Integration of Quality Testing Equipment with SAP R/3 Server

A Project Report

Submitted by

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in partial fulfillment for the award of the degree
of

Master of Engineering
in
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P-2064

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TO WHOMSOEVER IT MAY CONCERN

Miss Akila.A., Reg. No. 71205409001, student of final ME Industrial Engineering of Kumaraguru College of Technology, Coimbatore, has successfully completed her project entitled "Integration of quality testing equipments with SAP R/3 Server" in our organization. She has been fully involved in this project from Sept 2006 to April 2007 and has done considerable research both on the subject of the project, as well as the environment in which she has developed the software.

We have tested her work at every stage and are glad to certify that she has produced useful and functional software.

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National Conference on

Contemporary Approaches in Design and Manufacturing

CADAM '07

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ABSTRACT

Quality is essential to meet the customer needs as well as to lead the market. Especially, in textile industry, quality and cost effectiveness plays a vital role. Activities of Quality Assurance are involved with inward inspection, in-process checking, and final inspection. The basic process involved in spinning mill manufacturing are- initial mixing, blow room process, carding, drawing, simplex process, spinning and cone winding. The output of every stage of the above process is being inspected specialized quality equipments are being used here to meet the quality of the cotton yarn.

This project involves a detailed study about the database configuration of the various quality testing equipments being used in the quality department that checks whether the output product at each stage of the process meets the expected quality standards. These quality equipments are then integrated with SAP R/3 server to enable the information to go instrument wise against inspection lot, material batch wise and equipment wise result should be posted in SAP.

The project has been successfully implemented in Super Spinning Mill (SARA ELGI Groups Ltd). After studying and analyzing the existing quality system, this project has been carried out to integrate the quality testing equipments with the SAP R/3 server. Thus the Quality assurance department that remained as a legacy system has been brought into the SAP environment.

சாரம்

வாடிக்கையாளர்களின் தேவைகளை செய்வதோடு வெளிசந்தையில் முன்னிலைப் படுத்தவும் பொருளின் தரம் அத்தியாவசியமாகிறது. குறிப்பாக நூல் மற்றும் நெசவு சார்ந்த தொழிலில் தரமும் அதன் விலை நிர்ணயமும் பெரும் பங்கு வகிக்கிறது ஆரம்ப நிலை பொருளின் தரம் தன்மை முதலில் ஆய்வு செய்யப்பட்டு மேற்கொண்ட நடவடிக்கைகளுக்கு இறுதி செய்யப்படுதல் வேண்டும் நூற்பாளையின் அடிப்படை வேலையென்பது போதிய அளவு கலந்து செயல்முறையின் அனைத்து நிலை களிலும் (பிளோ ரூம் பிராஸஸ், கார்டிங் , டிராயிங் , சிம்ளக்ஸ் பிராஸஸ்)சிறப்பாக செய்து வெளிக் கொணர்தல். பொருள் வெளிக்கொணரும் ஒவ்வொரு நிலையிலும் ஆய்வ செய்து தரமானதாக உருவாக்க வேண்டும்.

பல நிலைகளிலும் தரமான பொருளின் தயாரிப்பிற்கு உபயோகப் படுத்தும் இயந்திரகளின் டாடாபேஸ் அமைப்புகளை(Data base Cofiguration) ஆய்வு செய்து கொள்வது மிகவும் அவசியம். இவ்வாய்வின் அடிப்படையில் இயந்திரங்களின் மூலம் வெளிக் கொணரும் அவுட் புட்(Out put) ஒவ்வொரு நிலையில் சாப் R/ 3 சர்வருடன் ஒருங்கிணத்து செயல்படுத்த ஆய்வுகள் மேற்கொண்டும் அதற்கான வழி முறைகளை வெளிப்படுத்தப்பட்டுள்ளது

DEDICATED
TO MY
BELOVED
PARENTS

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LIST OF SYMBOLS AND ABBREVIATIONS

Symbols

C	Character
N	Numeric
I	Integer
D	Date
F	Float
T	Time

Abbreviations

BDC	Batch Data Communication
ERP	Enterprise Resource Planning
SAP	Systems, Applications and Products in Data Processing
R/3	Real Time with 3 tier architecture
ABAP	Advanced Business Application Programming

Transaction Codes

SE11	ABAP Dictionary
SE38	ABAP Editor
SHDB	To create material master data
SE51	Screen Painter
SE80	Object Navigator
SE93	To create Transaction Codes

Chapter 1

Introduction

1.1 TEXTILE INDUSTRY

Textile Industry is providing one of the most basic needs of people and the holds importance; maintaining sustained growth for improving quality of life. It has a unique position as a self-reliant industry, from the production of raw materials to the delivery of finished products, with substantial value-addition at each stage of processing; it is a major contribution to the country's economy. The textile industry occupies a unique place in our country. One of the earliest to come into existence in India, it accounts for 14% of the total Industrial production, contributes to nearly 30% of the total exports and is the second largest employment generator after agriculture.

1.2 QUALITY IN TEXTILE INDUSTRY

Scenario for textile and clothing industry is fast changing with internet becoming a global market place and increased consumer awareness. World seems to be shrinking, bringing down trade barriers. Under these challenging market conditions effective quality systems have emerged as a major thrust point. Automation has made achieving quality easier, with electronics controlling operations, temperatures, speeds, twists, and efficiency.

Quality control is not a recent realization, though it has become paramount now. . To achieve consistency in quality it is necessary to define quality parameters. Thus attention to quality is an important way that an organization can prepare to meet the challenges and demands in the market.

1.3 SUMMARY OF PROJECT WORK

1.3.1 Problem Identification

Even though SAP is being implemented in the whole of Super Spinning Mill, there are some departments that still maintain the legacy system. Quality Assurance department is one among them. Because of this, the quality testing instruments remain separated from the business management system. Each quality testing equipment uses

different database to output the results. These results are entered manually to the server to obtain the final report on the product's quality specification.

1.3.2 Project objective

The objective of this project is to integrate the quality equipments involved in the textile process with the existing SAP server, in a spinning mill i.e., to enable the information to go instrument wise against inspection lot , material batch wise and equipment wise result should be posted in SAP.

1.3.3 Importance of Project

- Efficiency of the entire process increases
- Reduces time consumption
- Relieves the administration burden
- Reduces manual entry, thereby eliminating the data entry errors.

1.4 SEQUENCE OF THE REPORT

The sequence of the entire report goes in the following way:

- Chapter 1 gives an introduction of the importance of quality in textile industry, the spinning process and a summary of the whole project work.
- Chapter 2 gives detail information about the quality equipments that are being used for testing the yarn at various stages of spinning process.
- Chapter 3 deals with SAP and the ABAP language. In ABAP, Batch Data Communication process is detailed.
- Chapter 4 focuses on the case study of the company (Super spinning mill, ELGI group of Ltd). It identifies the problem and the methodology to solve it.
- Chapter 5 deals with the step-by-step procedure involved in integrating the quality equipments with the server.

- Chapter 6 gives the results of the project work being carried out with few transaction screens.
- Chapter 7 concludes the report with the solution for the problem being identified.

1.5 LIMITATIONS

There are numerous quality testing instruments being used in textile industry, but as per the company requirement the project is limited to integrating few machines that are being in use in the company. For further development, the project paves way for more inclusions of instruments output if required.

1.6 LITERATURE SURVEY

The literature survey is done by referring various journals and websites which has been listed out at the end of this report. . A model proposed by Youssef. Majed Al-Mashari, Mohamed Zairi for the effective application of SAP R/3 from an integrated and holistic perspective provides the need for SAP. Vidyaranya B. Gargeya has identified several success and failure factors for ERP system implementation in which he considers the SAP software package. His study is based on content analysis of various articles.

Udo waibel describes the software being developed that enables non technical persons to use the upload of excel into SAP. Excel remains an important productivity application at most companies and many information workers maintain or receive their data in Excel files, especially accounting, budgeting, and other financial data. In companies that have implemented various SAP solutions, these Excel data silos end up being very counterproductive due to delays involved in getting the Excel data into the SAP system in a timely fashion. . This paper describes how to easily integrate Excel data with SAP solutions and the resulting benefits from such integration - reduction in financial closing time, reduction in data entry resources, and availability of timely data for reporting. This has been very useful in comparing and analyzing the BDC session that is being used in the later part of the project.

IntelliCorp SAP consolidations, provides the key challenges faced while consolidating the data and is followed with solutions to overcome the hurdles. Companies are being driven to standardize processes and systems across the enterprise to improve efficiency. They are finding that although consolidating multiple instances in their SAP infrastructure can be technically difficult, it can produce outstanding business results with substantial reductions in equipment and resources. Automation tools can dramatically reduce the time, cost and complexity while providing the ability to perform detailed analysis of multiple SAP environments. Milan, Derby, Madrid, Derbyshire, highlights innovative technology for comprehensive automated order management to optimize the cash-order cycle. The automation software can remove the tedious manual effort from your next SAP consolidation project and free your staff to focus on strategic planning and execution.

Chapter 2

Spinning Mill Process

2.1 SPINNING PROCESS

A spinning mill carries out many processes which transform bales of raw cotton into a yarn ready for weaving. The term "spinning" can refer to the whole range of processes carried out in a spinning mill, starting with breaking open the bales of raw cotton to sizing the yarn. It can also mean the spinning of the final yarn.

2.1.1 Mixing of cotton

Cotton is a natural fibre and a hygroscopic material, hence it easily adapts to the atmospheric air-conditions. Air temperature inside the mixing and blow room area should be more than 25 degree centigrade and the relative humidity (RH %) should be around 45 to 60 %, because high moisture in the fibre leads to poor cleaning and dryness in the fibre leads to fibre damages which ultimately reduces the spin ability of cotton.

The raw cotton arrives in the form of large bales. These are broken open and a worker feeds the cotton into a machine called a "breaker" which gets rid of some of the dirt. The cotton may not be consistent in quality from bale to bale and samples will be taken.From here the cotton goes to a "scutcher". (Operated by a worker also called a scutcher). This machine cleans the cotton of any remaining dirt and separates the fibres. The cotton emerges in the form of thin "blanket" called the "lap". (Think of how "cotton wool" holds itself together). An important quantity is called the *"tex"* which basically measures the mass per metre. Ideally the tex of the emerging lap should stay more or less the same. The final end product of the mill, the yarn, needs to be of constant quality and character and this is achieved by checking the cotton through all the proceeding stages. One way to achieve this is by blending. The output from several breakers can be fed into the scutcher so that the contents of different bales are being blended to produce a more uniform output. The stress on quality control is something that has changed over the years and what used to be achieved by the experienced eye of the workers now relies more on measurement.

2.1.2 Blowroom process

Blow room is the process which takes care of opening, cleaning and blending of different fibres used in the mixing. The technological improvements are remarkable in this process. Basic operations in the blowroom:

1. opening
2. cleaning
3. mixing or blending
4. micro dust removal
5. uniform feed to the carding machine
6. Recycling the waste

Traditional methods use more number of machines to open and clean natural fibres. Mechanical action on fibres causes some deterioration on yarn quality, particularly in terms of neps. Moreover it is true that the staple length of cotton can be significantly shortened. Intensive opening in the initial machines like Bale breaker and blending machines means that shorter overall cleaning lines are adequate. In a beating operation, the flocks are subjected to a sudden strong blow. The inertia of the impurities accelerated to a high speed is substantially greater than that of the opened flocks due to the low air resistance of the impurities. The latter are hurled against the grid and because of their small size, pass between the grid bars into the waste box, while the flocks continue around the periphery of the rotating beater. By using a much shorter machine sequence, fibres with better elastic properties and improved spin ability can be produced. Air streams are often used in the latest machine sequence, to separate fibres from trash particles by buoyancy differences rather than beating the material against a series of grid bars. There are three types of feeding apparatus in the blowroom opening machines

1. two feed rollers(clamped)
2. feed roller and a feed table
3. a feed roller and pedals

Two feed roller arrangements gives the best forwarding motion, but unfortunately results in greatest clamping distance between the cylinders and the beating element. Feed roller and pedal arrangement gives secure clamping throughout the width and a small clamping distance, which is very critical for an opening machine In a feed roller and table arrangement, the clamping distance can be made very small. This gives intensive opening, but clamping over the whole width is poor, because the roller presses only on the highest points of the web. Thin places in the web can be dragged out of hue web as a clump by the beaters

Honeydew (sugar) or stickiness in cotton affects the process very badly. Because of that production and quality is affected. Particles stick to metal surfaces, and it gets aggravated with heat and pressure. These deposits change the surface characteristics which directly affects the quality and running behavior. There are chemicals which can be sprayed to split up the sugar drops to achieve better distribution. But this system should use water solutions which are not recommended due to various reasons. It is better to control the climate inside the department at 22 degree Celsius when sticky cotton is used.

2.1.3Carding

Card is said to be the heart of spinning mill. The purpose of carding is as follows.

1. Cleaning or elimination of impurities
2. Reduction of neps
3. Elimination of dust
4. Elimination of short fibres
5. Fibre blending
6. Fibre orientation or alignment
7. Sliver formation.
8. To open the flocks into individual fibres

The output of the previous stage called the lap is being converted to sliver during the carding and drawing process. 2 The carding machine is set with hundreds of fine

wires that separate the fibers and pull them into somewhat parallel form. A thin web of fiber is formed, and as it moves along, it passes through a funnel-shaped device that produces a ropelike strand of parallel fibers. Blending can take place by joining laps of different fibers. This is done by a machine called a "card". The fibres are separated more completely and the tex is reduced many times. The output from these machines is more like an untwisted 'rope' than a blanket. Maintenance is done by 'strippers' and 'grinders' according to Tippett but in the census they are generally called 'cardroom hands', 'cardroom operatives'.

2.1.4 Combing

When a smoother, finer yarn is required, fibers are subjected to a further paralleling method. A comb like device arranges fibers into parallel form, with short fibers falling out of the strand. Combing is the process which serves to improve the raw material. Combed yarn is stronger, more uniform, has greater shine and is smoother and purer. The quality improvements are obtained at the cost of additional expenditure on machines, floor and personnel, together with a loss of raw material. Combing is the process which is used to upgrade the raw material. It influences the following yarn quality

1. yarn evenness
2. strength
3. cleanness
4. smoothness
5. visual appearance

In addition to the above, combed cotton needs less twist than a carded yarn. To produce an improvement in yarn quality, the comber must perform the following operation.

1. Elimination of short fibres
2. Elimination of remaining impurities
3. Elimination of neps

The basic operation of the comber is to improve the mean length or staple length by removing the short fibres. Since fineness of short fibres(noil) is low, the overall micronaire of the sliver after combing is high. Because of combing, fibre parallelization increases. Please note that this is a side effect which is not an advantage always. The high degree of parallelization might reduce inter-fibre adhesion in the sliver to such an extent that the fibres slide apart while pulled out of the can. This may lead to sliver breaks or false draft.

Following are the process involved in combing.

P- 2064

1. Feeding, lap is fed by feed roller
2. fed lap gripped by the nipper
3. gripped lap is combed by circular comb
4. detaching roller grips the combed lap and moves forward
5. while the detaching roller delivers the material, top comb comes into action to further clean the lap
6. While going back, nipper opens and receives a new bit of lap.

2.1.5 Drawing

After carding or combing, the fiber mass is referred to as the sliver. Several slivers are combined before this process. A series of rollers rotating at different rates of speed elongate the sliver into a single more uniform strand that is given a small amount of twist and fed into large cans. Carded slivers are drawn twice after carding. Combed slivers are drawn once before combing and twice more after combing. Quality of the drawframe sliver determines the yarn quality. Drawing is the final process of quality improvement in the spinning mill.

Drafting is the process of elongating a strand of fibres, with the intention of orienting the fibres in the direction of the strand and reducing its linear density. In a roller drafting system, the strand is passed through a series of sets of rollers, each successive set rotating at a surface velocity greater than that of the previous set. During drafting, the fibres must be moved relative to each other as uniformly as possible by overcoming the

cohesive friction. Uniformity implies in this context that all fibres are controllably rearranged with a shift relative to each other equal to the degree of draft. In drawframe, the rollers are so rotated that their peripheral speed in the through flow direction increases from roller pair to roller pair, then the drawing part of the fibres, i.e. the draft, takes place. Draft is defined as the ratio of the delivered length to the feed length or the ratio of the corresponding peripheral speeds. Drawing apart of the fibres is affected by fibres being carried along with the roller surfaces. For this to occur, the fibres must move with the peripheral speed of the rollers. This transfer of the roller speed to the fibres represents one of the problems of drafting operation. The transfer can be affected only by friction, but the fibre strand is fairly thick and only its outer layers have contact with the rollers, and furthermore various, non-constant forces act on the fibres.

Roller drafting adds irregularities in the strand. Lamb states that, though an irregularity causing mechanism does exist in drafting, drafting also actually reduced the strand irregularities by breaking down the fibre groups. Drafting is accompanied by doubling on the drawframe, this offsets the added irregularity.

Variance (sliver out) = Variance (sliver in) + Variance (added by m/c)

In Statistics, Variance is the square of standard deviation.

2.1.6 Twisting

The sliver is fed through a machine called the roving frame, where the strands of fiber are further elongated and given additional twist. These strands are called the roving. Here the yarn is further attenuated — i.e. it is being stretched so that the weight per unit length decreases further. The process is very similar to drawing. The process is carried out by 'speed frames' and quite often there are three sets in series. The output from the first is called 'slubbing' The output from the second is called 'inter'(mediate). The output from the third is 'roving'. 'Slubber' and 'rover' are often given as census occupations.

2.1.7 Spinning

The predominant commercial systems of yarn formation are ring spinning and open-end spinning. In ring spinning, (Figure 2.1) the roving is fed from the spool through rollers. These rollers elongate the roving, which passes through the eyelet, moving down.

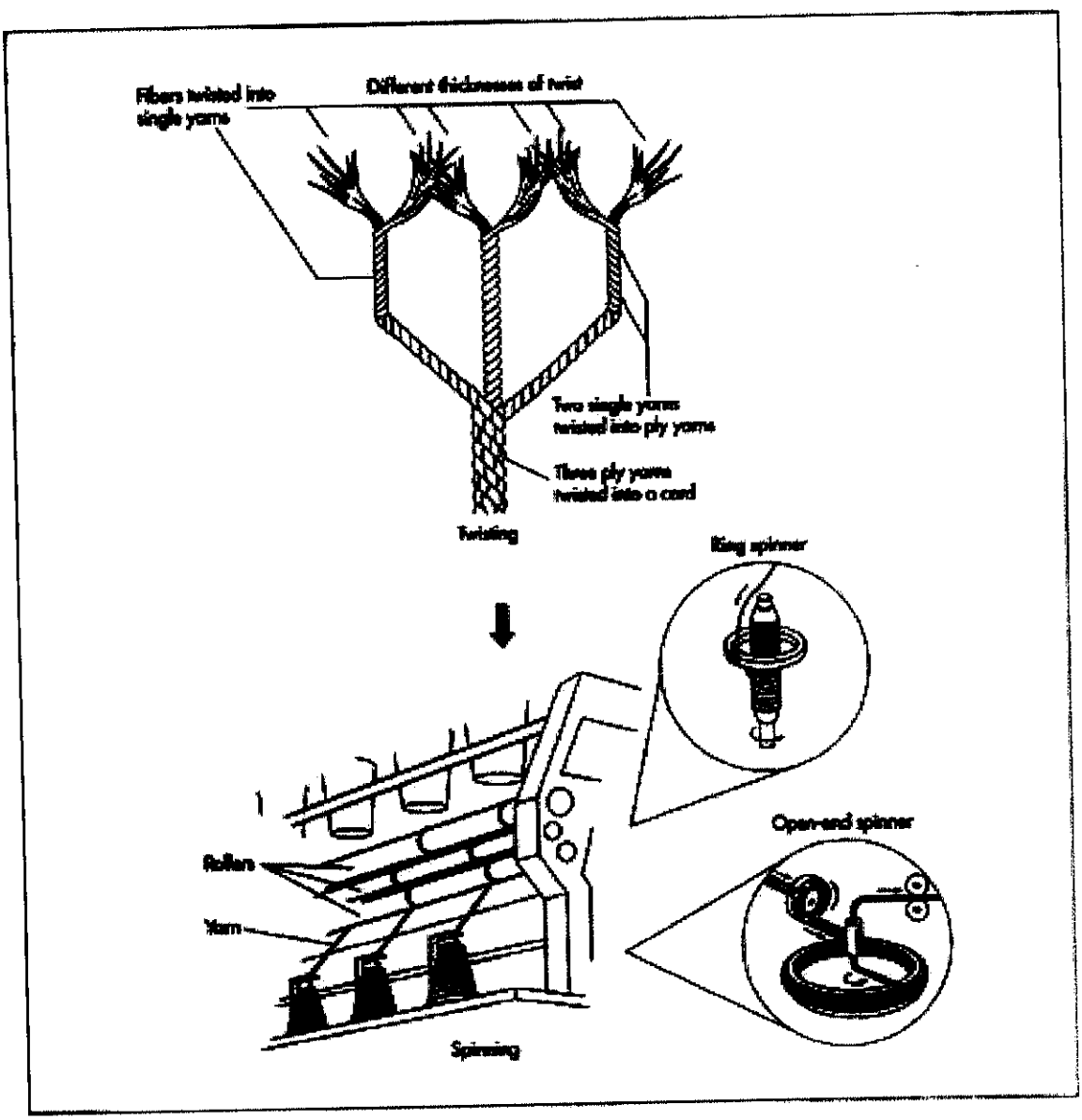

FIGURE 2.1: SPINNING PROCESS

The sliver is fed through a machine called the roving frame, where the strands of fiber are further elongated and given additional twist. The predominant commercial systems of yarn formation are ring spinning and open-end spinning. Open-end spinning omits the roving step and through the traveler as in figure 2.1. The traveler moves freely around the stationary ring at 4,000 to 12,000 revolutions per minute. The spindle turns the bobbin at a constant speed. This turning of the bobbin and the movement of the traveler twists and winds the yarn in one operation.

Open-end spinning omits the roving step. Instead, a sliver of fibers is fed into the spinner by a stream of air. The sliver is delivered to a rotary beater that separates the fibers into a thin stream that is carried into the rotor by a current of air through a tube or duct and is deposited in a V-shaped groove along the sides of the rotor. As the rotor turns, twist is produced. A constant stream of new fibers enters the rotor, is distributed in the groove, and is removed at the end of the formed yarn.

Chapter 3

Quality Parameters

3.1 FIBRE TESTING

All cotton produced in the world is tested at one stage or another before it is processed into an end product. Testing is done for two main objectives: assessing the true value of cotton so that it is priced correctly (from the buyer as well as the seller's perspective) and making best use of the fiber quality. Fiber quality cannot be assessed while fibers are still attached to the seed. Grading of seed cotton is not popular in most countries, and it is practically impossible when land holdings are small and every farmer is free to choose varieties and production practices, including irrigation, fertilizers and pesticide use. While varieties differ in their inherent abilities to produce qualitative differences, agronomic practices further amplify the magnitude of differences in quality. Moreover, ginners are bound to mix lots of cotton from small growers.

The hygroscopic nature of the cotton adds to the difficulties of proper quality evaluation. A sample of fiber tested under various conditions, at different temperature and humidity levels, produces different data. Testing equipment is also a source of variability for fiber quality parameters. A variety of fiber testing equipment is used, but the field of fiber testing equipment has not received much attention. On the one hand the development and manufacture of testing equipment is in the private sector and driven by economic motives. On the other hand, the development of suitable equipment that will measure all cottons under all environments equally is probably the most challenging task of the entire cotton industry. To do so at a minimum cost only adds to the problem. Consequently, fiber testing has lagged other fields like breeding, pest control, and more recently, utilization of biochemical and physiological processes going on in the plant. Certain characteristics of cotton fiber are known, and efforts are made to measure them as perfectly as possible. The cotton industry has succeeded in developing and measuring some characters betters than others.

3.2 IMPORTANCE OF RAW MATERIAL IN SPINNING PROCESS

Raw material represents about 50 to 70% of the production cost of a short-staple yarn. This fact is sufficient to indicate the significance of the raw material for the yarn producer. It is not possible to use a problem-free raw material always, because cotton is a

natural fibre and there are many properties which will affect the performance. If all the properties have to be good for the cotton, the raw material would be too expensive. To produce a good yarn with these difficulties, an intimate knowledge of the raw material and its behavior in processing is a must.

Fibre characteristics must be classified according to a certain sequence of importance with respect to the end product and the spinning process. Moreover, such quantified characteristics must also be assessed with reference to the following

- What is the ideal value?
- What amount of variation is acceptable in the bale material?
- What amount of variation is acceptable in the final blend?

Such valuable experience, which allows one to determine the most suitable use for the raw material, can only be obtained by means of a long, intensified and direct association with the raw material, the spinning process and the end product. Low cost yarn manufacture, fulfilling of all quality requirements and a controlled fibre feed with known fibre properties are necessary in order to compete on the world's textile markets. Yarn production begins with the raw material in bales, whereby success or failure is determined by the fibre quality, its price and availability. Successful yarn producers optimize profits by a process oriented selection and mixing of the raw material, followed by optimization of the machine settings, production rates, operating elements, etc. Simultaneously, quality is ensured by means of a closed loop control system, which requires the application of supervisory system at spinning and spinning preparation, as well as a means of selecting the most suitable bale mix.

3.3 BASIC FIBRE CHARACTERISTICS

A textile fibre is a peculiar object. It has not truly fixed length, width, thickness, shape and cross-section. Growth of natural fibres or production factors of manmade fibres are responsible for this situation. An individual fibre, if examined carefully, will be seen to vary in cross-sectional area along it length. This may be the result of variations in growth rate, caused by dietary, metabolic, nutrient-supply, seasonal, weather, or other

factors influencing the rate of cell development in natural fibres. Surface characteristics also play some part in increasing the variability of fibre shape. The scales of wool, the twisted arrangement of cotton, the nodes appearing at intervals along the cellulosic natural fibres etc. Following are the basic characteristics of cotton fibre

- Fibre length
- Fineness
- Strength
- Maturity
- Rigidity
- Fibre friction
- Structural features

The figure3.1 correlates the influence of the fibre properties with their subsequent processes.

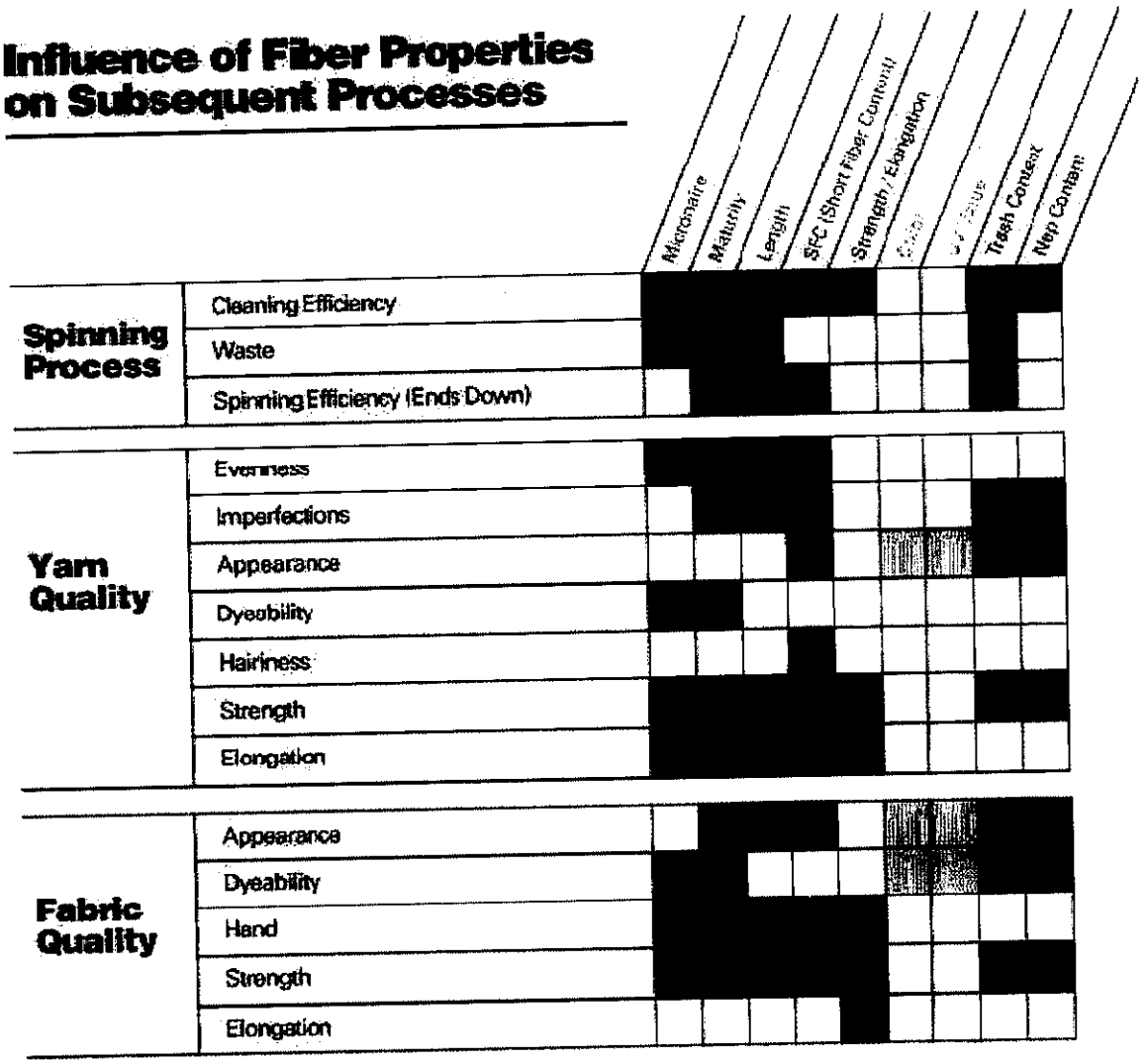

FIGURE 3.1: FIBRE PROPERTIES Vs QUALITY PARAMETERS CHART

3.4 QUALITY PARAMETERS TO BE TESTED

3.4.1 MIXING

According to the count cotton bales are issued to Contamination removal process. Here contaminations in bales are segregated manually to avoid the foreign fiber faults in cloth. Then mixing is prepared for further process.

Moisture

Moisture of cotton is checked by a moisture meter. If Moisture of cotton is low semi central is used to increase the moisture. If moisture is high, dehumidifier is used to reduce the moisture. The above activities are done for improving the working performance in further process.

Trash%

Trash% in cotton is checked for every lot & according to the trash content in cotton waste% to be extracted is decided in BR & Carding dept.

Neps

Small clusters of fibers which cannot be opened defined as Neps. Neps in cotton is checked by instrument & derived as Neps/ gram. This parameter is checked to decide the speeds to be worked in each subsequent machine.

3.4.2 BLOW ROOM

The cotton is processed through sequence of machines for Opening and Cleaning of the cotton. In this process Seed coats, leafs are removed.

The QA activity involved in this department are listed below

- Fibre Rupture
- Blow room Cleaning Effy
- Beater wise waste %
- Beater wise Waste Lint Loss %
- Blow room Synchronization
- Beaterwise Neps Generation

Fibre rupture

When cotton is processed through Blow room m/cs it is being beaten for cleaning & opening, at that time fibres get damaged at the tip. So to measure the loss of length, cotton is collected from every m/c input & output then fibre length is checked in Qad dept. Br fibre rupture should be around 4% below. It is calculated by the formula:

$$\frac{2.5\%\ \text{span length of input} - 2.5\%\ \text{span length of output}}{2.5\%\ \text{span length of input}} \times 100$$

B/R cleaning efficiency

The cotton processed in the m/c for cleaning, this is evaluated by checking the trash content in the cotton before & after processed in the machines by trash analyser m/c. It is calculated as,

$$\frac{\text{Trash\% in Input cotton - Trash\% in Output cotton}}{\text{Trash\% in Input cotton}} \times 100$$

BR cleaning efficiency should be around 50 to 60%.

B/R waste %

While the cotton is processed in each Br m/cs unwanted particles other than cotton is fallen down while it is beaten by beaters & grid bars. It is calculated as

$$\frac{\text{Waste wt in kgs}}{\text{Cotton input wt in kgs}} \times 100$$

Waste extracted varies from 2 to 4% which is decided to the trash content in mixing.

Beater wise lint loss%

Here the waste extracted checked in Trash analyzer for any good fibre loss

B/R synchronization

In Br line of machine supplies the material to the subsequent m/c as continuously as possible accordingly the m/c feed is controlled. Each machine calculated as

$$\frac{\text{Total time observed Beater idle time}}{\text{Total time observed}} \times 100$$

B/R nep generation

When the cotton is opened & cleaned cotton gets rolled in to small clusters defined as neps. This is measured by Qad m/cs in terms of neps/gram. Nep generation is calculated as

$$\frac{\text{Output neps/gram - Input neps/gram}}{\text{Input neps/gram}} \times 100$$

3.4.3 CARDING

The cotton after opened and cleaned to some extend is then further processed in carding Machine. Here the fibres are separated individually and parallels the fibre each

other. In this process short fibre and trash materials are removed and it delivers the cotton in rope Form called as sliver

The QA activities

- Wrapping
- U% Checking
- Cleaning Effy
- Waste %
- Nep Removal Efficiency
- Nep/trash content in sliver
- Breakage study

Wrapping

The output material called sliver is confirmed for Hank (Count). The material is checked by wrap block for length and it is weighed and calculated by the formulae given below.

$$\frac{0.54 \text{ x No of Yards}}{\text{Wt in grams}}$$

U% checking

The sliver is checked for short term variation in a machine called UT3.The sliver mass is measured with a capacitor and the machine calculates Unevenness%,1mt CV%, 3mt CV% etc,

Cleaning efficiency

The material is processed through the machine and the fibers are opened paralleled to each other and it separated the trash form cotton. The trash% is checked by a machine called Trash Analyzer. The input and output

Material checked for trash% and cleaning effy is derived.

$$\frac{\text{Trash\% in Input material} \quad \text{Trash\% in Output material}}{\text{Trash \% in Input material}} \text{ x } 100$$

Waste%

In carding process the sead coats, leaf bits, and short fibers are removed. The amount of unwanted materials removed is calculated as waste %

$$\frac{\text{Weight of waste removed}}{\text{Card sliver weight + Waste weight}} x100$$

Web appearance and neps checking

The delivery web is checked visually for uniformity and checked for neps with Shirley template. Now with latest instrument AFIS (Advanced fiber information system). The sliver neps checked by drafting and counting neps by the machine and reports neps/gram.

Nep removal effy

Neps content checked for the input & output material by AFIS m/c. Then Neps / gram derived & calculated by formulae given below.

$$\frac{\text{Neps/gram in input Neps/gram in output}}{\text{Neps/ gram input}} x100$$

Breakage study

This study is conducted to see that the material flow is not cut frequently. This determines the working performance of m/c, & derived Card breaks/ hour.

3.4.4 LAP FORMERS

This process is done only for combed counts. The sliver delivered in carding dept is combined with many slivers to minimize the sliver variation and make the sliver more uniform and deliver as a web called as lap and feed for the next process comber The QA activity carried out in the dept are Wrapping and u% of pre comber drawing, Gms/mt of lap former.

Linear density checking

The lap thickness is measured for length /weight and gms/mt is derived. This is checked for standard weight required.

Breakage study

As already mentioned breakage study is checked to see the performance of the m/c.

Pre comber drawing

Wrapping, U%, Breakage study is checked as similar to Carding dept.

3.4.5 COMBER

This is a main process to remove the short fibre content in the material. The lap fed is Gripped and combed by a unicomb , the floating fibres are removed while combing and Lengthy fibres are attached to good fibre and pulled out as web and delivered as sliver. The QA activity involved in this dept are

- Noil% Check
- U% and Wrapping
- Nep content in sliver
- Breakage study

Wrapping, U%, Neps, breakage study are all common procedures involved.

Noil checking

The wasted extracted is checked by weighing sliver wt ouput material & waste extracted for the same duration. The calculation involved is

$$\frac{\text{Waste wt in gms}}{\text{Silver wt} + \text{waste wt}} x 100$$

Neps checking

Neps / gram is checked in sliver as this is the finaly process. In Further process neps cannot be removed. This check is done by AFIS.

3.4.6 DRAWING

This process is very important as the sliver variations are only controlled here and Subsequent process there is no scope for correction. After combing the sliver variation are reduced by combining no of slivers and with the help of autoleveller it is further minimized. The following QA activity is carried out here

- A% checking

- U% and Wrapping
- Nep content in Sliver
- Fibre rupture
- 1 mt CV%
- Breakage study.

The common quality checks followed are Wrapping, U%, Neps breakage study etc.

A% checking

This checking is done for measuring the performance of Autoleveller. The total no of sliver input here is 8 ends & for this checking 7,8,9 slivers are fed & the output is checked for wrapping to ensure the accuracy of Hank achieved for allowed tolerance. The value derived in Ktex for common & following formulae used for A% where N denotes 8 ends up.

1. (N-1) - N / N * 100 (for 7 ends)
2. (N+1) - N / N * 100 (for 9 ends)

The results achieved must be +/- 0.5%.

Drawing 1 mt c.v%

This test carried out like wrapping but sample length taken is 1mt & no of readings around 20 & is calculated for C.V%. This also assures the autoleveler performance.

3.4.7 SIMPLEX

The sliver material is drafted down i.e. thinning down process around 10 to 15 times of its input value. The output material called as roving. The Q.A inspection checks carried out in this department are,

- Wrapping
- U%
- Stretch%
- Breakage study
- Idle checking
- C.V % checking

In this dept also quality checks like Wrapping, U%, breakage study are common.

Stretch %

This check is done to ensure minimum tension applied to roving at initial winding stage to bobbin & avoid stretch resulting finer Hank. The roving bobbins are collected at initial stage & full bobbin stage the same checked for wrapping & stretch% derived by the given formulae

H1 - Initial bobbin H2 - Full bobbin

$$\frac{\text{Stretch \%} = \text{H1} - \text{H2}}{(H1 + H2)/2} \text{X} 100$$

3.4.8 SPINNING

The Roving material which is input to this process, is drafted down i.e. thinning down process around 20 to 40 times according to the count determined. The output material is twisted and wounded on cops and called as yarn. The following Q.A checks being carried out in this dept are

- Wrapping
- U% & imp
- RKM
- RIDA breakage
- TPI checking
- Count change follow up

Wrapping count, strength

The yarn is wrapped in Wrap reel m/c around 120 yds known as lea weight for count the formulae given below.

0.54 * 120 yds / wt in grams = Count.

The same lea is used for checking strength in strength tester m/c where the leas are held in between 2 jaws & one of the jaws moves downwards & the with standing force of the yarn is noted as strength. The product of Count & strength is known as CSP.

U% & imperfections

The yarn is tested in testing instrument for U% as well as faults measured & given as Imperfection / Km . The following faults measured

Thin place - - 50% of the yarn diameter

Thick place - + 50% of the yarn diameter

Neps - + 200% with 1mm of the yarn diameter / length.

All added & mention as Total imperfection / km. In this machine Hairiness also checked that means short fibers protruding out of the core yarn.

RKM (resistance / km)

This checking is to determine the single yarn breaking strength commonly termed as Single Yarn strength.

TPI checking

The yarn produced needs some twist to hold the fibers together for better strength & it is measured as Twist per inch. The yarn is hold for a distance of 20 inches & the same untwisted & twisted for single yarn & the calculated by the formulae

No of turns / 2 / 20 = TPI.

Breakage study

This study is necessary to access working performance of m/c & determines production as well as quality. The same checked by latest method with RIDA Which is automatically updated online checking. Some time actual study also conducted manually. The breakage is measured as Breaks/100 spindle hrs.

Snarl checking

This is checked for seeing yarn entangled on its own while a distance of yarn let free. If the Twist in the yarn is more then snarling will be high. So optimum level of twist to be determined for that purpose this test is very important. It is checked in a snarl checking board manually & the result is noted from the marked values.

3.4.9 AUTOCONER

In this department cops which is produced in ring frame is joined together for a continuous yarn and wound on paper cones, at the same time faults are measured by electronic clearers and the faults portion of yarn is removed. The yarns are knotless as while joining it splices the yarn.The Q.A Activity included in this dept is,

1) Wrapping
2) U% & imp
3) RKM
4) TPI Checking
5) Wax pick up
6) Splice appearance & strength
7) Black board appearance
8) Drum wise/lot wise rewinding study
9) Knitting, cloth inspection.

The Common QA activities involved in this department are Count, Strength, CSP, RKM,and TPI checking.

Wax pickup

Wax is used only for Hosiery Yarn to reduce static energy while the yarn in pulled out through the needles. Wax pickup study is conducted to check the amount of wax applied on yarn.Formula :

$$\frac{\text{Weight of the Wax Before Process}\ \ \text{Weight of the Wax after Process}}{\text{Net yarn would on the cone}} X\ 100$$

Splice strength & appearance

The Yarn in Autoconer is spliced to produce knotless yarn. Spliced means both ends of the yarn are untwisted and merged together by twisting. The QA checks the strength of the spliced yarn; it should be around 80 to 85% of the Parent yarn.

$$\frac{\text{Spliced Yarn Strength}}{\textit{Parent}\ \text{Yarn Strength}} \text{x } 100$$

Appearance is compared with good spliced yarn specimen.

Winding and rewinding study

The QA Checks the Winding Breakage ie., Cops faults are removed by cutting the yarn and the same noted as breakage. The finished cone yarn is rewinded in A/C with closer setting to check for defect free yarn. This yarn length observed for study is calculated and derived as break / lakh meter

$$\frac{\text{Number of faults}}{\text{Total length of Yarn observed}} \times 1{,}00{,}000$$

Classidata check

This is checked for final yarn cone. Here it measures faults for a longer length and Classified as Raw material faults, objectionable faults, long thick, long thin etc., It is Checked in a Classidata Offline machine and results are consolidated as report. In Autoconer online data available for the latest version. So the same noted down in that case.

Knitting cloth

Hosiery Yarns are checked for cloth unevenness and Foreign Fibre content in Fabric. The Yan knitted in a knitting machine and the cloth is inspected in an Inspection Tables

Number of Faults / Observed cloth weight in kgs = Faults / Kg

Number of Foreign Fibre / Observed Cloth Weight in Kgs = FF / Kg

The final cones are packed and ready for dispatch. Every lot final inspection is checked and after ensuring quality the same dispatched to party. In final dispatch the following Q.A inspection carried out,

- 10% sampling done & visual inspection carried out
- U%, Imp & CSP/RKM checked.

3.5 TYPES OF QUALITY TESTING EQUIPMENTS

The major quality testing instruments used in textile industry are as follows:

- Rapid instrument testing
- Advanced Fiber Information System

- Fiber length measurement instruments
- Fiber strength testers
- Fineness and maturity testing
- Stickiness testing machines
- Trash testers.

3.6 EQUIPMENTS UNDER CONSIDERATION

Even though there are various quality testing instruments being in practice, the project concerns with only few machines that are being involved in spinning process. Detailed descriptions of these machines are as follows:

3.6.1 USTER AFIS

The uster afis (Figure 3.2) is a single fibre testing machine suitable for spinning mills. It has different modules, viz, Module N for the analysis of the nep count, and nep size; Module L&D measures fibre length and diameter; Module T determines the number and size of particles of foreign matter, dust and trash; Multi-Data module allows simultaneously to determine neps, trash, dust, fibre length and diameter of a sample; and the Autojet module takes care of the automatic loading of the test sample; thus the operator can do other important tasks in the laboratory. With uster afis unsuitable cotton types, incorrect machine setting, and changes of quality can be recognized quickly and reliably. Above all maintenance costs can be reduced particularly with respect to card clothing.

Various modules provide measurements on the basis of which quality management is accomplished as under:

- Neps module measures fiber and seed coat neps. The latter types of neps are difficult to remove. The blowing processes increases neps where as the carding removes neps, neps larger than 800/vm in size are visible in yarn. With the information on the number of neps in card sliver it is possible to predict nep content of yarn.

- Module T determines the number and size of particles of foreign matter, dust and trash. With information on trash content, nep content, waste extraction and nep removal efficiency can be optimised with card output rate, machine maintenance and wire performance.

Length and Maturity Module provides accurate measurement of length distribution curve, histogram, maturity ratio, SFC (short fiber content) and IFC (Immature Fiber content). An increase of SFC in the card sliver indicates fiber damage and calls for the adjustment of the settings and speeds of the functional parts of the card. The combing efficiency can be improved by comparison of SFC in comber lap and combed sliver. Individual deliveries of comber can also be checked. By regular monitoring of SFC at the comber it is possible to reduce noils by 1% and maintain yarn quality at the same level.

Testing activity carried out: Neps and length.

Operating system: DOS

Output format: Text files with *.Prn, *.txt extension.

FIGURE 3.2: USTER AFIS

3.6.2 STATEX HVI

Statex – HVI (Figure 3.3) is the most advanced instrument for testing of fiber properties. It measures 2.5% and 50% span length, strength, elongation, micronaire, maturity ratio, percentage of maturity, Fineness, UV-Status and color Rd;+b.It also provides uniformity ratio, Short fiber percentage, mean length, upper half mean length, uniformity index and fibro gram. Statex - HVI consists of automatic brushing unit, auto comb transport mechanism, Fibre length and strength measuring module and micronaire module. The fiber length and strength is measured with the same fiber sample prepared by the comb. A self diagnosis software for immediate identification of mechanical and electronic faults. Statex color mode having two options to test color of fibers. They are

- **UV- Reflection** - This mode measures the "UV- Status of the fibre by UV Light reflection principle. The "UV-Status" highly correlated with color absorption in fiber and variation in cloth.
- **Rd; +b value** - This mode measures the Rd - Reflectance and +b yellowness of fiber by halogen light reflection principle.

TABLE 3.1: TEST MODULES

Test Modules		**Principles**
Length		Optic
Strength		Constant rate of extension
Micronaire & Maturity		Double compression air flow
Colour	Rd;+b	Halogen Light Reflection
	UV - Status	UV - Light Reflection

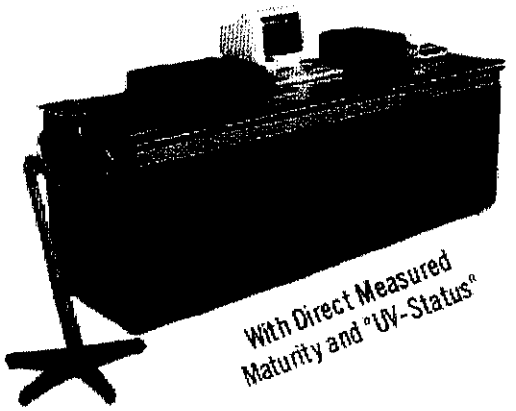

FIGURE 3.3: STATEX HVI

Operating system: Win 95

Output format: Script files with *.MV extension.

3.6.3 USTER CLASSIMAT QUANTUM

The Uster Classimat Quantum (Figure 3.4) detects and classifies automatically seldom occurring thick and thin places faults and foreign fiber in staple fiber yarns. At the end of the test, it converts the fault frequency to a standard yarn length. This instrument quickly provides an overall view of yarn quality by:

- Classifying foreign fibers
- Checking of cleared and un-cleared yarns.
- Inspection of purchased yarn.
- Display of test results in the integrated Uster Statistics.

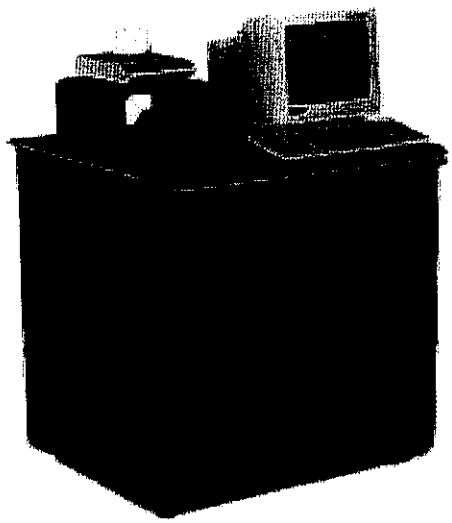

FIGURE 3.4 CLASSIMAT QUANTUM

Testing activity carried out: Classimat Faults checking

Operating system: Win98

Front End: PB5

Back End: SQL

Output format: Clipper Database file with *.db file extension.

Chapter 4

SAP R/3 System

4.1 INTRODUCTION TO ERP

ERP is a package with the techniques and concepts for the integrated management of business as a whole, for effective use of management resources, to improve the efficiency of an enterprise. Initially, ERP was targeted for manufacturing industry mainly for planning and managing core business like production and financial market. As the growth and merits of ERP package, ERP software was designed for basic process of a company from manufacturing to small shops with a target of integrating information across the company.

"Enterprise Resource Planning (ERP), is a software driven business management system which integrates all facets of the business, including planning, manufacturing, sales, and marketing".

The different types of ERP are SAP, BAAN, JD Edwards, Oracle Financials, Siebel, and PeopleSoft. Among all the ERP's most of the companies implemented or trying to implement SAP because of number of advantages aver other ERP packages.

4.1.1 Evolution of ERP

The history of ERP can be traced back to the 1960's, when the focus of systems was mainly towards inventory control. Most of the systems software were designed to handle inventory based in traditional inventory concepts. The 1970's witnessed a shift of focus towards MRP (Material Requirement Planning). This system helped in translating the master production schedule into requirements for individual units like sub assemblies, components and other raw material planning and procurement. This system was involved mainly in planning the raw material requirements.

Then, in 1980's came the concept of MRP-II i.e., the Manufacturing Resource Planning which involved optimizing the entire plant production process. Though MRP-II, in the beginning was an extension of MRP to include shop floor and distribution management activities, during later years, MRP-II was further extended to include areas like Finance, Human Resource, Engineering, Project Management etc. This gave birth to ERP (Enterprise Resource Planning) which covered the cross-functional coordination and integration in support of the production process. The ERP as compared to its ancestors included the entire range of a company's activities.

ERP addresses both system requirements and technology aspects including client/server distributed architecture, RDBMS, object oriented programming etc.

4.1.2 Evaluation Criteria

Some important points to be kept in mind while evaluating ERP software include:

- Functional fit with the Company's business processes
- Degree of integration between the various components of the ERP system
- Flexibility and scalability
- User friendliness
- Ease of implementation
- Ability to support multi-site planning and control
- Technology - client/server capabilities, database independence, security
- Availability of regular upgrades
- Amount of customization required
- Local support infrastructure
- Reputation and sustainability of the ERP vendor
- Total costs, including cost of license, training, implementation, maintenance, customization and hardware requirements.

4.2 OVERVIEW OF SAP

SAP is an enterprise resource planning (ERP) software product capable of integrating multiple business applications, with each application representing a specific business area. These applications update and process transactions in real time mode. It has the ability to be configured to meets the needs of the business.

SAP was founded in 1972 in Walldorf, Germany. It stands for Systems, Applications and Products in Data Processing. Over the years, it has grown and evolved to become the world premier provider of client/server business solutions for which it is so well known today. The SAP R/3 enterprise application suite for open client/server

systems has established new standards for providing business information management solutions.

The main advantage of using SAP as your company ERP system is that SAP has a very high level of integration among its individual applications which guarantee consistency of data throughout the system and the company itself.

SAP's R/3 is the world's most-used standard business software for client/server computing. R/3 meets the needs of a customer from the small grocer with 3 users to the multi-billion dollar companies. Figure 4.1 shows the increase in R/3 installations and users worldwide, over a period of 1992-1995.

The R/3 architecture is comprised of application and database servers. The application servers house the software and the databases servers handle document updates and master file databases. The system can support an unlimited number of servers and a variety of hardware configurations. SAP R/3 is based on various hardware and software architectures, running on most types of UNIX, on Windows NT and OS/400. It runs on several databases Oracle, Adabas D, Informix, DB2 for UNIX, DB2/400, and Microsoft's SQL Server 6.0.

The R/3 architecture can be seen as consisting of 3 layers. The three layers are:

- Presentation layer

  The PC-based GUI interface that is used by the end-user community.

- Application layer

  The SAP application servers that service requests for data and manage the interface to the presentation layer.

- Database layer

  The actual DBMS that communicates with the application servers to fulfill their requests for data.

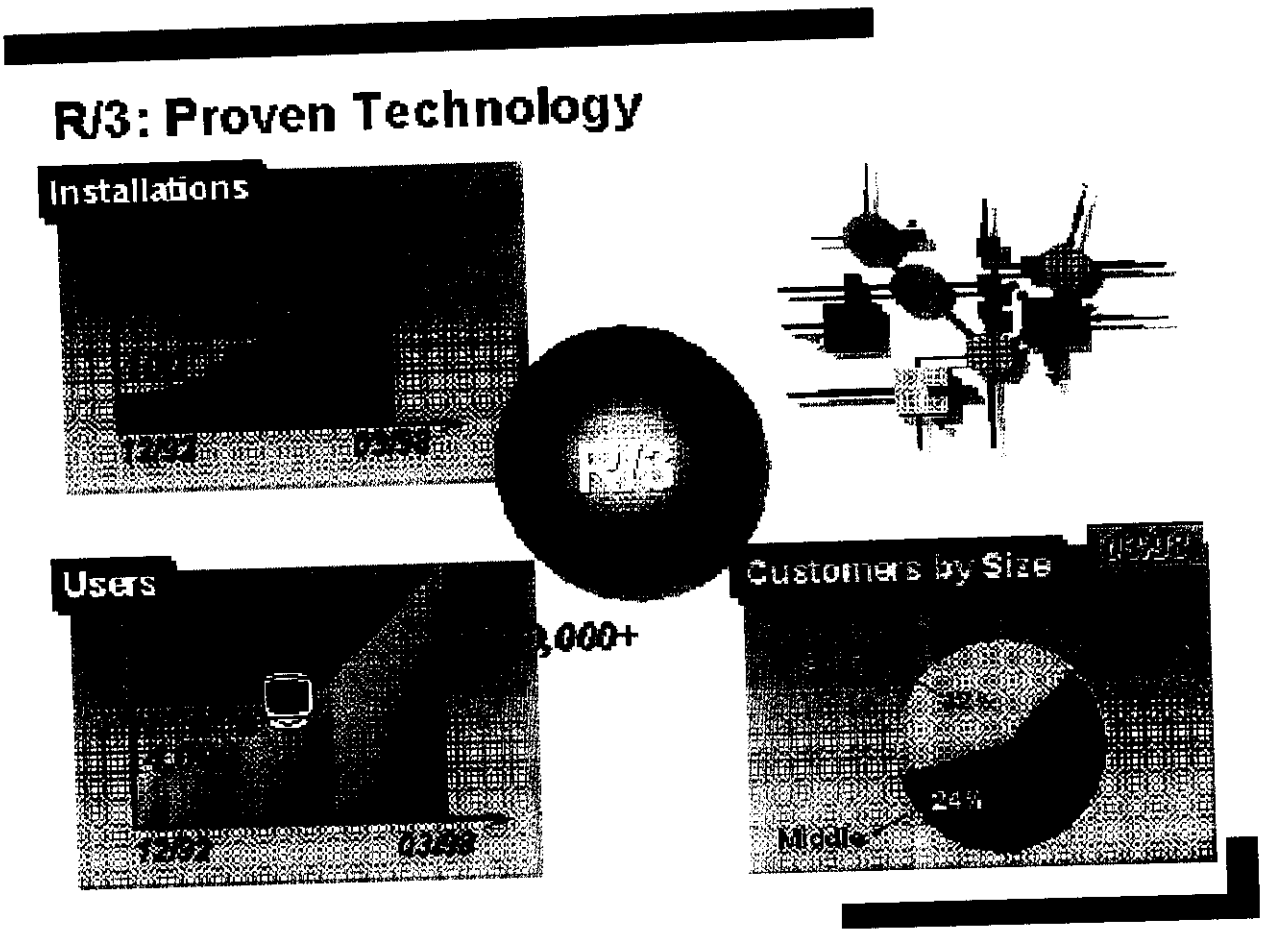

FIGURE 4.1: R/3 ARCHITECTURE

4.2.1 SAP R/3 Structure

- Application Layer for Standard and new applications.
- Middle ware Layer also called as R/3 Basis.
- Operating System, Database

TABLE 3.1: SAP R/3 STRUCTURE DETAILS

OS	DATABASE	GUI	PROTOCOLS
NT	ORACLE	WIN 3.1	TCP/IP
UNIX	INGRESS	NT,95	CPC
AS/400	INFORMIX,DB/2		

The different types of data are specified as Meta Data: Data that describes the structure of data or MetaObjects is called Metadata. Master Data: Master data is data that remains unchanged over a long period of time. It contains information that is always needed in the same way. With master data you are dealing with attributes, texts or hierarchies. Transaction data: Data relating to the day-to-day transactions.

4.2.2 Functional Modules

SAP is categorized into 3 core functional areas which is common to any type of industry:

- Logistics
  - Sales and Distribution (SD)
  - Material Management (MM)
  - Warehouse Management (WM)
  - Production Planning (PP)
  - General Logistics (LO)
  - Quality Management (QM)
- Financial
  - Financial Accounting (FI)
  - Controlling (CO)
  - Enterprise Controlling (EC)
  - Investment Management (IM)

- Treasury (TR)

- Human Resources
  - Personnel Administration (PA)
  - Personnel Development (PD)

4.2.3 Technical Module

ABAP/4 stands for Advanced Business Application Programming is the programming language used for the thousand of tiny embedded programs called transactions that make up the SAP application. It is an event driven language. It is the Central part of Middle ware layer that eliminates dependencies from Hardware, Operating Systems or database management systems. It is very similar to COBOL in its syntax. Use of the ABAP language allows SAP customers to extend the functionality of the base product. ABAP programs are interpreted not complied.

4.3 REASONS TO IMPLEMENT SAP

There are number of technical reasons numbers of companies are planning to implement SAP. It's highly configurable, highly secure data handling, min data redundancy, max data consistency; you can capitalize on economics of sales like purchasing, tight integration-cross function.

- Global Basis
- Faster Speed
- Flexibility for Changes (Business & IT)
- Agility
- Extended Supply Chain Management
- Reach New Opportunity
- Knowledge Sharing
- Creativity Focus

4.4 LIMITATIONS OF SAP

- Interfaces are huge problem.
- Determine where master data resides.
- Expensive.
- Very complex.
- Demands highly trained staff.
- Lengthy implementation time.

4.5 THE ABAP LANGUAGE

- Advanced **B**usiness **A**pplication **P**rogramming
- Developed by SAP for the interactive development of application programs
- 4th Generation Language (with some OO features)
- Main uses for ABAP programs include
  - creation of new reports
  - development of new user dialog programs (transactions)
  - customization of R/3 to meet individual client needs

4.5.1 Objectives

To introduce

- the ABAP integrated development environment
- the three main ABAP application types
  - reporting
  - dialog programming
  - To export and import data

4.5.2 ABAP Workbench Purpose & Function

- SAP's Integrated Graphical Programming Development Environment:
  - Used to create/change ABAP application programs
  - Each ABAP application program is either a report or a transaction:

    1.Reports are applications that retrieve and display information from database with little or no user interaction

    2. Transactions accept inputs/data from users and then perform one or more relevant actions, usually involving updating databases

- The Workbench can be used to
  - write ABAP code
  - design dialogs/screens with a graphical editor
  - create menus with a menu editor
  - debug an application
  - test an application for efficiency
  - control access to objects under development
  - create new or access predefined database information
- Comprises the following tools (as shown in figure 4.2).
  - the Object Navigator (Repository Browser)
  - the ABAP Language
    - ❖ the Screen and Menu Painters
  - the Repository Information System
  - the Data Modeler
  - various test and analysis tools

- the ABAP Query
- the Workbench Organizer

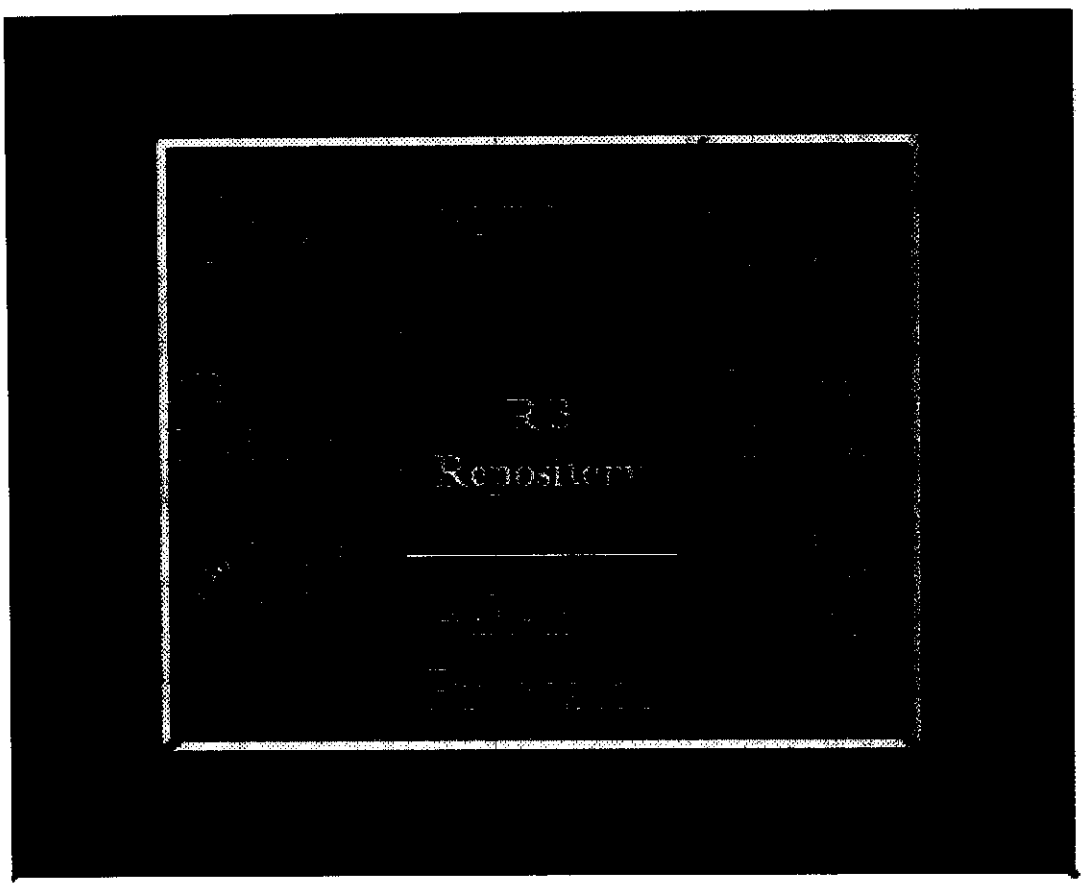

FIGURE 4.2: ABAP WORKBENCH ARCHITECTURE

Application Modules are all written in ABAP/4, which is interpreted by Basis executables, which in turn, run on the operating system. The sole purpose of an R/3 system is to provide a suite of tightly integrated, large-scale business applications. R/3 is the system in which ABAP/4 programs will run. Figure 3.2 shows the architecture of ABAP Workbench.

4.6 BATCH DATA COMMUNICAION

BDC session is used to transfer data from a non-SAP system to SAP system or from SAP system to a non-SAP system. It uses the normal transaction codes to transfer data. This method is used to transfer large amount of data that is available in electronic form. Figure 4.3 shows the initial screen used to select the data transfer mode in BDC session.

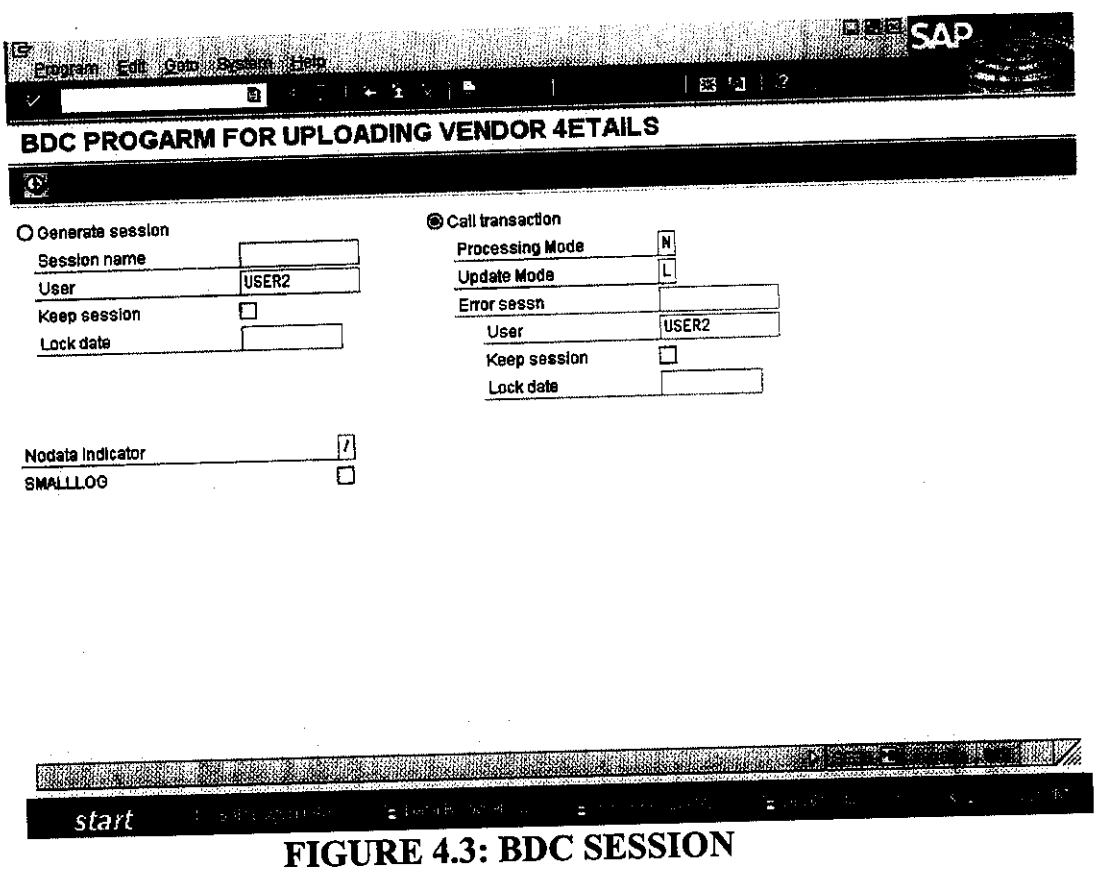

FIGURE 4.3: BDC SESSION

4.6.1 Data Transfer Methods

- **Call transaction**

Asynchronous processing takes place and the transaction is called every time.

- **Session method**

Synchronous processing takes place and a session is prepared, which is to be handled through SM35.Moreover, in Batch Input processing system log is maintained for every transaction. In Call transaction method messages have to be captured at runtime.

- **Direct input**

This is an SAP supplied conversion program that allows very fast loading of certain objects. The disadvantage is that it is not customizable.

Chapter 5

Case Study in Super Spinning Mill(ELGI SARA Group Ltd)

5.1COMPANY PROFILE– SUPER SPINNING MILLS (SARA ELGI)

5.1.1 Corporate Information

SARA ELGI is a multi-unit, multi-interest business group with a wide range of industrial activity, an organization that has founded its evolution on value-based commercial practice. Super Spinning Mills Limited was established in 1962 with an initial capacity of 12,000 spindles. Over its four decades of chequered growth it has expanded to 1,30,000 spindles spread over 3 operational units. The company commenced operations with the manufacture of grey, gassed, mercerized and dyed cotton yarn. Today, the company has carved a niche for itself on the textile map of the country.

5.1.2 Group Companies

- ELGI Electric & Industries Ltd
- ELGI Software & Technologies Ltd
- ELGI Building Products Ltd.
- SARA Trading & Industrial Services Ltd.
- SARA Envirotech Ltd
- SARA ELGI Industrial Research & Development Ltd
- SARA ELGI Insurance Advisory Services Pvt.Ltd
- ELGI Equipments Ltd
- ELGI Treads (I) Ltd.
- L.G.B & Bros. Ltd.
- ELGI Ultra Industries Ltd.
- Precot Mills Ltd.
- Meridian Industries Ltd.
- SARA ELGI Arteriors Ltd

Regarding the Super Spinning Mills, Constant commitment to high quality standards and innovation has been the secret of success ever since the company was founded. Superior Spinning units ensure the supply of consistent quality yarn to manufacture the garments. Constant commitment to high quality standards and innovation has been the secret of success ever since the company was founded. Superior Spinning units ensure the supply of consistent quality yarn to manufacture the garments. The Spinning Units leads the quality of yarn in the market. Ultimately, the crunch lies in the infusion of hi-tech, state-of-the-art machinery that aids in the production of high quality 100% combed yarn, in counts that range from NE 20s to 120s in single and doubles. The testimony to modernization and up gradation lies in the fact that the oldest machine in the plant is less than 10 years. Coupled with global standards of process manufacturing that turn out year

of superior quality in durability as well as finish. To produce superior quality garments, the company ensures that every kilogram of yarn supplied from our Spinning unit conforms to International standard and with zero complaint.

5.1.3 Production details

Production Capacity - 50,000 Kgs per day.

Superior Quality imported machines installed at Super Spinning Mills include:

- Reiter:

Vision Shield Foreign Fibre Remover in Blow Room

Unifloc – A10, A11

Drawframe – RSB 851 & D30

Unilap E32, Combers – E 7/5 A, E 7/6, E62

Suessen Elite Compact Ring Frame

- lakshmi rieter:

Flexifloc, Varioclean, Unimix

Cards – LC 300 A, LR C 1/3

Drawframes – RSB 851

Combers – LK 250 & E 7/4

Speed Frames – LF 1400 & 1400A

Ring Frames – G 5/1, LR6

- TRUTZSCHELER : Cards – DK 803 & 903
- CROSOL : Cards MK 5A & 5B
- KIRLOSKAR TOYODA : Ringframe
- MURATA 21 C : Auto Coner with Uster Quantum foreign fibre clearer

- SCHALAFHORST 338 : Autoconers with Loepfe and Uster Quantum Foreign fiber clearers
- ELGI WELKER :Yarn Conditioning
- VEEJAY LAKSHMI :Two-for-one Twister (TFO)
- JEETSTEX / TEXTOOL :Ring Doubling
- BATLIBOI :Fully Automatic Humidification Plant
- SSM :Gassing Machine
- ELITEX :Open End - BD-D2, D30

5.2 EXISTING SYSTEM IN THE COMPANY

In the existing system, each quality testing equipment uses different database to output the results. These results are entered manually to the server to obtain the final report on the product's quality specification.

5.2.2 Drawbacks

- The existing system consumes lot of time in re-entering the data to the server.
- Man power is wasted.
- There is chance for mistyping the data to the server.

5.3 PROPOSED SYSTEM

To overcome the drawbacks, the outputs generated at different instruments are converted into a common file format. The files are then uploaded to SAP server using the BDC session in ABAP programming.

5.4 STEPS BY STEP PROCEDURE

There are two basic steps involved in integrating the equipments with SAP server. They are.

- The various output formats from the quality equipments are converted to excel sheet format using ESF database converter.
- The excel sheets are uploaded to SAP server using BDC session.

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5.4.1 ESF Database Converter

Database conversion is a process by which data in the database of one format is translated into another. In current scenario of business, data conversion has become the necessity for effective running of an organization. . Most innovative data conversions technologies are used to convert data from one format to another, among different databases.

ESF Database Converter allows converting easily and quickly between various database formats. It can directly connect to MySQL, SQL Server, PostgreSQL, Oracle, InterBase, Access, Excel, Paradox, Lotus, dBase, Text and other formats, and convert between these formats (SQL Server to MySQL, MySQL to Access etc.).The program offers a simple step-by-step wizard that allows connecting to the source database, selecting the tables, fields, and then converting and copying them to the destination. One can choose to include all data or use a SQL statement to filter the data and can just copy the structure of the database.

Features

- It supports various database formats. It can interchangeably convert MySQL, SQL Server, PostgreSQL, Oracle, InterBase, Access, Excel, dBase, Paradox, Lotus, and Text. Or convert from DNS.
- Supports table Primary Keys, Indexes, and Auto increment (Auto-ID).
- Supports Batch Insert/Update records to increase conversion speed and thus ESF Database Convert run faster than other program.
- Can use SQL statement to filter dataset to be converting.

- Supports all the UNICODE character set (UTF8, LATIN, CP1250, ASCII and so on)

5.4.2 BDC Session

A BDC session is a combination of ABAP/4 programming and built-in SAP functionality. Interfaces that use BDC sessions to load data into SAP are most critical. At many SAP sites, the majority of programming done during an SAP installation is interface work. Thus BDC is a unique aspect of ABAP/4. To perform the data transfer in BDC session the following tasks must be carried out:

Task 1: Do a recording for the transaction by supplying sample data.

Task 2: Create an ABAP report based on the recording done.

Task 3: Now write ABAP code to fetch data from legacy system and store into SAP System.

Steps in data transfer

1. Analysis and cleanup of data in the non-SAP system
2. Extraction of data from the non-SAP system
3. Mapping the data in SAP format
4. Transferring the data to the SAP System
5. Checking the data

Chapter 6

Results & Conclusion

RESULTS & DISCUSSIONS

The outputs from the various quality testing instruments are collected and fed into the ESF database converter (figure 5.1&5.2). Thus each output is obtained as individual excel data sheets. A BDC table is created with respect to the excel sheet data. Using the ABAP coding data has been fed into the SAP screen (figure 5.3). The BDC table is submitted to the SAP environment. Thus the excel data sheets are uploaded to the SAP server.

ESF database results

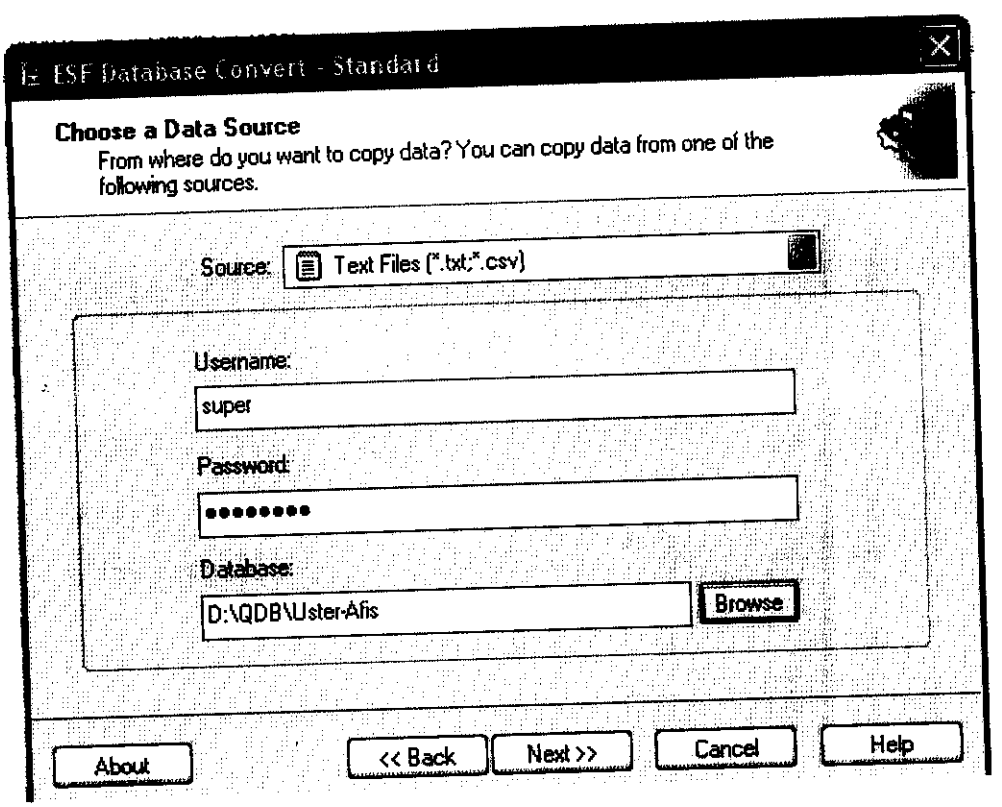


FIGURE 5.1 ESF DATABASE CONVERTER

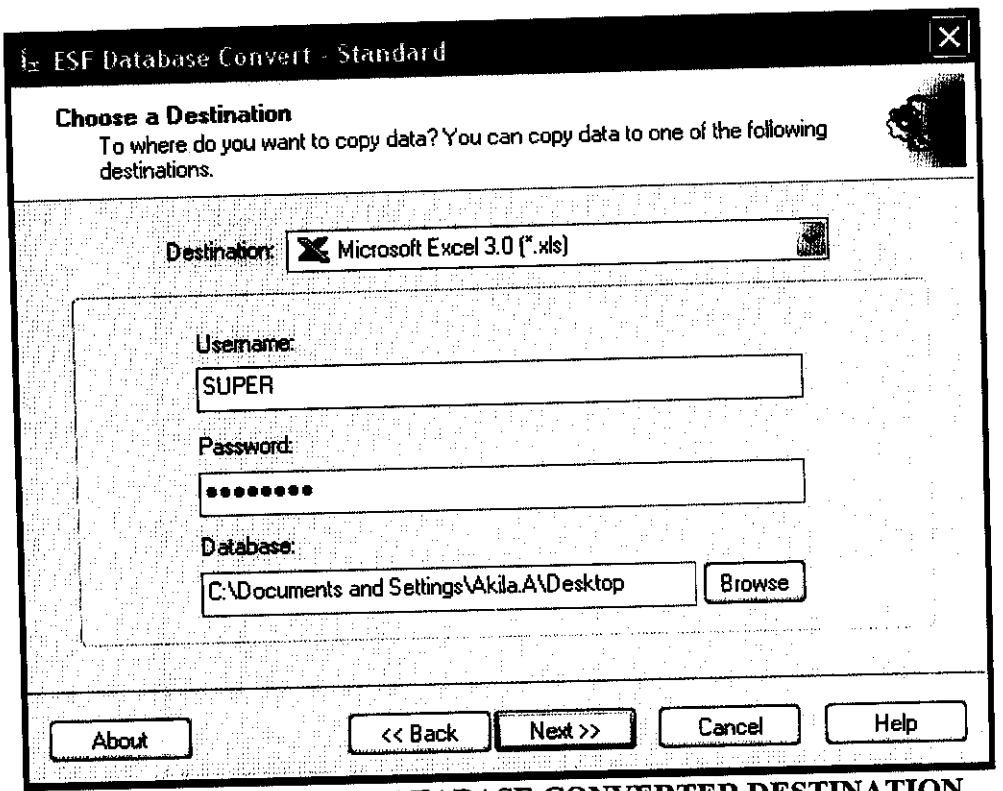


FIGURE 5.2 ESF DATABASE CONVERTER DESTINATION

BDC session results

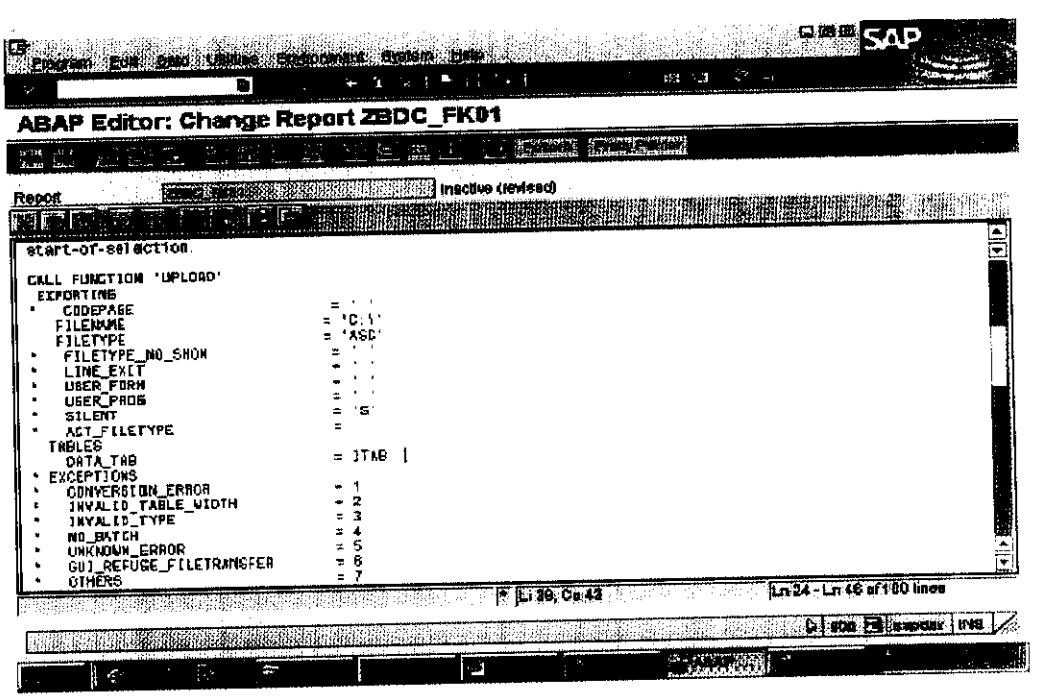


FIGURE 5.3 BDC SESSION UPLOAD FUNCTION

CONCLUSION

It is best suited for high and medium level industries. The result of the integration provides the following benefits:

- Reduces manual entry, thereby eliminating the data entry errors.
- Efficiency of the entire process increases.
- Reduces time consumption.

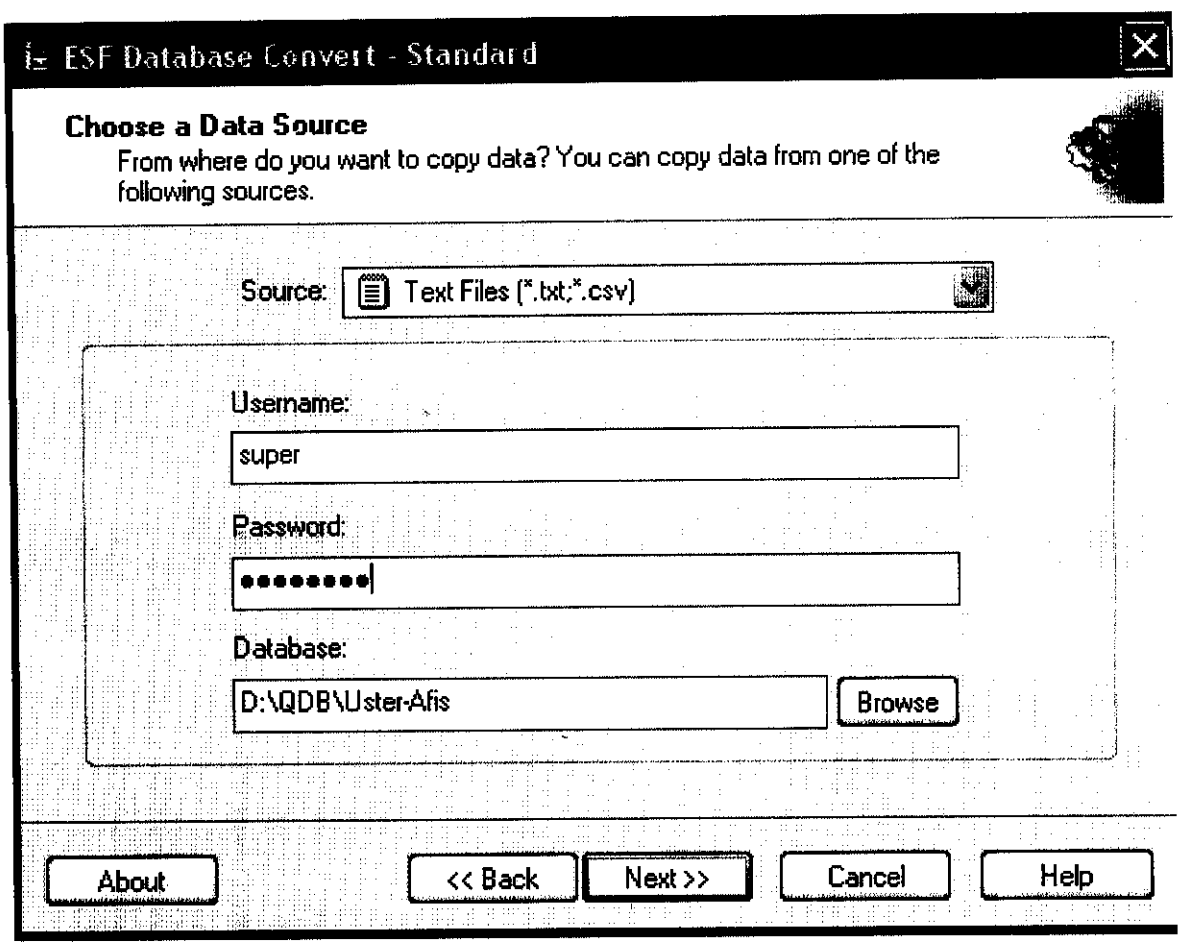
This project has been successfully implemented in Super Spinning Mill, quality assurance department.

Appendices

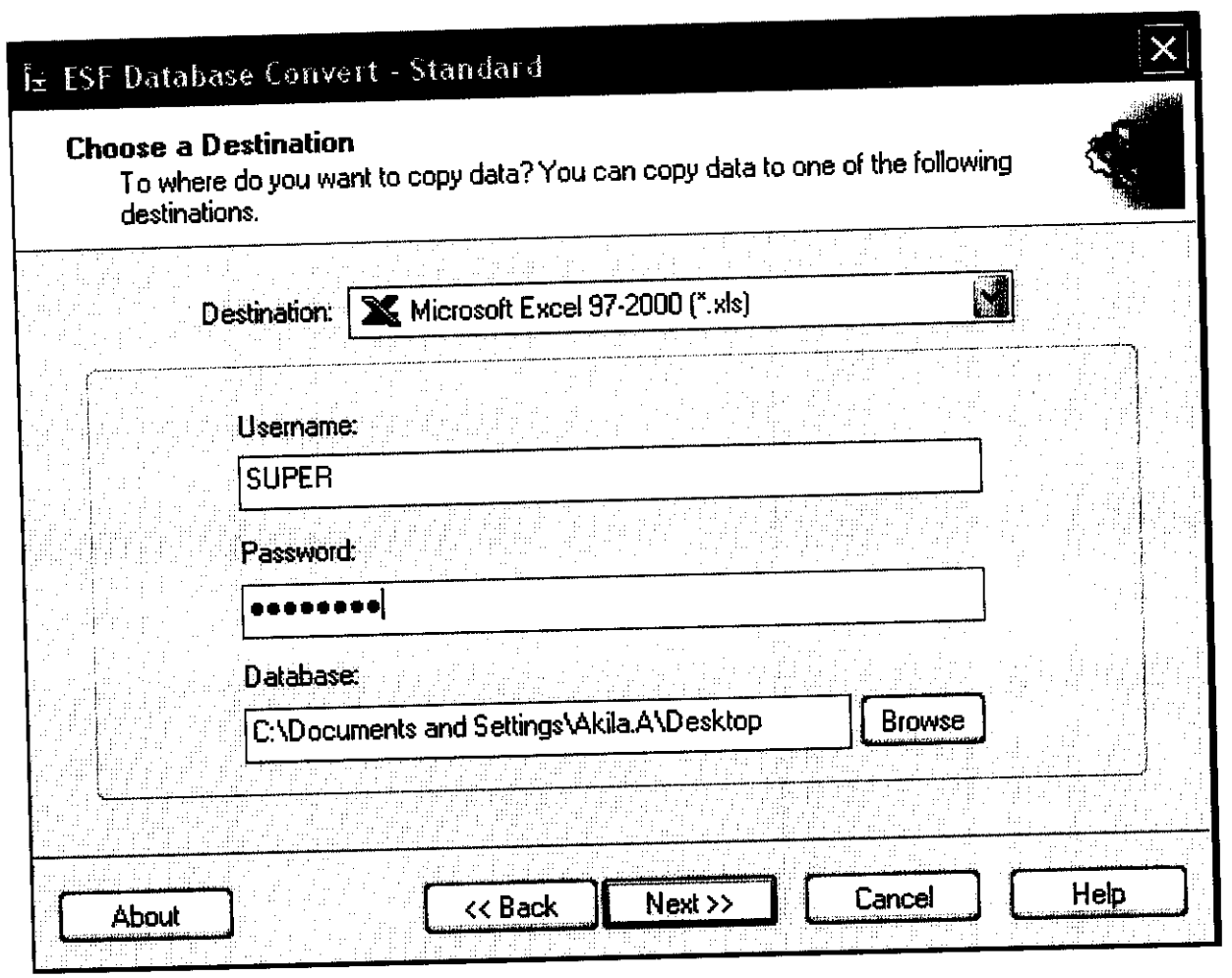
APPENDIX 1

ESF DATABASE CONVERTER

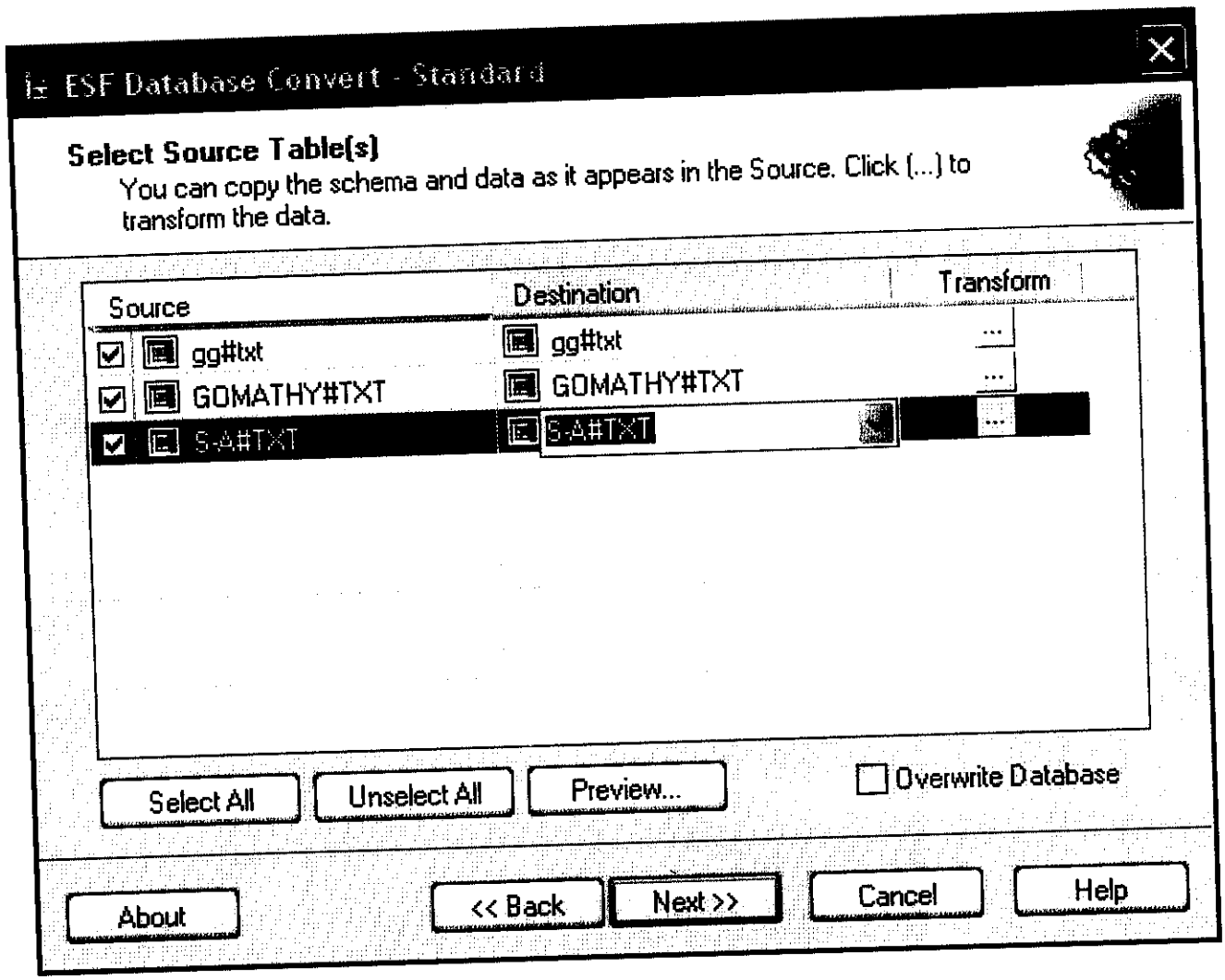
SOURCE



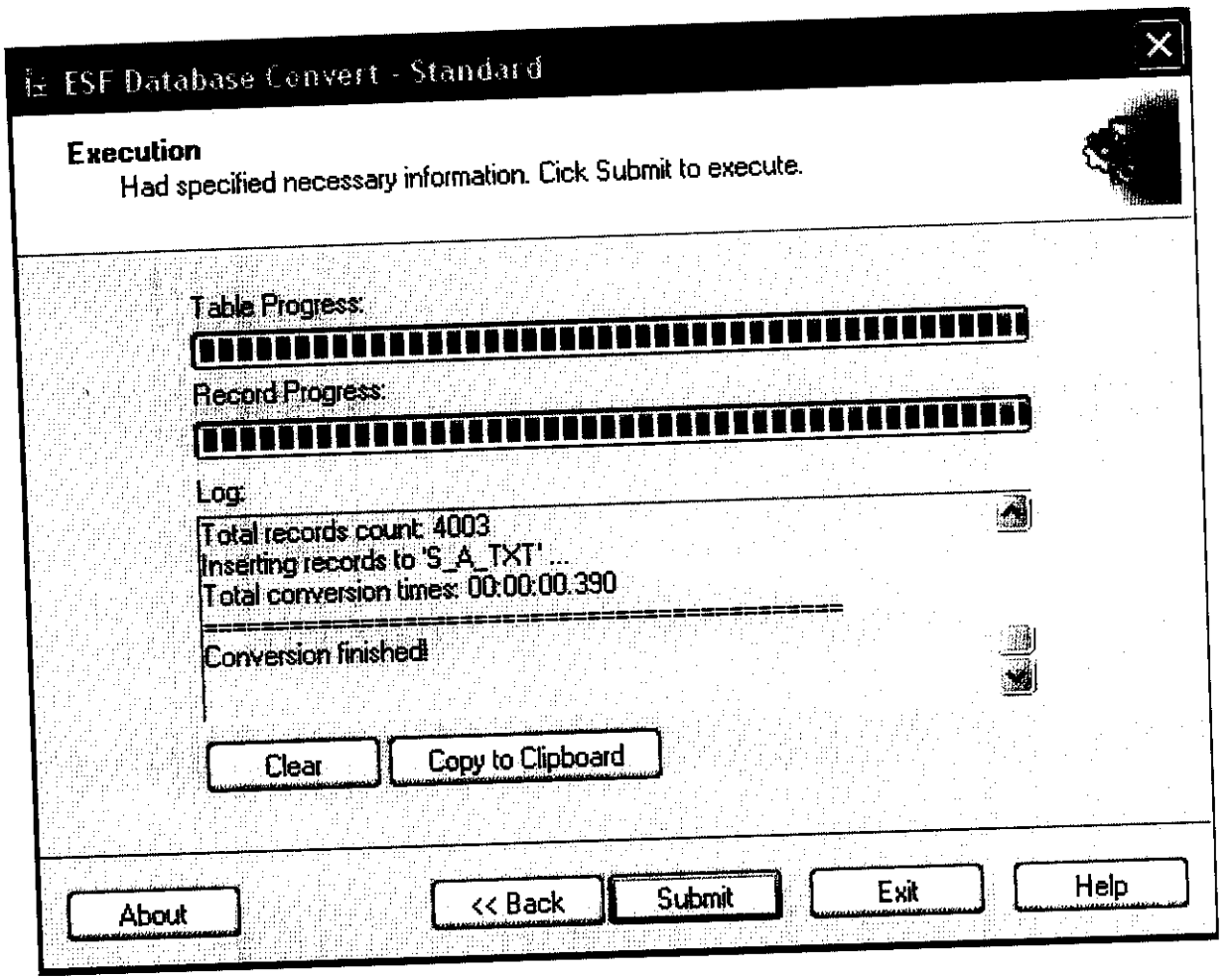
DESTINATION



TRANSFORMATION



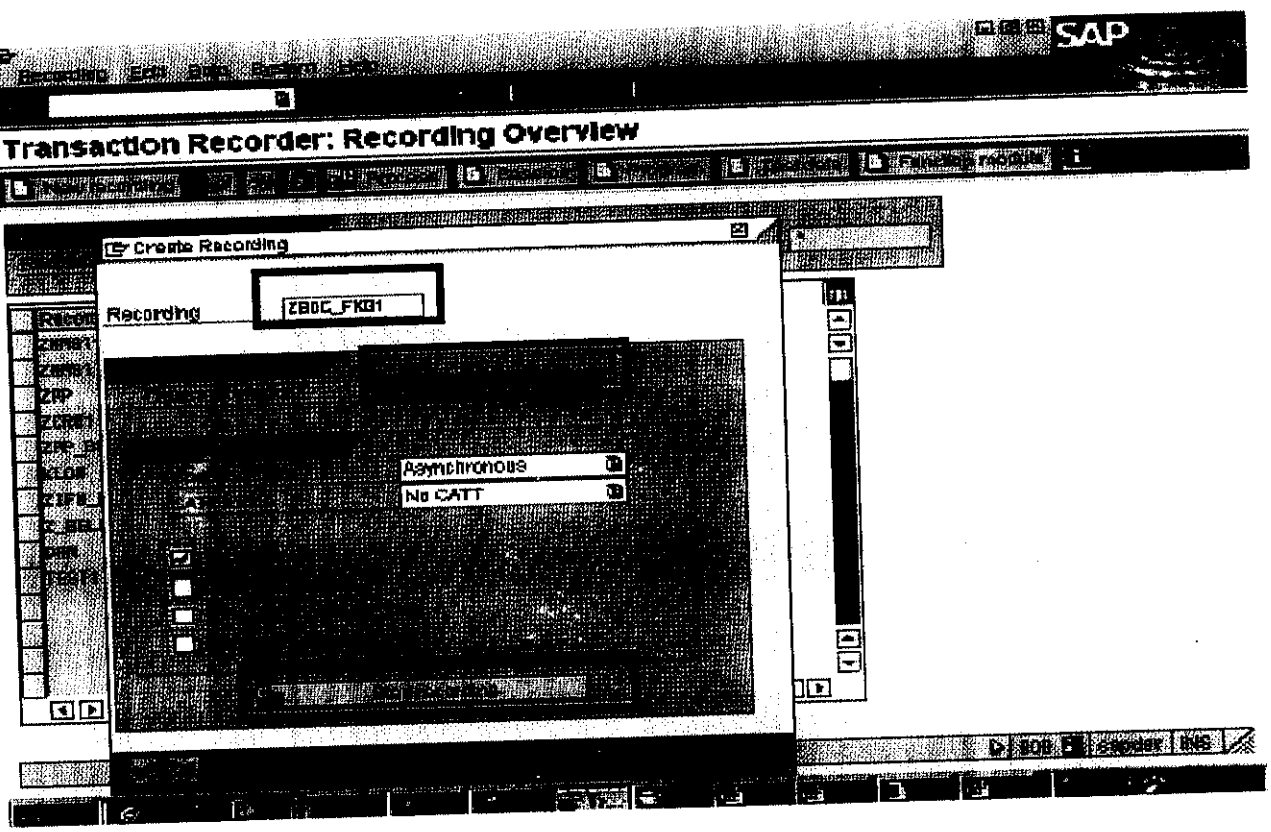
EXECUTION


ESF Database Convert - Standard
Execution
Had specified necessary information. Cick Submit to execute.
Table Progress:
Record Progress:
Log:
Total records count: 4003
Inserting records to 'S_A_TXT' ...
Total conversion times: 00:00:00.390
Conversion finished!
Clear
Copy to Clipboard
About
<< Back
Submit
Exit
Help

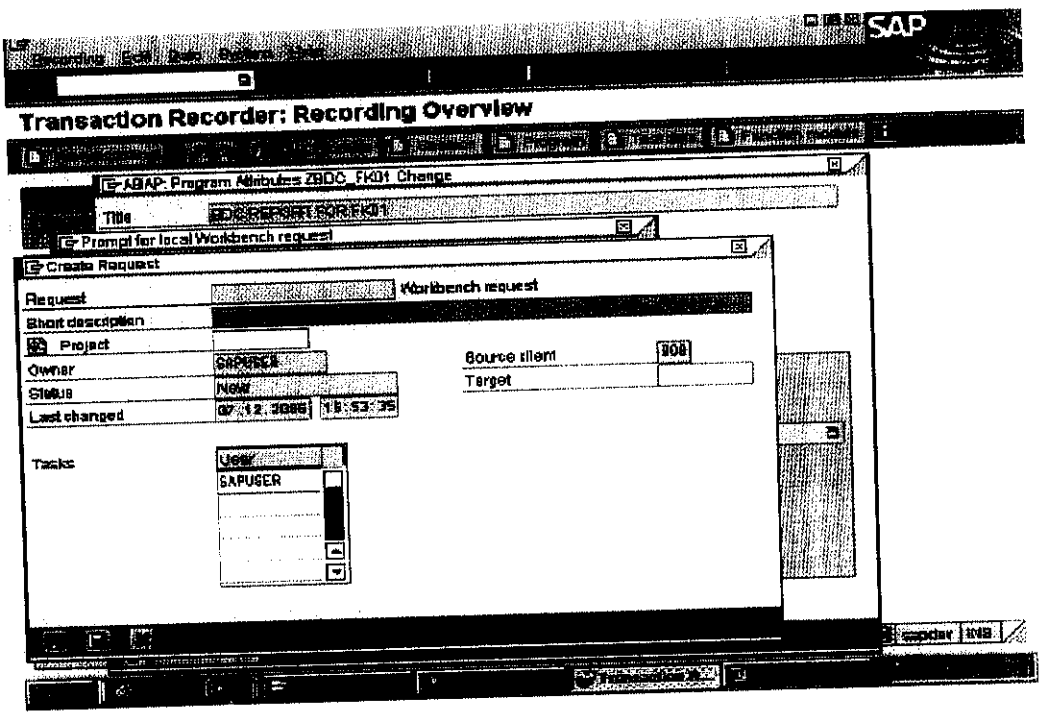
APPENDIX 2

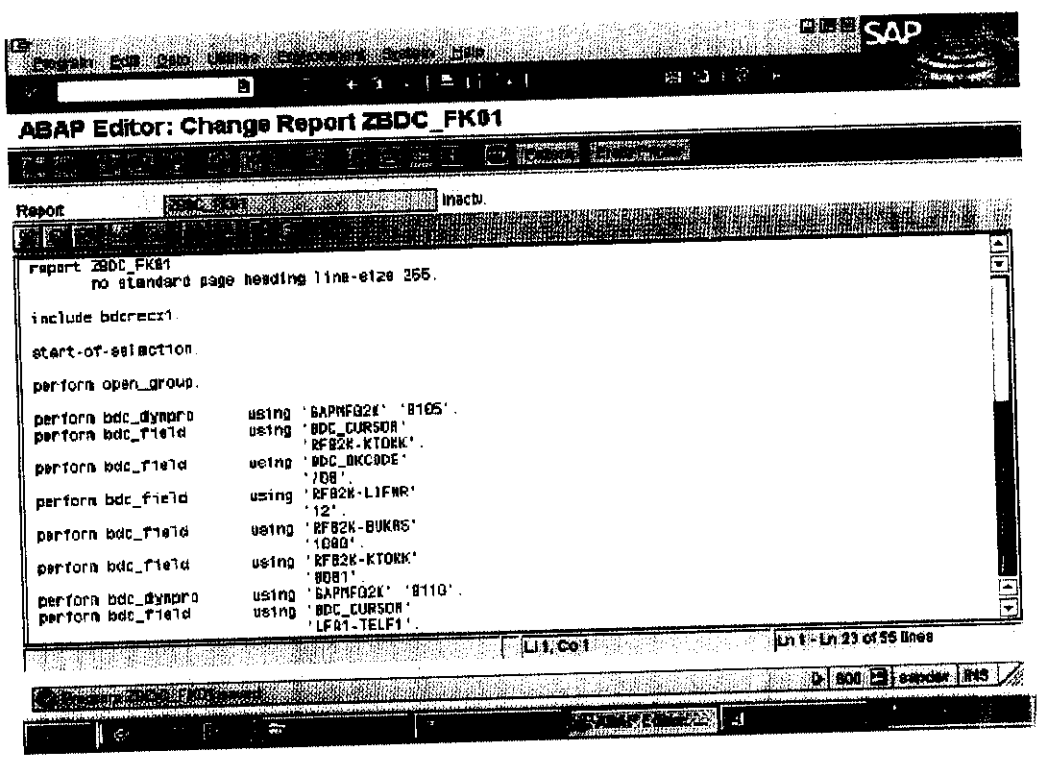
BDC SESSION

RECORDING THE TRANSACTION

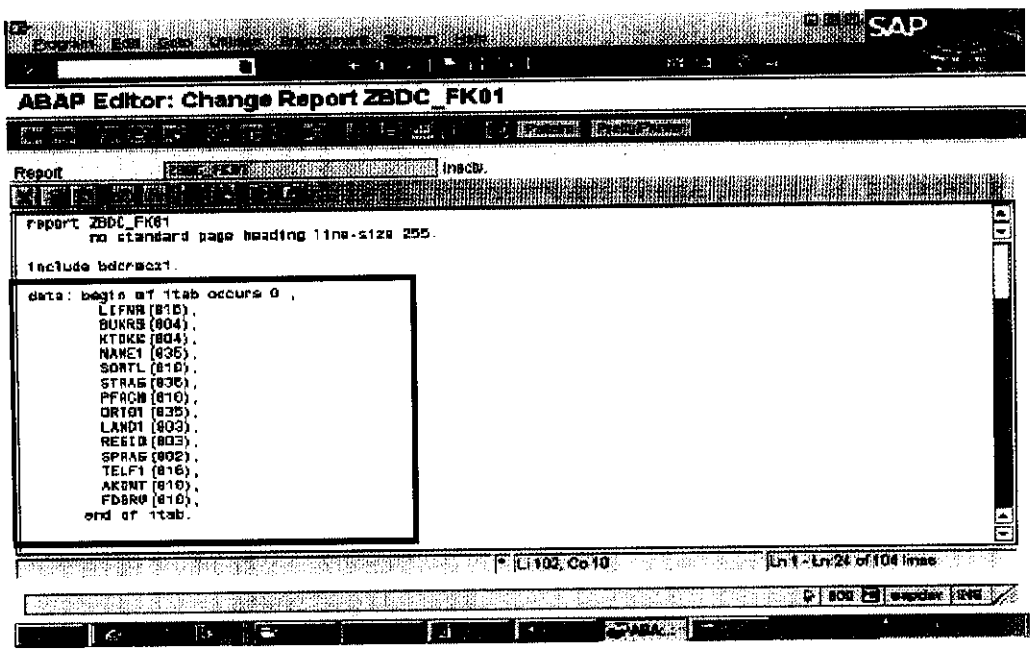


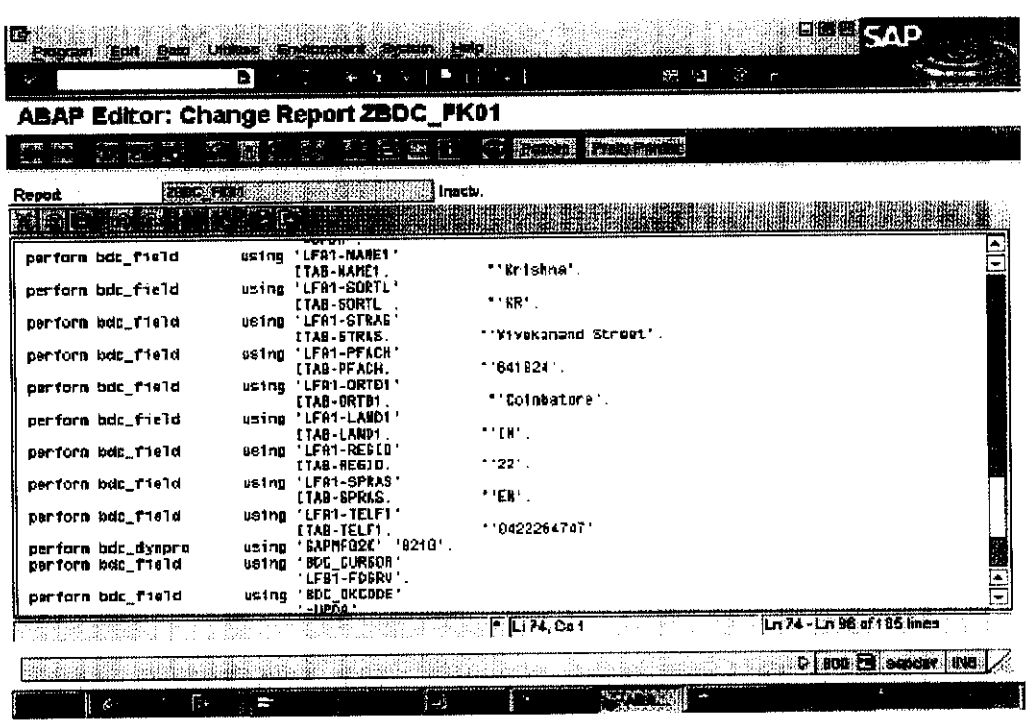
CREATING ABAP REPORTS



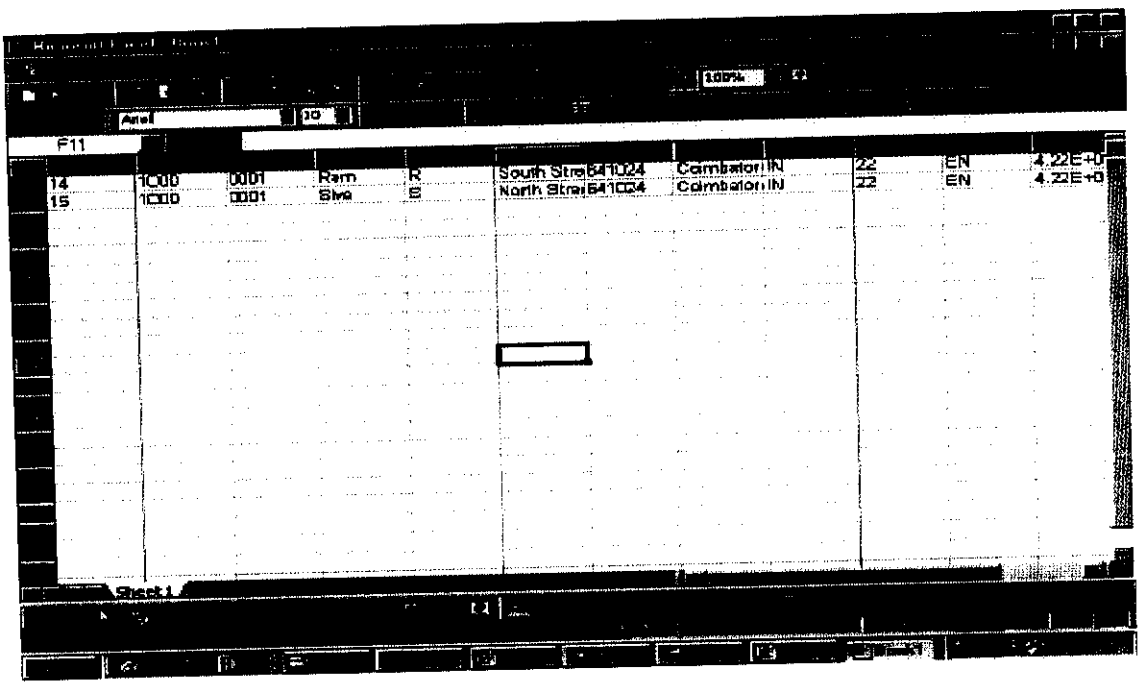


WRITING ABAP REPORTS

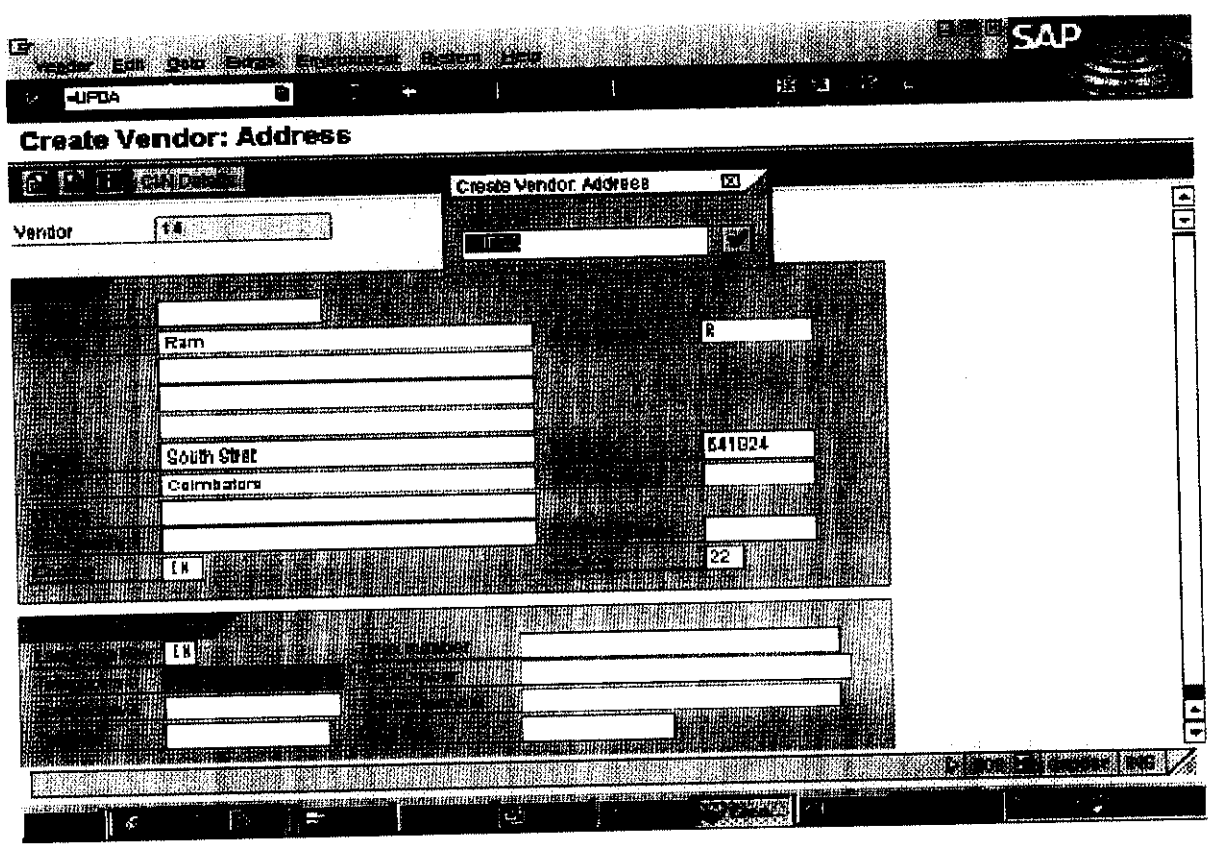




EXCEL SHEET DATA



DATA IN SAP ENVIRONMENT



APPENDIX 3

CODE GENERATION

```
report ZXK01
       no standard page heading line-size 255.
TYPE-POOLS TRUXS.
DATA: BEGIN OF ITAB OCCURS 0,
  LIFNR LIKE LFA1-LIFNR,
  KTOKK LIKE LFA1-KTOKK,
  NAME1 LIKE LFA1-NAME1,
  SORTL LIKE LFA1-SORTL,
  LAND1 LIKE LFA1-LAND1,
  END OF ITAB.


   data: fname type rlgrap-filename,
         VAR TYPE TRUXS_T_TEXT_DATA.
 *       file  type string.

 CALL FUNCTION 'KD_GET_FILENAME_ON_F4'
 * EXPORTING
 *   PROGRAM_NAME          = SYST-REPID
 *   DYNPRO_NUMBER         = SYST-DYNNR
 *   FIELD_NAME            = ' '
 *   STATIC                = ' '
 *   MASK                  = ' '
   CHANGING
     file_name           = FNAME
 * EXCEPTIONS
 *   MASK_TOO_LONG         = 1
 *   OTHERS                = 2
          .
 IF sy-subrc <> 0.
 * MESSAGE ID SY-MSGID TYPE SY-MSGTY NUMBER SY-MSGNO
 *         WITH SY-MSGV1 SY-MSGV2 SY-MSGV3 SY-MSGV4.
 ENDIF.

 *FILE = FNAME.

 CALL FUNCTION 'TEXT_CONVERT_XLS_TO_SAP'
   EXPORTING
```

```
 I_FIELD_SEPERATOR            = 'X'
  I_LINE_HEADER               = 'X'
   i_tab_raw_data             = VAR
   i_filename                 = FNAME
 tables
   i_tab_converted_data       = ITAB
EXCEPTIONS
  CONVERSION_FAILED           = 1
  OTHERS                      = 2
          .
IF sy-subrc <> 0.
* MESSAGE ID SY-MSGID TYPE SY-MSGTY NUMBER SY-MSGNO
*         WITH SY-MSGV1 SY-MSGV2 SY-MSGV3 SY-MSGV4.
ENDIF.
*START-OF-SELECTION.
*LOOP AT ITAB.
*WRITE : ITAB-LIFNR.
*ENDLOOP.
**CALL FUNCTION 'GUI_UPLOAD'
**  EXPORTING
**    filename                  = FILE
**   FILETYPE                   = 'ASC'
**   HAS_FIELD_SEPARATOR        = 'x '
***   HEADER_LENGTH             = 0
***   READ_BY_LINE              = 'X'
***   DAT_MODE                  = ' '
***   CODEPAGE                  = ' '
***   IGNORE_CERR               = ABAP_TRUE
***   REPLACEMENT               = '#'
***   CHECK_BOM                 = ' '
***   VIRUS_SCAN_PROFILE        =
*** IMPORTING
***   FILELENGTH                =
***   HEADER                    =
**  tables
**    data_tab                  = ITAB
** EXCEPTIONS
**   FILE_OPEN_ERROR            = 1
**   FILE_READ_ERROR            = 2
**   NO_BATCH                   = 3
**   GUI_REFUSE_FILETRANSFER    = 4
**   INVALID_TYPE               = 5
**   NO_AUTHORITY               = 6
**   UNKNOWN_ERROR              = 7
**   BAD_DATA_FORMAT            = 8
```

```
**    HEADER_NOT_ALLOWED              = 9
**    SEPARATOR_NOT_ALLOWED           = 10
**    HEADER_TOO_LONG                 = 11
**    UNKNOWN_DP_ERROR                = 12
**    ACCESS_DENIED                   = 13
**    DP_OUT_OF_MEMORY                = 14
**    DISK_FULL                       = 15
**    DP_TIMEOUT                      = 16
**    OTHERS                          = 17
**          .
**IF sy-subrc <> 0.
*** MESSAGE ID SY-MSGID TYPE SY-MSGTY NUMBER SY-MSGNO
***         WITH SY-MSGV1 SY-MSGV2 SY-MSGV3 SY-MSGV4.
**ENDIF.
*
include Ybdcrecx1.

start-of-selection.

perform open_group.
LOOP AT ITAB.
perform bdc_dynpro      using 'SAPMF02K' '0100'.
perform bdc_field       using 'BDC_CURSOR'
                              'RF02K-KTOKK'.
perform bdc_field       using 'BDC_OKCODE'
                              '/00'.
perform bdc_field       using 'RF02K-LIFNR'
                              ITAB-LIFNR.
perform bdc_field       using 'RF02K-KTOKK'
                              ITAB-KTOKK.
perform bdc_dynpro      using 'SAPMF02K' '0110'.
perform bdc_field       using 'BDC_CURSOR'
                              'LFA1-LAND1'.
perform bdc_field       using 'BDC_OKCODE'
                              '/00'.
perform bdc_field       using 'LFA1-NAME1'
                              ITAB-NAME1.
perform bdc_field       using 'LFA1-SORTL'
                              ITAB-SORTL.
perform bdc_field       using 'LFA1-LAND1'
                              ITAB-LAND1.
perform bdc_dynpro      using 'SAPMF02K' '0120'.
perform bdc_field       using 'BDC_CURSOR'
                              'LFA1-KUNNR'.
perform bdc_field       using 'BDC_OKCODE'
```

```
                                '/00'.
perform bdc_dynpro      using 'SAPMF02K' '0130'.
perform bdc_field       using 'BDC_CURSOR'
                              'LFBK-BANKS(01)'.
perform bdc_field       using 'BDC_OKCODE'
                              '=ENTR'.
perform bdc_dynpro      using 'SAPLSPO1' '0300'.
perform bdc_field       using 'BDC_OKCODE'
                              '=YES'.
perform bdc_transaction using 'XK01'.
ENDLOOP.
perform close_group.
```

References

REFERENCES

1. Majed Al-Mashari and Mohamed Zairi (2000), The effective application of SAP R/3: a proposed model of best practice, *Logistics and Information Management,* pp 156± 166.

2. Vidyaranya B.Gargeya , Cydnee Brady(2006), Success and failure factors of adopting SAP in ERP system Implementation , *Business Process Management journal,* 2006, pp. 501-516.

3. Udo Waibel (2004), Easy Integration of excel with SAP solutions for financial data, CFO-IT *magazine, summer 2004.*

4. Millan , Derby , Madrid, Derbyshire (2006), Best practice with order Management-Automation with SAP solutions, Esker Deliverware Whitepaper 2006.

5. Fawzy Soliman , Mohamed A. Youssef,(1998), *The role of SAP software in business process re-engineering,* International journal of operation research production management, 1998, pp. 886-895.

6. A report by secretariat of the international cotton advisory committee (2006), Survey of the fibre testing equipment, September 2006.

7. W.Oxenham, E. Bryan, & C. Yu, The abrasive properties of yarn, *Research study at dept of Textile &Apparel Technology, Management,North Carolina University, U.S.A..*

8. S.M.Ishtiaque & A.Das (2001), Characterization of grey cotton fibres as well as waste at different stages of spinning , *Indian journal of fibre and textile research,*march 2003, vol 28,pp. 65-70.

9. http://www.emeraldinsight.com

10. http://www.inderscience.com

11. http://www.sapgenie.com

12. http://www.sapdevelopment.co.uk

13. http://www. sapbrain.com