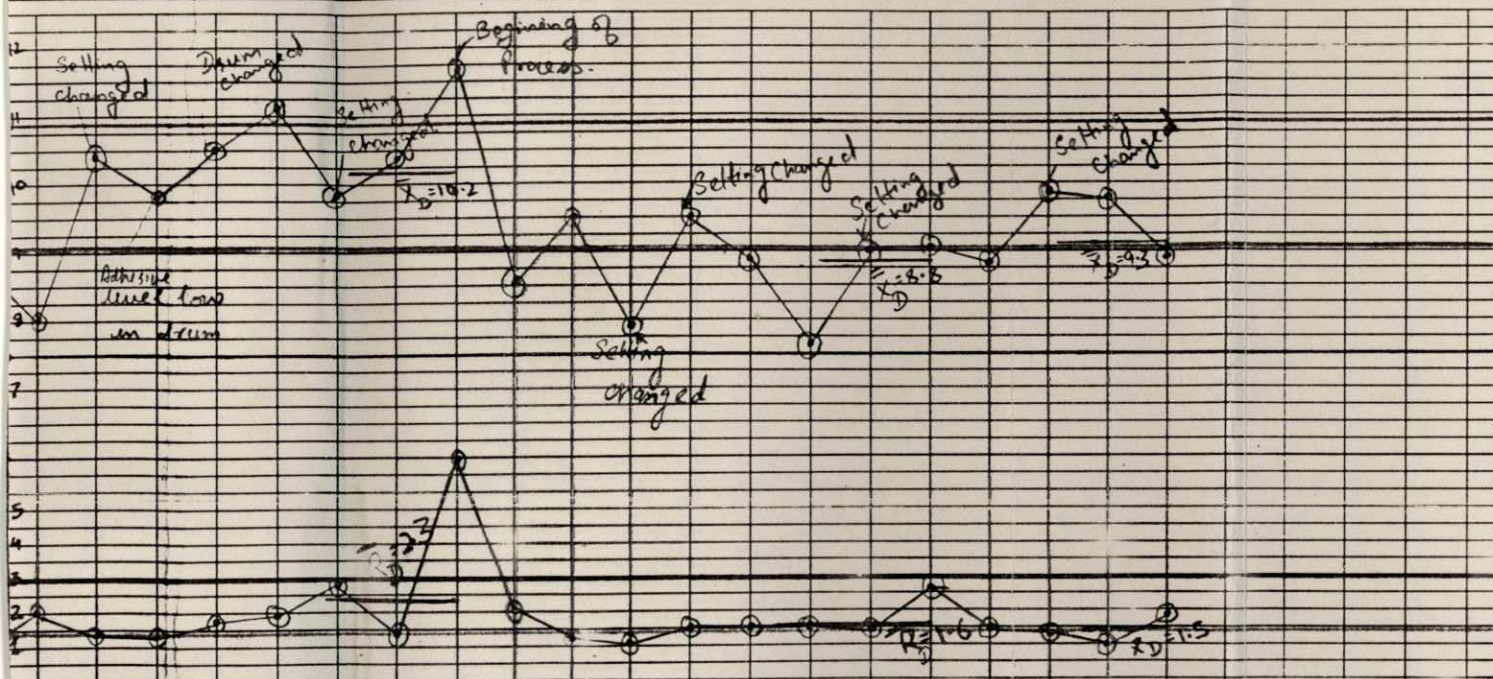
$$= 10.8$$

$$LCL_{\bar{x}} = 9.14 - 0.577 \times 1.4$$

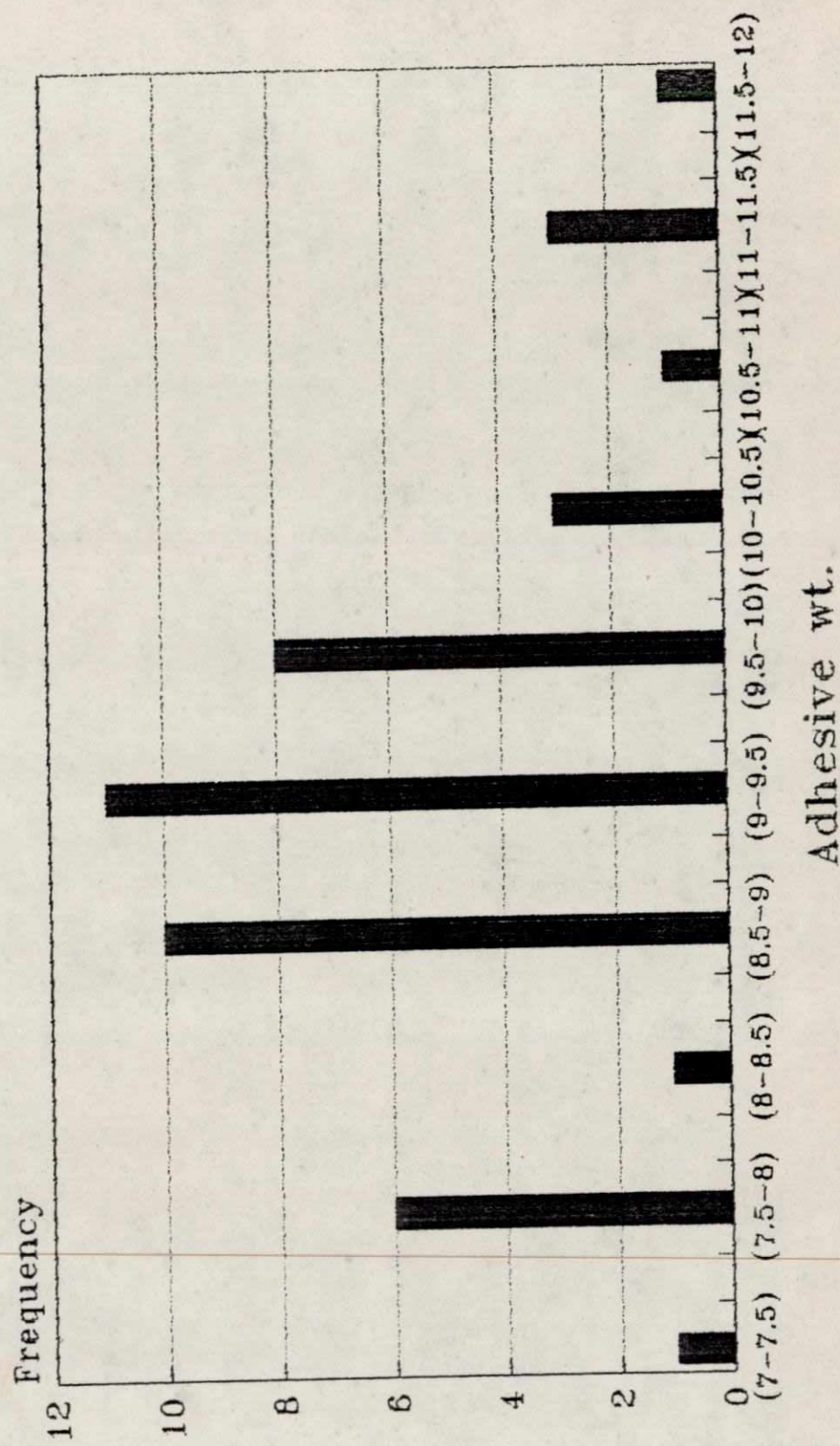
$$= 7.5$$

$$\bar{V} = \frac{\bar{R}}{d_2} = \frac{1.4}{2.326} = 0.60$$

$$6 \nabla = \underline{\underline{3.6}}$$



FREQUENCY DISTRIBUTION FOR ADHESIVE WT. (in gms)



RECOMMENDATIONS:

Process can be brought under statistical control and process average can be maintained close to the Nominal specification by :

- 1) Constant Adjustment in the setting.
- 2) Checking the dispensed weight once every two hours.

Since viscosity of Adhesive changes with change in temperature. Observation taken gave following results:

TIME	: VISCOSITY
Morning (9.00 A.M):	100 Sec/fd cup.
Afternoon(12.30 P.M):	75 Sec/fd cup.
Evening (4.00 P.M) :	55 Sec/fd cup.

COMPONENT: Side Sealing Clip.

Machine Side Sealing.

This machine is used for sealing the 'Pack' with a metal strip. The factor here under observation was clip length. Specified clip length was 94.6 mm with tolerance of ± 0.4 . Observations were taken in the similar way as in previous study i.e. Five consecutive samples were drawn from the Assembly line and were checked for their length but in this case time interval was every

15 minutes and study was come out for two days and in all 250 samples were drawn. There was difference in process average an 1st day and 2nd day, because of change in paper weight. But it was found that process can deliver much with in the specified limits.

Process was capable of giving the clip length with in ± 0.18 mm while the tolerance was ± 0.4 mm.

Process Capability = ± 0.18 mm.

COMPONENT : FILTER (Variation in height)

OPERATION : Final Curing Oven.

The factor a under observation, here, was change in filter height when it is passed thro oven for Final Curing. Every Filter is passed through oven for curing its Filter paper and also jelling one side, as other side was already jelled at previous station. When Filter passes through oven, which is maintained at about 160°C cures the paper and jells one side of Filter.

To get the change in hieght filters were measured before and other and of FCO. Process average came out to be in negative side. That is over all the hieght of the filter decreases after passing through FCO.

Process Average ($\bar{x}$) = - 0.02 mm

CENTRIFUGING Time = 10 sec

Quality Assurance	☐ S	Control Chart For Variables	☐ MONITORING	☒ $\bar{x}$	☐ s	Product/Component	PI-3208																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	☐ P		☐ $\bar{x}$	☒ R	Operation	CENTRIFUGING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	☐ C		☐ x	Characteristic	Oil content / Fiber (ingr/mg)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
x_1	9.5	10.2	10.5	10.8	11.0	11.2	11.5	11.8	12.0	12.2	12.5	12.8	13.0	13.2	13.5	13.8	14.0	14.2	14.5	14.8	15.0	15.2	15.5	15.8	16.0	16.2	16.5	16.8	17.0	17.2	17.5	17.8	18.0	18.2	18.5	18.8	19.0	19.2	19.5	19.8	20.0	20.2	20.5	20.8	21.0	21.2	21.5	21.8	22.0	22.2	22.5	22.8	23.0	23.2	23.5	23.8	24.0	24.2	24.5	24.8	25.0	25.2	25.5	25.8	26.0	26.2	26.5	26.8	27.0	27.2	27.5	27.8	28.0	28.2	28.5	28.8	29.0	29.2	29.5	29.8	30.0	30.2	30.5	30.8	31.0	31.2	31.5	31.8	32.0	32.2	32.5	32.8	33.0	33.2	33.5	33.8	34.0	34.2	34.5	34.8	35.0	35.2	35.5	35.8	36.0	36.2	36.5	36.8	37.0	37.2	37.5	37.8	38.0	38.2	38.5	38.8	39.0	39.2	39.5	39.8	40.0	40.2	40.5	40.8	41.0	41.2	41.5	41.8	42.0	42.2	42.5	42.8	43.0	43.2	43.5	43.8	44.0	44.2	44.5	44.8	45.0	45.2	45.5	45.8	46.0	46.2	46.5	46.8	47.0	47.2	47.5	47.8	48.0	48.2	48.5	48.8	49.0	49.2	49.5	49.8	50.0	50.2	50.5	50.8	51.0	51.2	51.5	51.8	52.0	52.2	52.5	52.8	53.0	53.2	53.5	53.8	54.0	54.2	54.5	54.8	55.0	55.2	55.5	55.8	56.0	56.2	56.5	56.8	57.0	57.2	57.5	57.8	58.0	58.2	58.5	58.8	59.0	59.2	59.5	59.8	60.0	60.2	60.5	60.8	61.0	61.2	61.5	61.8	62.0	62.2	62.5	62.8	63.0	63.2	63.5	63.8	64.0	64.2	64.5	64.8	65.0	65.2	65.5	65.8	66.0	66.2	66.5	66.8	67.0	67.2	67.5	67.8	68.0	68.2	68.5	68.8	69.0	69.2	69.5	69.8	70.0	70.2	70.5	70.8	71.0	71.2	71.5	71.8	72.0	72.2	72.5	72.8	73.0	73.2	73.5	73.8	74.0	74.2	74.5	74.8	75.0	75.2	75.5	75.8	76.0	76.2	76.5	76.8	77.0	77.2	77.5	77.8	78.0	78.2	78.5	78.8	79.0	79.2	79.5	79.8	80.0	80.2	80.5	80.8	81.0	81.2	81.5	81.8	82.0	82.2	82.5	82.8	83.0	83.2	83.5	83.8	84.0	84.2	84.5	84.8	85.0	85.2	85.5	85.8	86.0	86.2	86.5	86.8	87.0	87.2	87.5	87.8	88.0	88.2	88.5	88.8	89.0	89.2	89.5	89.8	90.0	90.2	90.5	90.8	91.0	91.2	91.5	91.8	92.0	92.2	92.5	92.8	93.0	93.2	93.5	93.8	94.0	94.2	94.5	94.8	95.0	95.2	95.5	95.8	96.0	96.2	96.5	96.8	97.0	97.2	97.5	97.8	98.0	98.2	98.5	98.8	99.0	99.2	99.5	99.8	100.0	100.2	100.5	100.8	101.0	101.2	101.5	101.8	102.0	102.2	102.5	102.8	103.0	103.2	103.5	103.8	104.0	104.2	104.5	104.8	105.0	105.2	105.5	105.8	106.0	106.2	106.5	106.8	107.0	107.2	107.5	107.8	108.0	108.2	108.5	108.8	109.0	109.2	109.5	109.8	110.0	110.2	110.5	110.8	111.0	111.2	111.5	111.8	112.0	112.2	112.5	112.8	113.0	113.2	113.5	113.8	114.0	114.2	114.5	114.8	115.0	115.2	115.5	115.8	116.0	116.2	116.5	116.8	117.0	117.2	117.5	117.8	118.0	118.2	118.5	118.8	119.0	119.2	119.5	119.8	120.0	120.2	120.5	120.8	121.0	121.2	121.5	121.8	122.0	122.2	122.5	122.8	123.0	123.2	123.5	123.8	124.0	124.2	124.5	124.8	125.0	125.2	125.5	125.8	126.0	126.2	126.5	126.8	127.0	127.2	127.5	127.8	128.0	128.2	128.5	128.8	129.0	129.2	129.5	129.8	130.0	130.2	130.5	130.8	131.0	131.2	131.5	131.8	132.0	132.2	132.5	132.8	133.0	133.2	133.5	133.8	134.0	134.2	134.5	134.8	135.0	135.2	135.5	135.8	136.0	136.2	136.5	136.8	137.0	137.2	137.5	137.8	138.0	138.2	138.5	138.8	139.0	139.2	139.5	139.8	140.0	140.2	140.5	140.8	141.0	141.2	141.5	141.8	142.0	142.2	142.5	142.8	143.0	143.2	143.5	143.8	144.0	144.2	144.5	144.8	145.0	145.2	145.5	145.8	146.0	146.2	146.5	146.8	147.0	147.2	147.5	147.8	148.0	148.2	148.5	148.8	149.0	149.2	149.5	149.8	150.0	150.2	150.5	150.8	151.0	151.2	151.5	151.8	152.0	152.2	152.5	152.8	153.0	153.2	153.5	153.8	154.0	154.2	154.5	154.8	155.0	155.2	155.5	155.8	156.0	156.2	156.5	156.8	157.0	157.2	157.5	157.8	158.0	158.2	158.5	158.8	159.0	159.2	159.5	159.8	160.0	160.2	160.5	160.8	161.0	161.2	161.5	161.8	162.0	162.2	162.5	162.8	163.0	163.2	163.5	163.8	164.0	164.2	164.5	164.8	165.0	165.2	165.5	165.8	166.0	166.2	166.5	166.8	167.0	167.2	167.5	167.8	168.0	168.2	168.5	168.8	169.0	169.2	169.5	169.8	170.0	170.2	170.5	170.8	171.0	171.2	171.5	171.8	172.0	172.2	172.5	172.8	173.0	173.2	173.5	173.8	174.0	174.2	174.5	174.8	175.0	175.2	175.5	175.8	176.0	176.2	176.5	176.8	177.0	177.2	177.5	177.8	178.0	178.2	178.5	178.8	179.0	179.2	179.5	179.8	180.0	180.2	180.5	180.8	181.0	181.2	181.5	181.8	182.0	182.2	182.5	182.8	183.0	183.2	183.5	183.8	184.0	184.2	184.5	184.8	185.0	185.2	185.5	185.8	186.0	186.2	186.5	186.8	187.0	187.2	187.5	187.8	188.0	188.2	188.5	188.8	189.0	189.2	189.5	189.8	190.0	190.2	190.5	190.8	191.0	191.2	191.5	191.8	192.0	192.2	192.5	192.8	193.0	193.2	193.5	193.8	194.0	194.2	194.5	194.8	195.0	195.2	195.5	195.8	196.0	196.2	196.5	196.8	197.0	197.2	197.5	197.8	198.0	198.2	198.5	198.8	199.0	199.2	199.5	199.8	200.0	200.2	200.5	200.8	201.0	201.2	201.5	201.8	202.0	202.2	202.5	202.8	203.0	203.2	203.5	203.8	204.0	204.2	204.5	204.8	205.0	205.2	205.5	205.8	206.0	206.2	206.5	206.8	207.0	207.2	207.5	207.8	208.0	208.2	208.5	208.8	209.0	209.2	209.5	209.8	210.0	210.2	210.5	210.8	211.0	211.2	211.5	211.8	212.0	212.2	212.5	212.8	213.0	213.2	213.5	213.8	214.0	214.2	214.5	214.8	215.0	215.2	215.5	215.8	216.0	216.2	216.5	216.8	217.0	217.2	217.5	217.8	218.0	218.2	218.5	218.8	219.0	219.2	219.5	219.8	220.0	220.2	220.5	220.8	221.0	221.2	221.5	221.8	222.0	222.2	222.5	222.8	223.0	223.2	223.5	223.8	224.0	224.2	224.5	224.8	225.0	225.2	225.5	225.8	226.0	226.2	226.5	226.8	227.0	227.2	227.5	227.8	228.0	228.2	228.5	228.8	229.0	229.2	229.5	229.8	230.0	230.2	230.5	230.8	231.0	231.2	231.5	231.8	232.0	232.2	232.5	232.8	233.0	233.2	233.5	233.8	234.0	234.2	234.5	234.8	235.0	235.2	235.5	235.8	236.0	236.2	236.5	236.8	237.0	237.2	237.5	237.8	238.0	238.2	238.5	238.8	239.0	239.2	239.5	239.8	240.0	240.2	240.5	240.8	241.0	241.2	241.5	241.8	242.0	242.2	242.5	242.8	243.0	243.2	243.5	243.8	244.0	244.2	244.5	244.8	245.0	245.2	245.5	245.8	246.0	246.2	246.5	246.8	247.0	247.2	247.5	247.8	248.0	248.2	248.5	248.8	249.0	249.2	249.5	249.8	250.0	250.2	250.5	250.8	251.0	251.2	251.5	251.8	252.0	252.2	252.5	252.8	253.0	253.2	253.5	253.8	254.0	254.2	254.5	254.8	255.0	255.2	255.5	255.8	256.0	256.2	256.5	256.8	257.0	257.2	257.5	257.8	258.0	258.2	258.5	258.8	259.0	259.2	259.5	259.8	260.0	260.2	260.5	260.8	261.0	261.2	261.5	261.8	262.0	262.2	262.5	262.8	263.0	263.2	263.5	263.8	264.0	264.2	264.5	264.8	265.0	265.2	265.5	265.8	266.0	266.2	266.5	266.8	267.0	267.2	267.5	267.8	268.0	268.2	268.5	268.8	269.0	269.2	269.5	269.8	270.0	270.2	270.5	270.8	271.0	271.2	271.5	271.8	272.0	272.2	272.5	272.8	273.0	273.2	273.5	273.8	274.0	274.2	274.5	274.8	275.0	275.2	275.5	275.8	276.0	276.2	276.5	276.8	277.0	277.2	277.5	277.8	278.0	278.2	278.5	278.8	279.0	279.2	279.5	279.8	280.0	280.2	280.5	280.8	281.0	281.2	281.5	281.8	282.0	282.2	282.5	282.8	283.0	283.2	283.5	283.8	284.0	284.2	284.5	284.8	285.0	285.2	285.5	285.8	286.0	286.2	286.5	286.8	287.0	287.2	287.5	287.8	288.0	288.2	288.5	288.8	289.0	289.2	289.5	289.8	290.0	290.2	290.5	290.8	291.0	291.2	291.5	291.8	292.0	292.2	292.5	292.8	293.0	293.2	293.5	293.8	294.0	294.2	294.5	294.8	295.0	295.2	295.5	295.8	296.0	296.2	296.5	296.8	297.0	297.2	297.5	297.8	298.0	298.2	298.5	298.8	299.0	299.2	299.5	299.8	300.0	300.2	300.5	300.8	301.0	301.2	301.5	301.8	302.0	302.2	302.5	302.8	303.0	303.2	303.5	303.8	304.0	304.2	304.5	304.8	305.0	305.2	305.5	305.8	306.0	306.2	306.5	306.8	307.0	307.2	307.5	307.8	308.0	308.2	308.5	308.8	309.0	309.2	309.5	309.8	310.0	310.2	310.5	310.8	311.0	311.2	311.5	311.8	312.0	312.2	312.5	312.8	313.0	313.2	313.5	313.8	314.0	314.2	314.5	314.8	315.0	315.2	315.5	315.8	316.0	316.2	316.5	316.8	317.0	317.2	317.5	317.8	318.0	318.2	318.5	318.8	319.0	319.2	319.5	319.8	320.0	320.2	320.5	320.8

$$\text{UCL } \bar{x} = + 0.21 \text{ mm.}$$

$$\text{LCL } \bar{x} = - 0.25 \text{ mm}$$

$$\text{Process capability } (+3 \sigma) = \pm 0.51 \text{ mm}$$

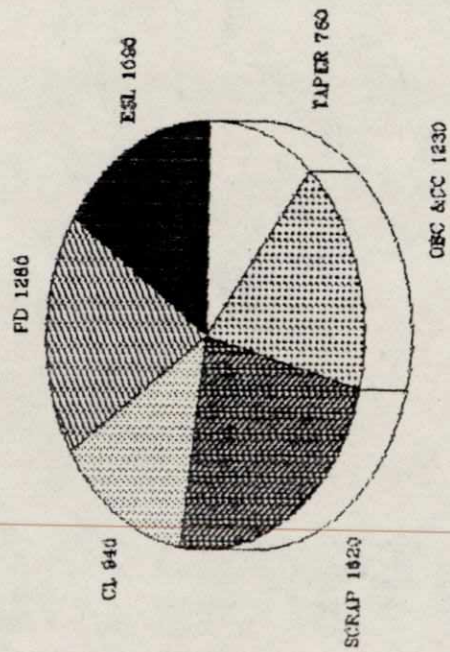
That means process is capable of delivering with in ± 0.51 mm of Filter Hieght.

OPERATION: CENTRIFUGING
(Extracting Oil from Filters)

THE ANALYSIS:

Centrifuging is done to extract oil from filter after leak Testing of filter. For this is centrifuging machine was employed which can centrifuge 12 filters at a time and two machines were there. For the analysis 5 filter were weighed before feeding them to Leak Testing then again they were weighed after centrifuging. Then the oil content was calculated. Centrifuging time was also noted which was 10 Secs. This study was done for five days, which gave process Average $(\bar{x}) = 8.4$ gms. That means on an everage Filter going out were having with in them 8.4 gms.of oil.

REJECTION CAUSES MICO LINE NOV.'91.



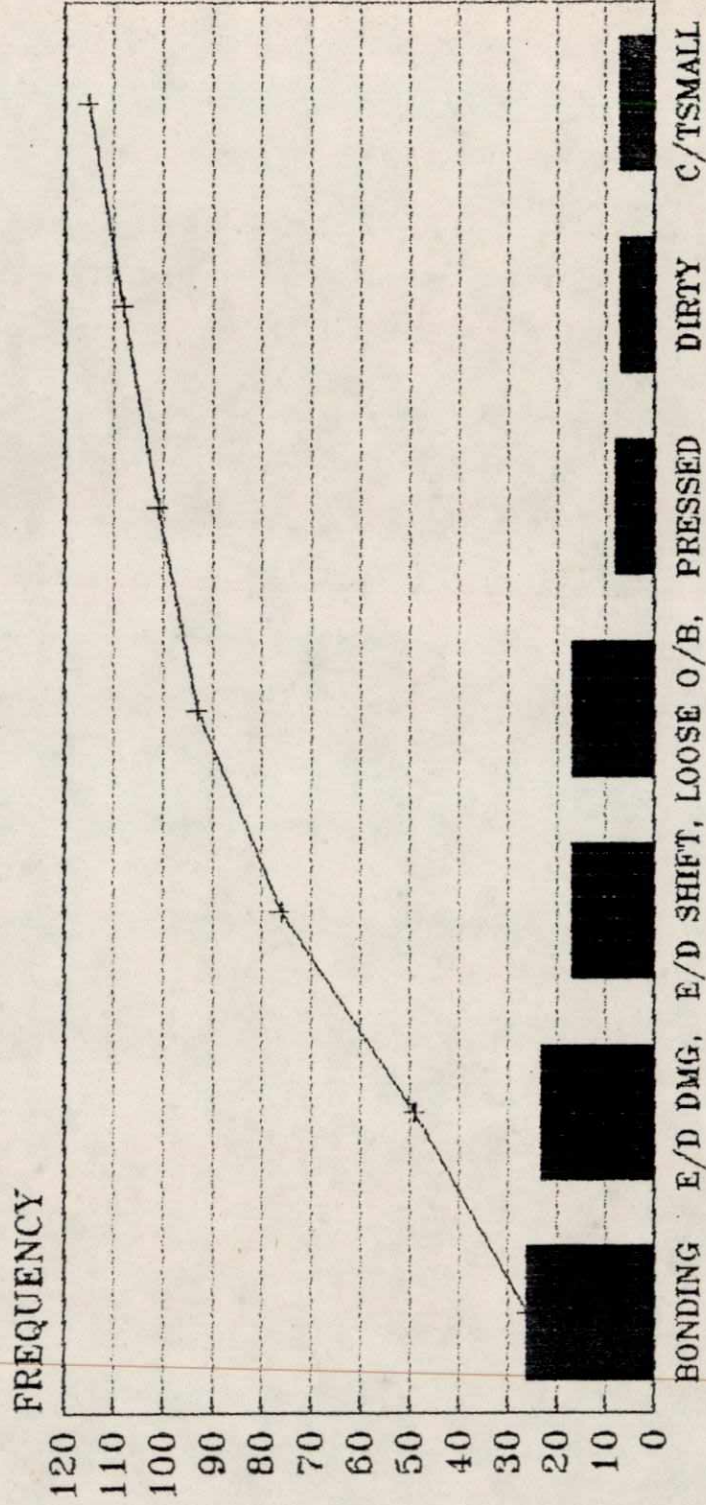
TOTAL REJ. 1.67 %

WASTAGE Wastage

REWORKABLE:		NON-REWORKABLE	
• ESL	: 0.3	PD	: 0.34
• OBC & CC	: 0.33	CL	: 0.25
• TAPER	: 0.44	DAMAGE	: 0.20

PARETO CHART

DEFECT TYPES (PI-1464)



DEFECTS

■ FREQUENCY +---+ CUMMULATIVE FREQ.

SOFTWARE DEVELOPMENT FOR GENERATING RMC:

↓
Raw material
cost

AIM:

Aim of this project was to develop a computer software for generating Bill of material of a particular Part No.(Filter), which should also contain the raw material cost of each component and its value and also at the end the total value of the Part No.(Filter) i.e. its price to be quoted. The report containing all this information was called RMC.

INTRODUCTION:

This project was basically aimed at combining two reports, one was Bill of Materials and other being RMC. Previously the Bill of Material was being prepared by ENGG. Department and then it was sent to Purchase Department who used to prepare its RMC, giving the total value of the filter, manually on the paper. A software had to be developed which could do both things i.e. Give us BOM of a particular Part Number and also Raw Material Cost of each component thus giving us the total value of the Filter. The software should be capable of considering all the costs to be added while calculating RMC i.e. Plating Cost, Assembly Cost (in case of vendor), Rate, Cost of Scrap, Job Work (for vendor) and lastly the Profit.

Hence these all adding to give out value of each component and Total value of component (RMC).

DEVELOPMENT:

This Software was developed in D Base III + package, in which Firstly a Pseudocode was made giving us our requirements of the software. There were basically three main programmes :-

- 1) for Adding New Part Numbers.
- 2) for Editing Old Part Numbers.
- 3) for Printing Reports.

First programme takes care of Adding New Part Numbers which are not existing in Master File. If a part number is added which already exist this programme gives the message and person can go in the Edit Mode.

Second programme takes care of Editing Old Part Numbers. In this case if you feed in a part number which is not their it Flashes a Message and you can go to Add Mode.

This main programme also ask you whether the Part Number contains a particular component, if answered is positive it goes to sub programme of that component and get various data needed for generating RMC e.g. Rate of Raw Material, Job Work/Profit etc. If it is answered

in negatives then it skips that programme and goes to next component. There were 28 sub programmes for taking the information required for calculation of RMC.

Third programme was made for printing reports in the form as shown, for a particular Part Number.

So these were the three software programmes which took care of whole of the RMC report.

Thapar Institute of Engrs & Tech.

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DETAILS OF MASTER DATA BASE FILE

FIELD NAME	CONTENTS	TYPE	WIDTH	DEC.
PINO	PI- NO.	CHARACTER	9	
DESC	DESCRIPTIPON	CHARACTER	12	
PARTNO	PART NO.	CHARACTER	9	
RM	RAW MATERIAL	CHARACTER	9	
RMCODE	RAW MAT. CODE	CHARACTER	5	
USAGE	USAGE FACTOR	NUMERIC	1	
FNLWT	COMPONENT WT. (Gms)	NUMERIC	8	3
NETWT	BLANK WT. (Gms)	NUMERIC	8	3
GRWT	GROSS WT. (Gms)	NUMERIC	8	3
UNIT	UNIT	CHARACTER	3	
SHSIZE	SHEET SIZE (Lmm*Bmm)	CHARACTER	10	
NOSBLK	NO. OF BLNKS	NUMERIC	4	
REMARKS	REMARKS	CHARACTER	15	
RATE	RATE OF MATL. (Rs/kg)	NUMERIC	5	2
JOB PRO	JOB WORK/PROFIT (Rs)	NUMERIC	5	2
SCRAP	SCRAP (Gms.)	NUMERIC	5	2
CO SCRAP	COST OF SCRP (Rs)	NUMERIC	5	2
RMC	RAW MTL. COST	NUMERIC	4	2
VALUE	TOTAL VALUE (Rs)	NUMERIC	4	2
TOTAL :			150	

DETAILS OF MASTER DATA BASE FILE

FIELD NAME	CONTENTS	TYPE	WIDTH	DEC.
PINO	PI-- NO.	CHARACTER	9	
DESC	DESCRIPTIPON	CHARACTER	12	
PARTNO	PART NO.	CHARACTER	9	
RM	RAW MATERIAL	CHARACTER	7	
RMCODE	RAW MAT. CODE	CHARACTER	5	
USAGE	USAGE FACTOR	NUMERIC	1	
FNLWT	COMPONENT WT. (Gms)	NUMERIC	8	3
NETWT	BLANK WT. (Gms)	NUMERIC	8	3
GRWT	GROSS WT. (Gms)	NUMERIC	8	3
UNIT	UNIT	CHARACTER	3	
SHSIZE	SHEET SIZE (Lmm*Bmm)	CHARACTER	10	
NOSBLK	NO. OF DLNKS	NUMERIC	4	
REMARKS	REMARKS	CHARACTER	15	
RATE	RATE OF MATL. (Rs/kg)	NUMERIC	5	2
JOB_PRO	JOB WORK/PROFIT (Rs)	NUMERIC	5	2
SCRAP	SCRAP (Gms.)	NUMERIC	5	2
CO_SCRAP	COST OF SCRP (Rs)	NUMERIC	5	2
RMC	RAW MTL. COST	NUMERIC	4	2
VALUE	TOTAL VALUE (Rs)	NUMERIC	4	2
TOTAL :			150	


```

* PROGRAM FOR BILL OF MATERIALS
set talk off
set confirm on
set safety off
SET ECHO OFF
CLEA
SET PROCEDURE TO GOOD
DO GOOD WITH "CORRECTING OLD RECORDS"
STORE SPACE(1) TO ANS
@ 10,3 SAY "YOU WANT TO APPEND (Y)" GET ANS
READ
IF ANS="N"
@ 15,3 SAY "SO NICE OF YOU"
@ 17,3 SAY "THANKS"
ELSE
@ 15,3 SAY "WELCOME TO ANOTHER STORMING SESSION"
@ 17,3 SAY "GOOD LUCK"
@ 18,3 SAY " "
WAIT
SET TALK OFF
STORE SPACE(9) TO PNO
STORE SPACE(1) TO FV
STORE 000.000 TO FWFVCL
STORE 0 TO UFFVCL
STORE SPACE(1) TO GN
STORE 000.000 TO FWGEON
STORE 0 TO UFGON
STORE " " TO GEONCOM
STORE SPACE(1) TO EP
STORE 0 TO UFEPOXY
STORE 000.000 TO FWEPOXY
STORE SPACE(1) TO PA
STORE SPACE(6) TO PGPACK
STORE 0000.000 TO FWPACK
STORE " " TO PACKCOM
STORE SPACE(1) TO SS
STORE 00.000 TO FWSSC
STORE SPACE(1) TO TC
STORE SPACE(9) TO PNECT
STORE SPACE(3) TO RNECT
STORE SPACE(5) TO RMCOECT
STORE 0 TO UFECT
STORE 0000.000 TO FWECT
STORE 0000.000 TO BWECT
STORE 0000.000 TO GWECT
STORE SPACE(12) TO BSSECT
STORE SPACE(12) TO SHSECT
STORE 0000 TO NOSECT
STORE SPACE(1) TO ECTCOM
STORE SPACE(1) TO BC
STORE SPACE(9) TO PNECB
STORE SPACE(3) TO RMECB
STORE SPACE(5) TO RMCOECB
STORE 0 TO UFECEB
STORE 0000.000 TO FWECEB

```



```

* PROGRAM FOR BILL OF MATERIALS
set talk off
set confirm on
set safety off
SET ECHO OFF
CLEA
SET PROCEDURE TO GOOD
DO GOOD WITH "CORRECTING OLD RECORDS"
STORE SPACE(1) TO ANS
@ 10,3 SAY "YOU WANT TO APPEND (Y)" GET ANS
READ
IF ANS="N"
@ 15,3 SAY "SO NICE OF YOU"
@ 17,3 SAY "THANKS"
ELSE
@ 15,3 SAY "WELCOME TO ANOTHER STORMING SESSION"
@ 17,3 SAY "GOOD LUCK"
@ 18,3 SAY " "
WAIT
SET TALK OFF
STORE SPACE(9) TO FNO
STORE SPACE(1) TO FV
STORE 000.000 TO FWFVCL
STORE 0 TO UFFVCL
STORE SPACE(1) TO GM
STORE 000.000 TO FWGEON
STORE 0 TO UFGCON
STORE " " TO GEONCOM
STORE SPACE(1) TO EP
STORE 0 TO UFEPOXY
STORE 000.000 TO FWEPOXY
STORE SPACE(1) TO PA
STORE SPACE(6) TO FGPACM
STORE 0000.000 TO FWPACK
STORE " " TO PACKCOM
STORE SPACE(1) TO SS
STORE 00.000 TO FWSSC
STORE SPACE(1) TO TC
STORE SPACE(9) TO PNECT
STORE SPACE(3) TO RNECT
STORE SPACE(5) TO RMCOECT
STORE 0 TO UFECT
STORE 0000.000 TO FWECT
STORE 0000.000 TO BWECT
STORE 0000.000 TO GWECT
STORE SPACE(12) TO BSECT
STORE SPACE(12) TO SHSECT
STORE 0000 TO NOSECT
STORE SPACE(1) TO ECTCOM
STORE SPACE(1) TO BC
STORE SPACE(9) TO PNECB
STORE SPACE(3) TO RMECB
STORE SPACE(5) TO RMCOECB
STORE 0 TO UFECEB
STORE 0000.000 TO FWECEB

```


STORE 0000.000 TO BWECB
 STORE 0000.000 TO GWECEB
 STORE SPACE(12) TO BSECEB
 STORE SPACE(12) TO SHSECEB
 STORE 0000 TO NOSECEB
 STORE SPACE(1) TO ECBCOM
 STORE SPACE(1) TO EDT
 STORE SPACE(9) TO PNEDT
 STORE 0 TO UFEDT
 STORE 000.000 TO GWEDT
 STORE 000.000 TO BWEDT
 STORE SPACE(1) TO EDTCOM
 STORE SPACE(1) TO EDB
 STORE SPACE(9) TO PNEDB
 STORE 0 TO UFEDB
 STORE 000.000 TO GWEDEB
 STORE 000.000 TO BWEDEB
 STORE SPACE(1) TO EDBCOM
 STORE SPACE(1) TO CT
 STORE SPACE(9) TO PNCT
 STORE SPACE(3) TO RMCT
 STORE SPACE(5) TO RMCOCT
 STORE 0000.000 TO BWCT
 STORE 0000.000 TO FWCT
 STORE 0000.000 TO GWCT
 STORE SPACE(12) TO BSCT
 STORE SPACE(12) TO SHSCT
 STORE 0000 TO NOSCT
 STORE SPACE(1) TO CTCOM
 STORE SPACE(1) TO OR
 STORE SPACE(9) TO PNOR
 STORE SPACE(3) TO RMOR
 STORE SPACE(5) TO RMCOOR
 STORE 0000.000 TO BWOR
 STORE 0000.000 TO FWOR
 STORE 0000.000 TO GWOR
 STORE SPACE(12) TO BSOR
 STORE SPACE(12) TO SHSOR
 STORE 0000 TO NOSOR
 STORE SPACE(1) TO ORCOM
 STORE SPACE(1) TO OB
 STORE SPACE(9) TO PNOB
 STORE 000.000 TO BWOB
 STORE SPACE(1) TO ORCOM
 STORE SPACE(1) TO RS
 STORE SPACE(9) TO PNRS
 STORE SPACE(1) TO RSCOM
 STORE SPACE(1) TO GU
 STORE SPACE(9) TO PNGU
 STORE SPACE(3) TO RMGU
 STORE SPACE(5) TO RMCUGU
 STORE 000.000 TO FWGU, JORGU, RTGU
 STORE 000.000 TO BWGU
 STORE 000.000 TO GWGU
 STORE SPACE(1) TO GUCOM

STORE 0 TO UFGU
 STORE SPACE(1) TO GMT1
 STORE SPACE(9) TO PNGMT1
 STORE 0 TO UFGMT1
 STORE SPACE(1) TO GMT1COM
 STORE SPACE(1) TO GMT2
 STORE SPACE(9) TO PNGMT2
 STORE 0 TO UFGMT2
 STORE SPACE(1) TO GMT2COM
 STORE SPACE(1) TO GKT1
 STORE SPACE(9) TO PNGKT1
 STORE 0 TO UFGKT1
 STORE SPACE(1) TO GKT1COM
 STORE SPACE(1) TO GKT2
 STORE SPACE(9) TO PNGKT2
 STORE 0 TO UFGKT2
 STORE SPACE(1) TO GKT2COM
 STORE SPACE(1) TO CG1
 STORE SPACE(9) TO PNCB1
 STORE 0 TO UFCB1
 STORE SPACE(1) TO CG2
 STORE SPACE(9) TO PNCB2
 STORE 0 TO UFCB2
 STORE SPACE(1) TO ORI
 STORE SPACE(9) TO PNORI
 STORE 0 TO UFORI
 STORE SPACE(1) TO DEL
 STORE 000.000 TO FWDEL
 STORE SPACE(1) TO WSR
 STORE SPACE(9) TO PNWSR
 STORE SPACE(6) TO RMWSR
 STORE SPACE(5) TO RMCOWSR
 STORE 0 TO UFSR
 STORE SPACE(1) TO WSRCOM
 STORE SPACE(1) TO PB
 STORE SPACE(9) TO PNPB
 STORE 0000.000 TO FWPB
 STORE SPACE(1) TO PBCOM
 STORE SPACE(1) TO MPB
 STORE SPACE(9) TO PNMPE
 STORE 0.000 TO UFMPE
 STORE SPACE(12) TO MPBSZ
 STORE 0000.000 TO FWMPE
 STORE SPACE(1) TO MPBCOM
 STORE SPACE(1) TO CTN
 STORE SPACE(9) TO PNCTN
 STORE SPACE(5) TO RMCOCN
 STORE SPACE(12) TO CTNSZ
 STORE SPACE(1) TO CTNCOM
 STORE SPACE(1) TO MCTN
 STORE SPACE(9) TO PNMCTN
 STORE 0.000 TO UFMCTN
 STORE SPACE(5) TO RMCOCNCTN
 STORE SPACE(1) TO MCTNCOM
 STORE SPACE(1) TO MCRT

STORE SPACE(9) TO PNMCR
STORE 0.000 TO UFMCR
STORE SPACE(5) TO RMCOMCR
STORE SPACE(1) TO MCRCOM
STORE SPACE(1) TO LBL
STORE SPACE(9) TO PNLBL
STORE 0.000 TO UFLBL
STORE SPACE(1) TO LBLCOM
STORE SPACE(1) TO LBLCOM
STORE SPACE(1) TO STKR
STORE SPACE(9) TO PNSTKR
STORE 0.000 TO UFSTKR
STORE SPACE(1) TO STKRCOM
STORE SPACE(1) TO COM
STORE SPACE(9) TO COMP,PNCOV
STORE SPACE(1) TO FNLCOM
STORE 000.00 TO RTCOV,FWCOV,BWCOV,GMCOV,JOBCOV,PCOST,SCPRNT
RTECT,RTECB,RTEDT,RTEDB,RTBO,RTSSC,RTRS,ASSCH,SPCH,REJ,ASCHR
STORE 000.00 TO JOBECT,JOBECB,JOBEDT,JOBEDB,JOBB0,JOBS5C,JOBR5
STORE SPACE(1) TO ECT,ECB,EDT,EDB,RT
STORE SPACE(1) TO BO,GEO,EPO,ASSY,COVCOM
STORE SPACE(12) TO BSCOV,SHSCOV
STOR " " TO NEXT
SET TALK ON
DO MENU
SET SAFETY ON
SET CONFIRM OFF
RETURN


```

**SUBPROGRAM FOR BILL OF MATERIALS
CLEA
USE MASTER1
GO TOP
STOR RECNO() TO X
DO WHILE .T.
GO X
SET COLO TO W/+
@ 10,10 SAY "FOR WHICH PI--NO. " GET PNO
READ
CLEA
@ 8,3 SAY "SIDE SEALING CLIP ? (Y/N)" GET SS PICT "!"
READ
IF SS<>"N"
DO SSC
ENDIF
CLEA
@ 8,3 SAY "REINFORCEMENT SPRING ? (Y/N)" GET RS PICT "!"
READ
IF RS<>"N"
DO RS
ENDIF
CLEA
@ 8,3 SAY "CT GUIDE ?(Y/N)" GET GU PICT "!"
READ
IF GU<>"N"
DO GU
ENDIF
CLEA
@ 8,3 SAY "GROMET--1 ?(Y/N)" GET GMT1 PICT "!"
READ
IF GMT1<>"N"
DO GMT1
ENDIF
CLEA
@ 8,3 SAY "GROMET--2 ?(Y/N)" GET GMT2
READ
IF GMT2<>"N"
DO GMT2
ENDIF
CLEA
@ 8,3 SAY "GASKET--1 ?(Y/N)" GET GKT1
READ
IF GKT1<>"N"
DO GKT1
ENDIF
CLEA
@ 8,3 SAY "GASKET--2 ?(Y/N)" GET GKT2
READ
IF GKT2<>"N"
DO GKT2
ENDIF
CLEA
@ 8,3 SAY "C GKT--1 ?(Y/N)" GET CG1
READ

```



```

IF CG1<>"N"
DO CG1
ENDIF
CLEA
@ 8,3 SAY "C GKT-2 ?(Y/N)" GET CG2
READ
IF CG2<>"N"
DO CG2
ENDIF
CLEA
@ 8,3 SAY "O RING ?(Y/N)" GET ORI
READ
IF ORI<>"N"
DO ORI
ENDIF
CLEA
@ 8,3 SAY "GEON ?(Y/N)" GET GEO
READ
IF GEO<>"N"
DO GEO
ENDIF
CLEA
@ 8,3 SAY "EPOXY ?(Y/N)" GET EPO
READ
IF EPO<>"N"
DO EPOXY
ENDIF
CLEA
@ 8,3 SAY "DELFIN ?(Y/N)" GET DEL
READ
IF DEL<>"N"
DO DEL
ENDIF
CLEA
@ 8,3 SAY "WASHER ?(Y/N)" GET WSR
READ
IF WSR<>"N"
DO WSR
ENDIF
CLEA
@ 8,3 SAY "POLYBAG ?(Y/N)" GET PB
READ
IF PB<>"N"
DO PB
ENDIF
CLEA
@ 8,3 SAY "MUL PB ?(Y/N)" GET MPB
READ
IF MPB<>"N"
DO MPB
ENDIF
CLEA
@ 8,3 SAY "CARTON" GET CTN
READ

```



```

DO CTN
ENDIF
CLEA
@ 8,3 SAY "MUL CTN ?(Y/N)" GET MCTN
READ
IF MCTN<>"N"
DO MCTN
ENDIF
CLEA
@ 8,3 SAY "M CRATE ?(Y/N)" GET MCRT
READ
IF MCRT<>"N"
DO MCRT
ENDIF
CLEA
@ 8,3 SAY "LABLE ?(Y/N)" GET LBL
READ
IF LBL<>"N"
DO LBL
ENDIF
CLEA
@ 8,3 SAY "STICKER ?(Y/N)" GET STKR
READ
IF STKR<>"N"
DO STKR
ENDIF
CLEA
@ 8,3 SAY " END CAP TOP ?(Y/N) " GET ECT
READ
IF ECT<>"N"
DO ECT
ENDIF
CLEA
@ 8,3 SAY "END CAP BOTTOM ?(Y/N)" GET ECB
READ
IF ECB <> "N"
DO ECB
ENDIF
CLEA
@ 8,3 SAY " END DISC BOTTOM ?(Y/N)" GET EDB
READ
IF EDB<>"N"
DO EDB
ENDIF
CLEA
@ 8,3 SAY " END DISC TOP ?(Y/N)" GET EDT
READ
IF EDT<>"N"
DO EDT
ENDI
CLEA
@ 8,3 SAY " BOWL ?(Y/N)" GET BO
READ
IF BO<>"N"
DO BOWL

```



```
ENDI
CLEA
@ 8,3 SAY "COVER ASSEMBLY (Y/N) ?" GET ASSY
READ
IF ASSY<>"N"
DO COVER
ENDIF
CLEA
@ 10,3 SAY "NEXT PI-NO. NOW ?(Y/N)" GET NEXT
READ
IF NEXT<>"N"
CLEA
SET COLO TO
STORE X+30 TO X
LOOP
ENDIF
RETURN
ENDDO
```


** PROGRAM FOR SSC

@ 15,3 SAY "COMPONENT WT" GET FWSSC PICTURE "99.999"

READ

WAIT

LOCATE FOR PINO=PNO .AND. DESC="SSC"

CLEAR

@ 16,5 SAY "R A T E : " GET RTSSC PICT "999.99"

READ

REPLACE PARTNO WITH SUBSTR(PINO,1,4)+"02000"

REPLACE RM WITH "AL"

REPLACE RMCODE WITH "AL031"

REPLACE USAGE WITH 1

REPLACE FNLWT WITH FWSSC

REPLACE RATE WITH RTSSC

REPLACE SCRAP WITH GRWT-FNLWT

REPLACE CD_SCRAP WITH SCRAP*5/1000

REPLACE RMC WITH RATE*GRWT/1000

REPLACE VALUE WITH RMC +JOB_PRO

REPLACE UNIT WITH "GMS"

RETURN

CLEA

* REN SPG

DO WHILE .T.

@ 10,3 SAY "PARTNO" GET PNRS

READ

WAIT

@ 16,5 SAY "R A T E : " GET RTRS PICT "999.99"

READ

@ 18,5 SAY "JOB WORK/ PROFIT : " GET JOBR5 PICT "999.99"

READ

LOCATE FOR PINO=PNO .AND. DESC="REN SPG"

DO CASE

CASE FOUND()

REPLACE PARTNO WITH PNRS

REPLACE RM WITH "SPG STEEL"

REPLACE RMCODE WITH "SSPOO"

REPLACE USAGE WITH 1

REPLACE FNLWT WITH 1.000

REPLACE RATE WITH RTRS

REPLACE JOB_PRO WITH JOBR5

REPLACE RMC WITH RATE*GRWT/1000

REPLACE VALUE WITH RMC +JOB_PRO

REPLACE UNIT WITH "NOS"

CASE .NOT. FOUND()

CLEAR

@ 10,10 SAY "PART NOT FOUND"

WAIT "Press Any key to continue"

ENDCASE

RETURN

ENDDO


```

* GUIDE
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNGU
READ
@ 12,3 SAY "RAW MATL" GET RMGU
READ
@ 13,3 SAY "RM CODE" GET RMCODU
READ
@ 14,3 SAY "USAGE FACTOR" GET UFGU
READ
@ 15,3 SAY "COMPONENT WT." GET FWGU PICTURE "999.999"
READ
@ 16,3 SAY "BLANK WT" GET BWGU PICTURE "999.999"
READ
@ 17,3 SAY "GROSS WT" GET GWGU PICTURE "999.999"
READ
CLEAR
@ 10,10 SAY "R A T E : " GET RTGU PICT "999.99"
READ
@ 12,10 SAY "JOB WORK/ PROFIT : " GET JOBGU PICT "999.99"
READ
@ 18,3 SAY "YOU MADE SOME MISTAKE ??" GET GUCOM
READ
IF GUCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="CT-GUIDE"
REPLACE PARTNO WITH PNGU
REPLACE RM WITH RMGU
REPLACE RMCODE WITH RMCODU
REPLACE USAGE WITH UFGU
REPLACE FNLWT WITH FWGU
REPLACE NETWT WITH BWGU
REPLACE GRWT WITH GWGU
REPLACE RATE WITH RTGU
REPLACE JOB_PRO WITH JOBGU
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CO_SCRAP WITH SCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC *JOB_PRO
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```



```

* GROMET-1
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNGMT1
READ
@ 14,3 SAY "USAGE FACTOR" GET UFGMT1
READ
@ 19,3 SAY "ANY CHANGE(Y/N)" GET GMT1COM
READ
IF GMT1COM="Y"
LOOP
ELSE
LOCATE FOR PIND=PNO .AND. DESC="GROMET-1"
REPLACE PARTNO WITH PNGMT1
REPLACE RM WITH "SYN RUB"
REPLACE USAGE WITH UFGMT1
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO
CLEA

```

```

* GROMET-2
DO WHILE .T.
@ 6,3 SAY "PARTNO" GET PNGMT2
READ
@ 8,3 SAY "USAGE FACTOR" GET UFGMT2
READ
@ 10,3 say " R A T E   : " GET RT PICT "999.99"
READ
@ 12,3 SAY "JOB WORK/ PROFIT   :" GET JOB "999.99"
READ
@ 16,3 SAY "YOU WANT TO CORRECT SOME THING ??" GET GMT2COM
READ
IF GMT2COM="Y"
LOOP
ELSE
LOCATE FOR PIND=PNO .AND. DESC="GROMET-2"
REPLACE PARTNO WITH PNGMT2
REPLACE RM WITH "SYN RUB"
REPLACE USAGE WITH UFGMT2
REPLACE FNLWT WITH 1.000
REPLACE RATE WITH RT
REPLACE JOB_PRO WITH JOB
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```



```

* GASKET-1
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNGKT1
READ
@ 12,3 SAY "USAGE FACTOR" GET UFGKT1
READ
@ 18,3 SAY "YOU WANT TO CORRECT SOMETHING ??(Y/N)" GET GKT1COM PICT "!"
READ
IF GKT1COM="Y"
LOOP
ELSE
LOCATE FOR PIND=PND .AND. DESC="GASKET-1"
REPLACE PARTNO WITH PNGKT1
REPLACE RM WITH "SYNRUB"
REPLACE USAGE WITH UFGKT1
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO
CLEA

```

```

* GASKET-2
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNGKT2
READ
@ 14,3 SAY "USAGE FACTOR" GET UFGKT2
READ
WAIT
LOCATE FOR PIND=PND .AND. DESC="GASKET-2"
REPLACE PARTNO WITH PNGKT2
REPLACE USAGE WITH UFGKT2
REPLACE RM WITH "SYN RUB"
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
RETURN
ENDDO
CLEA

```



```
* C GKT-1
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNCG1
READ
@ 14,3 SAY "USAGE FACTOR" GET UFCG1
READ
WAIT
LOCATE FOR PIND=PND .AND. DESC="C GKT--1"
REPLACE PARTNO WITH PNCG1
REPLACE USAGE WITH UFCG1
REPLACE RM WITH "SYN RUB"
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
RETURN
ENDDO
CLEA
```

```
* C GKT--2
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNCG2
READ
@ 14,3 SAY "USAGE FACTOR" GET UFCG2
READ
WAIT
LOCATE FOR PIND=PND .AND. DESC="C GKT--2"
REPLACE PARTNO WITH PNCG2
REPLACE RM WITH "SYN RUB"
REPLACE USAGE WITH UFCG2
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
RETURN
ENDDO
CLEA
```

```

* ORING
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNORI
READ
@ 14,3 SAY "USAGE FACTOR" GET UFORI
READ
WAIT
LOCATE FOR PIND=PNO .AND. DESC="O RING"
REPLACE PARTNO WITH PNORI
REPLACE RM WITH "SYN RUB"
REPLACE USAGE WITH UFORI
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
RETURN
ENDDO
CLEA

```

```

** PROGRAM FOR GEON
DO WHILE .T.
@ 15,3 SAY "USAGE FACTOR" GET UFGEON
@ 17,3 SAY "FINAL WT" GET FWGEON PICTURE "999.999"
@ 19,3 SAY "ANY CHANGE ?" GET GEONCOM
READ
IF GEONCOM<>"N"
LOOP
ENDIF
LOCATE FOR PIND=PNO .AND. DESC="ADHSV2"
REPLACE PARTNO WITH SUBSTR(PIND,1,4)+"33000"
REPLACE RM WITH "GEON"
REPLACE RMCODE WITH "G5400"
REPLACE USAGE WITH UFGEON
REPLACE FNLWT WITH FWGEON
REPLACE UNIT WITH "GMS"
RETURN
ENDDO
CLEA

```


** PROGRAM FOR EPOXY

@ 15,3 SAY "USAGE FACTOR" GET UFEPOXY

READ

@ 18,3 SAY "FINAL WT" GET FWEPOXY PICTURE "999.999"

READ

WAIT

LOCATE FOR PINO=PNO .AND. DESC="ADHSV3"

REPLACE PARTNO WITH SUBSTR(PINO,1,4)+"35000"

REPLACE RM WITH "EPOXY"

REPLACE RMCODE WITH "A2060"

REPLACE USAGE WITH UFEPOXY

REPLACE FNLWT WITH FWEPOXY

REPLACE UNIT WITH "GMS"

RETURN

CLEA

* DELFIN

DO WHILE .T.

@ 12,3 SAY "FINAL WT" GET FWDEL PICTURE "99.999"

READ

WAIT

LOCATE FOR PINO=PNO .AND. DESC="ADHSV4"

REPLACE PARTNO WITH SUBSTR(PINO,1,4)+"34000"

REPLACE RM WITH "DELFIN"

REPLACE RMCODE WITH "DELOO"

REPLACE USAGE WITH 1

REPLACE FNLWT WITH FWDEL

REPLACE UNIT WITH "GMS"

RETURN

ENDDO

CLEA

```

* WASHER
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNWSR
READ
@ 12,3 SAY "RAW MATL" GET RMWSR
READ
@ 14,3 SAY "RM CODE" GET RMCOWSR
READ
@ 16,3 SAY "USAGE FACTOR" GET UFWSR
READ
@ 18,3 SAY "ANY CHANGE(N)" GET WSRCOM
READ
IF WSRCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="WASHER"
REPLACE PARTNO WITH PNWSR
REPLACE RM WITH RMWSR
REPLACE RMCODE WITH RMCOWSR
REPLACE USAGE WITH UFWSR
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NDS"
ENDIF
RETURN
ENDDO
CLEA

```

```

* POLY BAG
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNPB
READ
@ 12,3 SAY "FINAL WT" GET FWPB PICTURE "9999.999"
READ
@ 14,3 SAY "YOU WANT TO CORRECT SOME THING(Y/N)" GET PBCOM
READ
IF PBCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="POLYBAG"
REPLACE PARTNO WITH PNPB
REPLACE RM WITH "PTHENE"
REPLACE RMCODE WITH "RBG00"
REPLACE BLSIZE WITH "GEN 003,005"
REPLACE USAGE WITH 1.000
REPLACE FNLWT WITH FWPB
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO

```



```

* MUL PB
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNMPB
READ
@ 12,3 SAY "USAGE FACTOR" GET UFMPB PICTURE "9.999"
READ
@ 14,3 SAY "FINAL WT" GET FWMPB PICTURE "9999.999"
READ
@ 18,3 SAY "YOU WANT TO CORRECT SOMETHING ??" GET MPBCOM
READ
IF MPBCOM="Y"
LOOP
ELSE
LOCATE FOR PIND=PNO .AND. DESC="MUL PB"
REPLACE PARTNO WITH PNMPB
REPLACE USAGE WITH UFMPB
REPLACE RM WITH "PTHENE"
REPLACE RMCODE WITH "RBG00"
REPLACE BLSIZE WITH "GEN 034, 003"
REPLACE FNLWT WITH FWMPB
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO

```

```

* CARTON
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNCTN
READ
@ 12,3 SAY "RMCODE" GET RMCDOCTN
READ
@ 16,3 SAY "ANY CHANGE (N)" GET CTNCOM
READ
IF CTNCOM="Y"
LOOP
ELSE
LOCATE FOR PIND=PNO .AND. DESC="CARTON"
REPLACE PARTNO WITH PNCTN
REPLACE RM WITH "BOARD"
REPLACE RMCODE WITH RMCDOCTN
REPLACE BLSIZE WITH "GEN 004"
REPLACE USAGE WITH 1
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```

```

* MUL CTN
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNMCTN
READ
@ 12,3 SAY "USAGE FACTOR" GET UFMCTN PICTURE "9.999"
READ
@ 14,3 SAY "RM CODE" GET RMCOMCTN
READ
@ 16,3 SAY "ANY CHANGE (N)" GET MCTNCOM
READ
IF MCTNCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="MUL CTN"
REPLACE PARTNO WITH PNMCTN
REPLACE RM WITH "BOARD"
REPLACE RMCODE WITH RMCOMCTN
REPLACE USAGE WITH UFMCTN
REPLACE BLSIZE WITH "GEN 004"
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```

```

* LABLE
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNLEBL
READ
@ 12,3 SAY "USAGE FACTOR" GET UFLBL
READ
@ 14,3 SAY "ANY CHANGE (N)" GET LBLCOM
READ
IF LBLCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="LABLE"
REPLACE PARTNO WITH PNLEBL
REPLACE USAGE WITH UFLBL
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```



```

* MASTER CRATE
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNMCR T
READ
@ 12,3 SAY "USAGE FACTOR" GET UFMCR T PICTURE "9.999"
READ
@ 14,3 SAY "RM CODE" GET RMCOMCR T
READ
@ 16,3 SAY "YOU WANT TO CORRECT SOMETHING ??" GET MCRTCOM
READ
IF MCRTCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="M CRATE"
REPLACE PARTNO WITH PNMCR T
REPLACE RM WITH "BOARD"
REPLACE RMCODE WITH RMCOMCR T
REPLACE USAGE WITH UFMCR T
REPLACE BLSIZE WITH "GEN 034"
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```

```

* STICKER
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNSTKR
READ
@ 12,3 SAY "USAGE FACTOR" GET UFSTKR PICTURE "9.999"
READ
@ 16,3 SAY "YOU WANT TO CORRECT SOMETHING ??" GET STKRCOM
READ
IF STKRCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="STICKER"
REPLACE PARTNO WITH PNSTKR
REPLACE USAGE WITH UFSTKR
REPLACE FNLWT WITH 1.000
REPLACE UNIT WITH "NOS"
ENDIF
RETURN
ENDDO

```



```

** PROGRAM FOR EC-T
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNECT
@ 14,3 SAY "RM CODE" GET RMCOECT
@ 15,3 SAY "USAGE FACTOR" GET UFECT
@ 16,3 SAY "COMPONENT WT" GET FWECT PICTURE "9999.999"
@ 17,3 SAY "BLANK WT" GET BWECT PICTURE "9999.999"
@ 18,3 SAY "GROSS WT" GET GWECT PICTURE "9999.999"
@ 19,3 SAY "BLANK SIZE" GET BSECT
@ 20,3 SAY "SHEET SIZE" GET SHSECT
@ 21,3 SAY "NOS OF BLANKS" GET NOSECT
READ
CLEA
@ 10,15 SAY "PLATING COST :" GET PCOST PICT "99.999"
READ
@ 12,15 SAY "SCREEN PRINTING COST :" GET SCPRNT PICT "99.999"
READ
@ 16,15 SAY "R A T E :" GET RTECT PICT "999.99"
READ
@ 17,15 SAY "JOB WORK/ PROFIT :" GET JOBJECT PICT "999.99"
READ
@ 19,3 SAY "YOU MADE SOME MISTAKE ??(Y/N)" GET ECTCOM
READ
IF ECTCOM<>"N"
CLEAR
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="EC-T"
REPLACE PARTNO WITH PNECT
REPLACE RM WITH "CRS"
REPLACE RMCODE WITH RMCOECT
REPLACE USAGE WITH UFECT
REPLACE BLSIZE WITH BSECT
REPLACE SHSIZE WITH SHSECT
REPLACE FNLWT WITH FWECT
REPLACE NETWT WITH DWECT
REPLACE GRWT WITH GWECT
REPLACE NOSBLK WITH NOSECT
REPLACE RATE WITH RTECT
REPLACE JOB_PRO WITH JOBJECT
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CO_SCRAP WITH SCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO +PCOST+SCPRNT
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```


*PROGRAM FOR EC-B

DO WHILE .T.

@ 12,3 SAY "PARTNO" GET PNECB

@ 14,3 SAY "RM CODE" GET RMCDECB

@ 15,3 SAY "USAGE FACTOR" GET UFECB

@ 16,3 SAY "COMPONENT WT" GET FWECEB PICTURE "9999.999"

@ 17,3 SAY "BLANK WT" GET BWECEB PICTURE "9999.999"

@ 18,3 SAY "GROSS WT" GET GWECEB PICTURE "9999.999"

@ 19,3 SAY "BLANK SIZE" GET BSECEB

@ 20,3 SAY "SHEET SIZE" GET SHSECEB

@ 21,3 SAY "NOS OF BLANKS" GET NOSECEB

READ

CLEAR

@ 14,10 SAY "R A T E : " GET RTECEB PICT "999.99"

READ

@ 16,10 SAY "JOB WORK/ PROFIT : " GET JOBECEB PICT "999.99"

READ

@ 18,10 SAY "YOU MADE SOME MISTAKE ??(N)" GET ECBCOM

READ

IF ECBCOM ="Y"

LOOP

ELSE

LOCATE FOR PIND=PNO .AND. DESC="EC-B"

REPLACE PARTNO WITH PNECB

REPLACE RM WITH "CRS"

REPLACE RMCODE WITH RMCDECB

REPLACE USAGE WITH UFECB

REPLACE FNLWT WITH FWECEB

REPLACE NETWT WITH BWECEB

REPLACE GRWT WITH GWECEB

REPLACE BLSIZE WITH BSECEB

REPLACE SHSIZE WITH SHSECEB

REPLACE NOSBLK WITH NOSECEB

REPLACE RATE WITH RTECEB

REPLACE JOB_PRO WITH JOBECEB

REPLACE SCRAP WITH GRWT-FNLWT

REPLACE CD_SCRAP WITH SCRAP*5/1000

REPLACE RMC WITH RATE*GRWT/1000

REPLACE VALUE WITH RMC +JOB_PRO

REPLACE UNIT WITH "GMS"

ENDIF

RETURN

ENDDO

CLEA

```

* ED-B
DO WHILE .T.
@ 10,3 SAY "PARTNO" GET PNEDB
@ 12,3 SAY "USAGE FACTOR" GET UFEDE
@ 14,3 SAY "GROSS WT" GET GWEDB PICTURE "999.999"
@ 16,3 SAY "BLANK WT" GET BWEDB PICTURE "999.999"
READ
CLEAR
@ 13,5 SAY "R A T E :" GET RTEDEB PICT "999.99"
READ
@ 15,5 SAY "JOB WORK/ PROFIT :" GET JOBEDB PICT "999.99"
READ
@ 18,5 SAY "YOU WANT TO CORRECT SOME THING ??" GET EDECOM
READ
IF EDECOM ="Y"
LOOP
ELSE
LOCATE FOR PNO=PNO .AND. DESC="ED-B"
REPLACE PARTNO WITH PNEDEB
REPLACE RM WITH "ED PPR"
REPLACE RMCODE WITH "ED000"
REPLACE USAGE WITH UFEDEB
REPLACE NETWT WITH BWEDB
REPLACE GRWT WITH GWEDB
REPLACE RATE WITH RTEDEB
REPLACE JOB_PRO WITH JOBEDB
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CD_SCRAP WITH SCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```



```

* ED-T
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNEDT
@ 14,3 SAY "USAGE FACTOR" GET UFEDT
@ 16,3 SAY "GROSS WT" GET GWEDT PICTURE "999.999"
@ 18,3 SAY "BLANK WT" GET BWEDT PICTURE "999.999"
READ
CLEA
@ 12,15 SAY "R A T E :" GET RTEDT PICT "999.99"
READ
@ 14,15 SAY "JOB WORK/ PROFIT :" GET JOBEDT PICT "999.99"
READ
@ 18,15 SAY "YOU MADE SOME MISTAKE ??(N)" GET EDTCOM
READ
IF EDTCOM ="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="ED-T"
REPLACE PARTNO WITH PNEDT
REPLACE RM WITH "ED PPR"
REPLACE RMCODE WITH "ED000"
REPLACE USAGE WITH UFEDT
REPLACE GRWT WITH GWEDT
REPLACE NETWT WITH BWEDT
REPLACE RATE WITH RTEDT
REPLACE JOB_PRO WITH JOBEDT
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CD_SCRAP WITH SCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```

```

* PROGRAM FOR BOWL
DO WHILE .T.
@ 12,3 SAY "PARTNO" GET PNBOWL
@ 14,3 SAY "RM CODE" GET  RMCOBOWL
@ 16,3 SAY "COMPONENT WT" GET FWBOWL PICTURE "9999.999"
@ 17,3 SAY "BLANK WT" GET BWBOWL PICTURE "9999.999"
@ 18,3 SAY "GROSS WT" GET GWBOWL PICTURE "9999.999"
@ 19,3 SAY "BLANK SIZE" GET BSBOWL
@ 20,3 SAY "SHEET SIZE" GET SHSBOWL
@ 21,3 SAY "NOS OF BLANKS" GET NOSBOWL
READ
@ 16,5 SAY "R A T E : " GET RTBD PICT "999.99"
READ
@ 17,7 SAY "JOB WORK/ PROFIT : " GET JOBBD PICT "999.99"
READ
@ 22,3 SAY "YOU MADE SOME MISTAKE ??(Y/N)" GET BOWLCOM
READ
IF BOWLCOM="Y"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="BOWL"
REPLACE PARTNO WITH PNBOWL
REPLACE RM WITH "CRS"
REPLACE RMCODE WITH RMCOBOWL
REPLACE USAGE WITH 1
REPLACE BLSIZE WITH BSBOWL
REPLACE SHSIZE WITH SHSBOWL
REPLACE FNLWT WITH FWBOWL
REPLACE NETWT WITH BWBOWL
REPLACE GRWT WITH GWBOWL
REPLACE NOSBLK WITH NOSBOWL
REPLACE RATE WITH RTBD
REPLACE JOB_PRO WITH JOBBD
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CD_SCRAP WITH CCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```



```

*FOR COVER ASSY.
DO WHILE .T.
STORE 00.000 TO CPCOST,NOSCOV,GWCOV
STORE SPACE(1) TO UFCOV
STORE SPACE(4) TO RMCOV
CLEAR
@ 6,3 SAY "PARTNO" GET PNCOV
@ 8,3 SAY "RM CODE" GET RMCOV
@ 10,3 SAY "USAGE FACTOR" GET UFCOV
@ 12,3 SAY "COMPONENT WT" GET FWCOV PICT "9999.999"
@ 14,3 SAY "BLANK WT" GET BWCOV PICT "9999.999"
@ 16,3 SAY "GROSS WT" GET GWCOV PICT "9999.999"
@ 17,3 SAY "BLANK SIZE" GET BSCOV
@ 18,3 SAY "SHEET SIZE" GET SHSCOV
@ 19,3 SAY "NOS OF BLANKS" GET NOSCOV
READ
CLEA
@ 10,15 SAY "PLATING COST :" GET CPCOST
READ
@ 16,15 SAY "R A T E :" GET RTCOV
READ
@ 17,15 SAY "JOB WORK/ PROFIT :" GET JOBCOV PICT "999.99"
READ
CLEAR
@ 22,3 SAY " ASSEMBLY CHARGES =" GET ASCHR PICT "999.99"
READ
@ 22,3 SAY "YOU MADE SOME MISTAKE ??(N)" GET COVCOM
READ
IF COVCOM<>"N"
LOOP
ELSE
LOCATE FOR PINO=PNO .AND. DESC="COVER-ASSY"
REPLACE PARTNO WITH PNCOV
REPLACE RM WITH "CRS"
REPLACE RMCODE WITH RMCOV
REPLACE USAGE WITH UFCOV
REPLACE BLSIZE WITH BSCOV
REPLACE SHSIZE WITH SHSCOV
REPLACE FNLWT WITH FWCOV
REPLACE NETWT WITH BWCOV
REPLACE GRWT WITH GWCOV
REPLACE NOSBLK WITH NOSCOV
REPLACE RATE WITH RTCOV
REPLACE JOB_PRO WITH JOBCOV
REPLACE SCRAP WITH GRWT-FNLWT
REPLACE CO_SCRAP WITH SCRAP*5/1000
REPLACE RMC WITH RATE*GRWT/1000
REPLACE VALUE WITH RMC +JOB_PRO +CPCOST+ASCHR
REPLACE UNIT WITH "GMS"
ENDIF
RETURN
ENDDO
CLEA

```

BILL OF MATERIALS

DESC	PARTNO	RAW	MATL	CODE	RM	USAGE	BLANK	SIZE	PER	FILTER	WT.	WT.	WT.	WT.	COMP. UNIT	SHEET	SIZE	BLANKS	WOS OF	REMARKS	SCRAP	COST OF	RATE	RMC	J.WORK/	PROFIT	VALUE
------	--------	-----	------	------	----	-------	-------	------	-----	--------	-----	-----	-----	-----	------------	-------	------	--------	--------	---------	-------	---------	------	-----	---------	--------	-------

** =====
ADHSV2 148133000 BECN B5400 2
PACK 148101000 FLTR PPR S122 1
EC-1 148106000 CRS CRS 1 124.0 D
C-TUBE 148110000 CRS CRS SC027 1 216.4*202
***** BOM FOR PIND. : 1481EL199

** Subtotal **
*** Total ***
6.04
6.04

BILL OF MATERIALS

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DESC	PARTNO	RAW MATL	RM CODE	USAGE FACTOR PER FILTER	BLANK SIZE (mm)	GROSS WT.	BLANK WT.	COMP. UNIT WT.	SHEET SIZE (mm)	NOS OF BLANKS PER SHEET	REMARKS	SCRAP GMS	COST OF SCRAP RS/KG	RATE RS/KG	RMC	J.WORK/ PROFIT	VALUE
** ===== BOM FOR PIND. > 1481ELI99																	
ADHSV2	148133000	GEDM	G5400	2		0.000	0.000	142.160 GMS		0		0.00	0.00	0.00	0.00	0.00	0.00
PACK	148101000	FLTR PPR	S122	1		0.000	0.000	142.160 GMS		0		0.00	0.00	0.00	0.00	0.00	0.00
ED-T	148106000	CRS	CRS	1	124.0 D	61.000	43.625	43.341 GMS	900*2500	133		17.66	0.09	23.00	1.40	0.38	2.28
C-TUBE	148110000	CRS	SC027	1	216.4*202	150.860	140.690	113.066 GMS	900*2500	48		37.79	0.19	22.00	3.32	0.44	3.76
** Subtotal **																	
																	6.04
*** Total ***																	
																	6.04

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