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Automated Production Maintenance

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BONAFIDE CERTIFICATE

This is to certify that the project report titled **Production Automation Maintenance** is the bonafide work of **Mr. V.M. Siva Sankaran** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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**DECCAN INDUSTRIES**

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To Whom It May Concern

This is to certify that Mr. **V.M. SIVA SANKARAN**
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Analyzed, designed and exercised a project titled,

“PRODUCTION AUTOMATION MAINTENANCE”

in our industry between the period 07th Jan 2007 and 30th Apr 2007. He exercised the project in a much appreciable manner and the results were good. His skill to understand the subject and the approach towards project was good.

During the project period his conduct was highly commendable.

We wish all success in his future endeavors.

For Deccan Industries

R. Vivekanandan

(R. Vivekanandan)
Manager Sys. & Trg.

ABSTRACT

This Project entitled as “Automated Production Maintenance” developed for providing automatic updating facilities to maintain the production process unit. The system enables the management to have online views of results pertaining to the annual production. This helps to take corrective action related to the quality and kind of components being delivered to the customers.

The Automated Production Maintenance retains the manual methodology followed by the Deccan industry. In the Deccan industry manual systems consumes much time and resources and are prone to errors in aggregation process. But the automated system recovers all these impacts. Each operations of raw component carried out in automated system are maintained through job card, during the preparation of finished components from the raw components. After this, the production of each and every finished component in Deccan industries is updated automatically and submitted to the management.

The Automated Production System takes care of such potential threats and provides reliable services to the management and staff concerned, on demand. The system also helps the staff in component assembling and production maintenance.

The system provides components, raw materials, semi-finished component, full finished components and production maintenance details. Staff can also update the information as and when they need.

The Automation System thus provides a comprehensive coverage of the functional requirements with regard to production and assembling details desirable to the staff and management of Deccan industries.



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CHAPTER 1

INTRODUCTION

1.1 SYSTEM OVERVIEW

The project titled "**Automated production Maintenance**" offers total solution to the various official related requirements of the official staff and management.

The project provides computer assistance in obtaining details about the production maintenance owing to the graphical user interface environment, to system is user friendly one and need less computer expertise to handle the system. The system was designed for ordinary user who has practically no knowledge about the basic principles behind the working of as application software. Moreover the process involved was quite a repetitive one and was prone to numerous errors which could result in inappropriate data being presented to the management.

Automation is the key to increased efficiency, performance and reliability in any system and is being rapidly followed in all walks of life. The problem with the existing system is that due to the manual entry of the foxpro database tables, there is always the possibility of error in calculation. Moreover the error goes unnoticed if the reports are not viewed by the concerned. Automation helps to eradicate the root cause of the error by completely automizing the system of entry and calculation.

The system integrates all the subsystems such as **Login, Raw Components, Component, Component Master, Finished Component, Employee, Machine Details, Machine Breakdown Details, Job Card Preparation and Job Card Completions, Assembled Component, Quotation for Assembling, Full Finished Components.**

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The Raw components and Component are used to get input from the users. The raw components specifies the information about the raw material stock details. The component specifies the number of operations a particular component has to undergo to produce a semi-finished component. In the Finished component module, the quantity available on hand can be known when the user asks for the stock detail about the finished component after all the operations had been carried out.

The Machine Details module deals with the entry of the machine details such as service details, purchased year, make, maintenance due details and the Machine Breakdown Details module deals with the entry of the breakdown details such as breakdown and restored dates and the details regarding the person who attended the failure case.

The Component Master module deals with the stock details of the materials after each operation. It takes care of the quantity allotted in process. The Semi Finished Component module deals with stock details of the semi finished components.

The Job Card Preparation module deals with the details of job card information prepared while the job is allocated to the employee to the particular machine. The Job Card Completion module deals with completion details regarding the jobs allocated to the particular employee. The Employee Details module deals with the personal and pay details of the employee.

The Assembled Components module deals with the details of the assembling component. The Quotation for Assembling module deals with the employee involved and units required for particular component assembling. Full Finished Components module deals with the stock details of the fully finished components.

1.2 COMPANY PROFILE

Deccan Industries, the pioneers in the submersible pumps segment was established in the year 1981, with a vision of 'Service to Mankind'. The company focuses on developing new products and perfecting the existing ones. In its relationship with its customers, vendors and employees 'Deccan' refers to its core values like innovation, excellence, integrity and respect. The company consciously attempts at staying in pace with the market keeping in focus the customers' current and future needs. True to this, the company offers a wide range of products catering to almost every specific requirement of the customer. What makes Deccan unique is its ability to provide product differentiation along with efficient after sales service. Be it agricultural, industrial or domestic purpose Deccan an excellent technical solutions

Deccan products are made from superior materials engineered by precise methods to ensure long and trouble free life for its products DECCAN is committed to evolving, developing, manufacturing and distributing pumps and systems for all applications involving water – with durability, serviceability and maintainability features.

Deccan providers reliable and efficient submersible pumps, centrifugal pumps and jet pumps for applications in Irrigation, residential, construction, industrial and water supply sectors.

Water distribution from Tubewells / Borewells / Boreholes, openwells, pumps, lakes, tanks and rivers are major applications. Pressure Boosting, dewatering and cooling are other applications.

CHAPTER 2

SYSTEM STUDY AND ANALYSIS

2.1 PROBLEM STATEMENT

The office staff has to manually enter the required data into the database tables and perform various required operations and finally submit a copy of the reports generated to the management. The tasks involved in the generation of these reports are repetitive. Often, due to the repetitive nature of the work and the tedious process involved, errors creep into these reports which lead to inconsistent information being submitted to the management. Inconsistent reports lead to less full proof decisions being made to improve the quality being provided.

The available quantity of raw materials after each operation should be updated based on the in-process quantity allocated and the quantity accepted. This could affect the overall process of the system.

The job card details are currently filed in paper documents and there are chances that these pieces of paper are lost or misplaced. This could affect the concerned process during the appraisal periods.

Also, the information regarding the quotation of assembling and the stock details of the fully finished components are maintained separately in the files prepared manually. The information is quite difficult to obtain in case these files are misplaced.

The industry requires a system which could help ease out the problems faced in each of the scenarios mentioned above.

2.3.1 Advantages Of The Proposed System

The expected benefits of the Proposed System are as follows:

- User friendly
- New modules can be added with ease without much modifications to the existing system
- Data available on demand
- Retrieval of data will be much easier and simple
- Distributed application
- Platform independence

2.4 FEASIBILITY ANALYSIS

Feasibility analysis is the measure of how beneficial or practical the development of Information System will be to the Organization. Once the problem is explained, information is gathered about the system to test for technical, financial and operational feasibility. Thus, feasibility study is carried out in three phases as follows:

2.4.1 Technical Feasibility

Technical Feasibility is the measure of specific technical solution and the availability of technical resources and expertise. It centers on the existing computer system (hardware, software, etc.) and to what extent it can support the new addition.

The proposed system is to be developed using Java, MS-SQL Server 2000, JSP, and Servlet which are some of the leading technologies in the market. These resources are easily available. These technologies work on all

2.2 EXISTING SYSTEM

The existing system was developed in Foxpro. Only database tables were created. The entries are made directly into the table. The tables were not normalized. So there is possibility of redundant data.

2.2.1 Drawbacks Of The Existing System

The drawbacks of the existing systems can be summarized as below:

- No login session maintenance
- Entries are directly made into the database tables
- No distributed application environment
- No front-end application to input the data
- Data Redundancy
- Data Inconsistency
- Access and retrieval of relevant information requires considerable overhead
- Generation of reports is difficult

2.3 PROPOSED SYSTEM

The proposed system would automate all of the processes described which would help to reduce the overhead incurred by the staff and make the whole process simple and efficient. The proposed system will have computerized data entry screens and processes can be carried out based on inputs from those screens. A set of reports would be provided to ease out the end users' task of having to consolidate data to be sent across to the management.

architectures i.e. on all available platforms. Hence if the industry decides to shift on to Linux platform later, the system can be ported across to it.

2.4.2 Operational Feasibility

Operational Feasibility asks if the system will work when it is developed and installed. It checks for the support of the management, the current business methods, user's involvement and their attitude towards the proposed system, etc.

The proposed system has found encouraging support from the staff and management as it will be of great use to them. The employees of the organization are also committed to have the system operational as it will save time and reduce their workload. Also since the staff can have easy access to the information, they are very much in favor of implementing the system.

2.4.3 Economic Feasibility

Economic Feasibility is the measure of the cost-effectiveness of the proposed system. The investment to be made in the proposed system must prove a good investment to the organization by returning benefits equal to or exceeding the costs incurred in developing the system.

The proposed benefits of the system will outweigh the costs to be incurred during system developed since the system does not require procurement of additional hardware facilities it is economically feasible. In addition, capability of the system to incorporate future enhancement will improve the performance to suit the future need.

CHAPTER 3

DEVELOPMENT ENVIRONMENT

3.1 HARDWARE REQUIREMENTS

The hardware support required for deploying the application:

Processor	: Pentium series and backward compatible
RAM	: Minimum 256 MB
Hard Disk	: 40GB or more
Monitor	: 15" monitor

3.2 SOFTWARE REQUIREMENTS

The software support required for deployment is:-

Platform	: J2EE
Operating System	: Windows XP
Server	: Apache Tomcat Server 5.5
Database	: MS-SQL Server 2000
Software for Development	: JSP, Servlet

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J2EE Platform Benefits

With features designed to expedite the process of developing distributed applications, the J2EE platform offers several benefits:

- Simplified architecture and development
- Freedom of choice in servers, tools, and components
- Integration with existing information systems
- Scalability to meet demand variations
- Flexible security model

MS-SQL SERVER 2000

Microsoft SQL Server is a relational database management system (RDBMS) produced by Microsoft. Its primary query language is Transact-SQL, an implementation of the ANSI/ISO standard Structured Query Language (SQL) used by both Microsoft and Sybase. SQL Server is commonly used by businesses for small- to medium-sized databases, but the past five years have seen greater adoption of the product for larger enterprise databases.

Features of SQL Server

- Simplify the integration of back-end systems and data transfer.
- Derive additional value from data using sophisticated data mining tools.
- Obtain results quickly using Microsoft English Query, which allows users to pose questions in English instead of using Structured Query Language (SQL) or Multidimensional Expressions (MDX).
- Create business-to-business (B2B) and business-to-consumer (B2C) Web sites, analyze Web site trends, and implement personalization

3.3 PROGRAMMING ENVIRONMENT

3.3.1 J2EE

Since its introduction was more than 3 years ago, the Java 2 platform Enterprise Edition (J2EE) has rapidly established a new model for developing distributed applications. This model is based on well-defined components that can automatically take advantage of sophisticated platform services. These components can be developed according to standard guidelines, combined into application, deployed on a variety of compatible server products, and reused for maximum programmer productivity. This model is intended to both standardize and simplify the kind of distributed applications required for today's networked information economy. The success of the J2EE platform is in large part due to the success of this model.

Today, all leading application server and enterprise information system vendors have adopted the J2EE standard and introduced products based on the J2EE platform specification. Application architects and developers have come to rely on the J2EE standard to help them solve the various design challenges that face them day to day. While the fundamentals of the J2EE platform are relatively easy to describe, mapping these features to architectural issues in the design of distributed applications requires deeper understanding and careful decision making.

Although the J2EE standard offers a simplified programming model compared to previous alternatives, the platform is not monolithic. Certain features require that architects and developers weigh their options before making design decisions and be prepared to re-think those decisions as they uncover new challenges. That, in turn, requires some understanding of the design motivations behind the platform and of the trade-offs involved in applying specific design features to a specific architectural problem.

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automatically using Microsoft Commerce Server 2000 and SQL Server 2000.

- Improve productivity with T-SQL enhancements.
- Take advantage of complete, end-to-end analysis capabilities—including data mining—with the integrated SQL Server 2000 extensible Analysis Services.
- Deliver robust, scalable database applications rapidly using the improved SQL Server 2000 development tools.
- Take full advantage of your hardware resources by running multiple, isolated applications on a single computer using SQL Server 2000 multi-instance support.

3.3.2 JAVA SERVER PAGE(JSP)

The typical web application consists of the presentation logic representing the static content used to design the structure of a Web page in terms of the page layout, color, and text. The business logic or dynamic content involves application of business intelligence and diagnostics in terms of financial and business calculation.

JSP technology has facilitated the segregation of the work profiles of a Web designer and a Web developer. On the other hand, a Web developer working independently can use java code and other JSP specific tags to code the business logic.

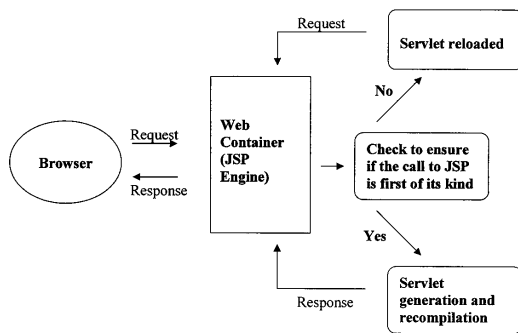
A JSP page, after compilation, generates a servlet and therefore incorporates all servlet functionalities. Servlets and JSP thus share common features, such as

- Platform Independence
- Creation of database-driven Web applications
- Server side programming capabilities.



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The Block Diagram



3.3.3.1 Block Diagram of JSP

Advantages Of Java Server Pages (JSP)

- Easy to learn and Portable
The design of JSP makes them usable by Web developers who have minimal programming skills but are well-versed in the areas of Web site development.
- Customizable
A web application developer can create their own tags allowing them to separate tasks from the visual presentation.
- Automatic Compilation
Changes made to the JSP pages are automatically compiled by the web server through JSP engine.

known as the modules and the process of dividing an entire system into subsystems is known as Decomposition.

The modules identified for the proposed **Automated Production Maintenance** are as below:

- Raw Components
- Component
- Component Master
- Finished Components
- Employee Details
- Machine Details
- Machine Breakdown Details
- Job Card Preparation
- Job Card Completion
- Assembled Components
- Quotation for Assembling
- Full Finished Components

4.1.1.1 Raw Components

- The details regarding the raw materials such as name, quantity available are maintained in this subsystem.
- The stock details should be maintained by this subsystem which aids in the reorder level maintenance and make further orders.
- All these details are configured as and when required by the concerned staff.
- The stock detail report is produced.

CHAPTER 4

SYSTEM DESIGN AND DEVELOPMENT

4.1 ELEMENTS OF DESIGN

System Design is the most creative and challenging phase in the development of a software system. Design implies to a description of the final system and the process by which it is developed. The first step is to determine which input data is needed for the system and then to design a database that will meet the requirements of the proposed system. The next step is to determine what are the outputs needed from the system and the format of the output to be produced.

The steps carried out in the design phase are as follows:

- Modular Design
- Input Design
- Output Design
- Database Design

4.1.1 Modular Design

System architecture embodies modularity that is, software is divided into separately named and addressable components, often called modules, that are integrated to satisfy problem requirements. Modularity is the single attribute of software that allows a program to be intellectually manageable.

A software system is always divided into several subsystems which make it easier to develop and perform tests on the whole system. The subsystems are

4.1.1.2 Component

- The details regarding the components such as the name, number of operations a particular component has to undergo are maintained.
- Quantities available after a particular sub-operation had been performed are maintained to provide the necessary information to the production department to improve its performance.
- The component detail after each operation is produced to the management as a report.

4.1.1.3 Component Master

- The details such as quantity on hand of raw material, the inprocess quantity and the operations carried out are maintained in this subsystem.
- The details regarding the stock level of the raw materials after each required operations are maintained based on the component details maintained in the database.
- The reports to review the component details are produced based on request.

4.1.1.4 Finished Components

- The stock details of the components available after all the operations had been carried out will be obtained.
- The report saying about the stock details of the finished components available is produced to the management when required.

4.1.1.5 Employee Details

- The information such as employee code, name, age, date of joining, basic salary, incentive, overtime, allowance and deduction details are maintained.
- Records can be updated at any point of time and can be retrieved at any point of time, thus providing easy access.

4.1.1.6 Machine Details

- The information such as machine code, name, make details, purchase year, maintenance details and service details are maintained.
- Records can be updated at any point of time and can be retrieved at any point of time, thus providing easy access.

4.1.1.7 Machine Breakdown Details

- The information required for maintaining the breakdown details are maintained in this database table. The machine code, date of breakage and restoration and the attending person are maintained.
- Records can be updated at any point of time and can be retrieved at any point of time, thus providing easy access.

4.1.1.8 Job Card Preparation

- The purchase bill entry should be made only when an order is made to the particular vendor.
- The quantity received and the rate per unit should be same as the one mentioned in the purchase order.

4.1.1.9 Job Card Completion

- The purchase bill entry should be made only when an order is made to the particular vendor.
- The quantity received and the rate per unit should be same as the one mentioned in the purchase order.

4.1.1.10 Assembled Component

- The information such as assembling code, assembling name are maintained.
- Records can be updated at any point of time and can be retrieved at any point of time, thus providing easy access.

4.1.1.11 Quotation for Assembling

- The purchase bill entry should be made only when an order is made to the particular vendor.
- The quantity received and the rate per unit should be same as the one mentioned in the purchase order.

4.1.1.12 Full Finished Components

- The purchase bill entry should be made only when an order is made to the particular vendor.
- The quantity received and the rate per unit should be same as the one mentioned in the purchase order.

4.1.2 Input Design

The input design is the process of converting the user-oriented inputs into computer-based format. The goal of designing input data is to make sure that the automation is easy, logical and free from errors.

The input design requirements such as user friendliness, consistent format and interactive dialog which provide users with timely help and correct messages are given high priority.

The input forms of the **Automated Production Maintenance** are listed as below:

- Raw Material Entry Form
 - Component Entry Form
 - Component Master Entry Form
 - Job Card Preparation Entry Form
 - Job Card Completion Entry Form
 - Machine Details Entry Form
 - Machine Breakdown Details Entry Form
 - Assembled Component Entry Form
 - Quotation for Assembling Entry Form
- ❖ The raw material details such as code, name and quantity available are entered in the raw material entry form.
 - ❖ The component details such as code, name, number of operations and quantity available are entered in the component entry form.
 - ❖ The details such as code, operation number and lot number are entered in the component master entry form.

- ❖ The information such as job card number, date of preparation, lot number, component code, operation number, quantity of allocated components, employee code and machine code are entered in the job card preparation entry form.
- ❖ The job card number, accepted quantity, rejected quantity and completion date are entered through the job card completion entry form.
- ❖ The machine details such as machine code, name, make, purchase year, maintenance due date, service details are entered in the machine details entry form.
- ❖ The machine breakdown details such as machine code, breakage date, restored date, attending person are entered in the machine breakdown details entry form.
- ❖ The assembly code and name are entered in the assembled component entry form.
- ❖ The assembly code, name, completion date, incharge employee, required units are entered in the quotation for assembling entry form.

4.1.3 Output Design

Reports are generated as output for the users to view and take print-outs. Different reports are generated for different criteria. The reports present in the system are:

- Raw Material Available Report
- Report for Components after each Operation
- Per month production details Report
- Finished Components Available Report
- Per Month Full Finished Components Available Report
- Total Components Generated Report.

4.1.4 Database Design

A database is a collection of inter-related data stored with minimum redundancy to serve many users quickly and efficiently. The general objective of database design is to make the data access easy, inexpensive and flexible to the user. An elegantly designed database can play a strong foundation for the whole system.

The details about the relevant data for the system are first identified. According to their relationship, tables are designed through the following methods:

- The data type for each data item in the table is decided.
- The tables are then normalized.

The tables are normalized so that they can provide better response time, have data integrity, avoid redundancy and be secure.

Table No. 4.2.4 Table Name: COMPONENTMASTER		
Field Name	Type	Description
Ccode	varchar(7)	Foreign Key Component Code
OpNo	number(2)	Operation Number
Opdesc	varchar(10)	Operation Description
QtyOHRM	number(7)	Quantity on Hand of Raw Materail
InprocessQty	number(7)	In Process Quantity

Table No. 4.2.5 Table Name: JOBCARDPREPARATION		
Field Name	Type	Description
JCno	varchar(7)	Primary Key Job Card Number
JCdate	date/time(8)	Date when job card is prepared
Empcode	varchar(7)	Foreign Key Employee Code
Mcode	varchar(7)	Foreign Key Machine Code
Ccode	varchar(7)	Foreign Key Component Code
Opno	number(2)	Operation number

Table No. 4.2.6 Table Name: JOBCARDCOMPLETION		
Field Name	Type	Description
JCno	varchar(7)	Foreign Key Job Card Number
QtyAcc	number(7)	Accepted Quantity
QtyRej	number(7)	Rejected Quantity
JCompDate	date/time(8)	Date of Job Completion

The tables for the Automated Production Maintenance System have been normalized up to the Second Normal Form (2NF).

4.2 TABLE STRUCTURE

Table No. 4.2.1 Table Name: COMPONENT		
Field Name	Type	Description
Ccode	varchar(7)	Primary Key Component Code
Cname	varchar(10)	Component Name
Noop	Number(2)	Number of operations a particular component has to undergo

Table No. 4.2.2 Table Name: RAWCOMPONENTS		
Field Name	Type	Description
Rcode	varchar(7)	Primary Key Raw Material Code
Rname	varchar(10)	Raw Material Name
qtyOH	number(2)	Quantity on Hand

Table No. 4.2.3 Table Name: SEMIFINISHEDCOMPONENT		
Field Name	Type	Description
Ccode	varchar(7)	Foreign Key Component Code
Cname	varchar(10)	Component Name
Noop	number(2)	Number of Operations
qtyOH	number(5)	Quantity on Hand

Table No. 4.2.7 Table Name: EMPLOYEEDETAILS		
Field Name	Type	Description
Empcode	varchar(7)	Primary Key Employee Code
Empname	varchar(15)	Employee Name
Sex	Char(1)	Sex of the Employee
DOB	Date/time(8)	Date of Birth of the Employee
Age	Number(2)	Age of the Employee
Address	varchar(25)	Address of the Employee
Estatus	varchar(10)	Status of the Employee
DOJ	Date/time	Date of Joining of the Employee
Basicpay	Number(10,2)	Basic Pay of the Employee
HRA	Number(5,2)	House Rent Allowance
TA	Number(5,2)	Traveling Allowance
PFno	Number(5,2)	Provident Fund Number
EPF%	Number(5,2)	Employee Provident Fund Percent
FPF%	Number(5,2)	Function Performance Fund Percent
ESI%	Number(5,2)	Employee Salary Incentive Percent
EligibilityOT	varchar(5)	Eligibility for Over Time
EligibilityIncen	varchar(5)	Eligibility for Incentive
DateLeft	Date/time(8)	Date when the Employee Left

Table No. 4.2.8 Table Name: MACHINEDETAILS		
Field Name	Type	Description
Mcode	Varchar(7)	Primary Key Machine Code
Mname	varchar(10)	Machine Name
Make	varchar(10)	Make of the Machine
PurYear	Number(4)	Year of Purchase
NextMD	Date/time(8)	Next Maintenance Due Date
OnService	Varchar(5)	Service Details
SerRemarks	Varchar(10)	Remarks during Service

Table No. 4.2.9 Table Name: MACHINEBREAKDOWNDETAILS		
Field Name	Type	Description
Mcode	varchar(7)	Foreign Key Machine Code
BreakDate	Date/time(8)	Date when the machine was broken
ResDate	Date/time(8)	Date when the machine was restored
AttendedBy	Varchar(15)	Name of the Attending Person

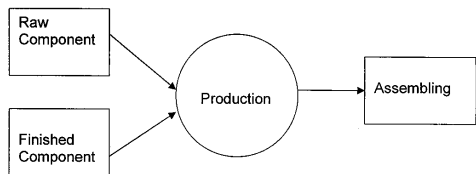
Table No. 4.2.10 Table Name: ASSEMBLEDCOMPONENTS		
Field Name	Type	Description
Acode	varchar(7)	Primary Key Assembling Code
Aname	varchar(15)	Assembling Name

Table No. 4.2.11 Table Name: QUOTATIONFORASSEMBLING		
Field Name	Type	Description
Acode	varchar(10)	Foreign Key Assembling Code
Ccode	Varchar(7)	Foreign Key Component Code
Adate	Date/time(8)	Date of Assembling
Cqty	Number(10)	Available Quantity of the Component
ElIncharge	Varchar(25)	Name of the Incharge
RUnits	Number(10)	Required Units

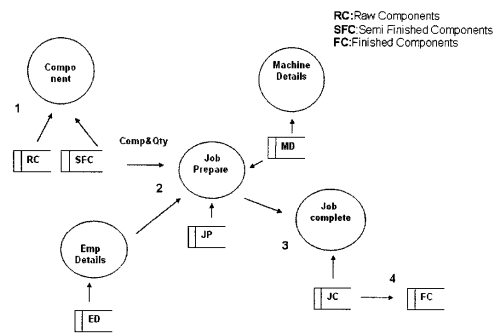
Table No. 4.2.12 Table Name: FULLFINISHEDCOMPONENTS		
Field Name	Type	Description
Acode	varchar(7)	Foreign Key Assembling Code
Aname	varchar(15)	Foreign Key Assembling Name
CompDate	Date/time(8)	Date when the Assembling Process was Completed
FCompQty	Number(10)	Quantity on Hand of fully finished components

4.3 DATA FLOW DIAGRAMS

Data flow diagrams are graphical representation depicting information regarding the flow of control and the transformation of data from input to output. The DFD may be used to represent the system or software at any level of abstraction. In fact, DFD can be partitioned into levels



4.3.1 Level 0 – Production Unit



4.3.3 Level 1 – Overall Process

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 IMPLEMENTATION

The process of an Implementation is the stage of the project where the theoretical design is turned into a working system. At this stage, the main work load, the greatest sudden change and the major impact on the existing system shifts to the user department. If the implementation is not carefully planned and controlled, it can cause errors and confusion.

In an Implementation part, deals about the process of converting an old system to new system. The new system which overcome all the impacts of existing system. The new system should also be more reliable than existing system. During the implementation process we should be careful; if any impacts arises then we can't satisfy the customer requirements.

The new system should be tested under various categories, whether it works effectively, efficiently and feasibility or not. The process of implementing the new system in an organization is called system implementation. At the level of implementation process the system should be tested whether is meet the specification. The end users check the feasibility of the system. The planning and checking of the current system should be careful and the condition on implementation, design of methods also be take careful.

The implementation stage involves the following tasks:

- Careful planning
- Investigation of system and constraints

- Validation Testing

5.2.1 Unit Testing

Module or Unit Testing is the process of testing all the program units that make up a system. Unit testing focuses on an individual module thus allowing one to uncover all the errors made logically and while coding in the module.

Each page is tested separately as a unit. Initially the flow of control and data through that page is checked. When considering a module as a unit, the flow of data and control through the whole module is tested. The result is stored in the test plan. In a page, each control is further tested in unit testing. The process is done in all the pages of the system. Once the errors are rectified, the testing procedure is repeated with the same test cases to ensure this hasn't produced any new errors. Hence this is a continuous process.

Test cases were generated to test the control flow of each unit or module. Almost all cases needed for testing control flows have been generated.

Test Cases for various units:

Test Case ID	Test Unit: Login
Test Case Name	Login Processing
Action	Enter User Name and Password
Expected Output	Display error message if password and user name is incorrect; else provide the user with the home page

- Design of methods to achieve the changeover
- Training of the staff in the changeover phase
- Evaluation of the changeover method

The method of implementation and the time scale to be adopted are found out initially. Next the system is tested properly and the same time users are trained in the new procedures.

5.2 TESTING

Testing is a critical element of software quality and assurance and represents the ultimate review of specification design and coding. It is a vital activity that has to be enforced in the development of any system. This could be done in parallel during all the phases of system development. The feedback received from these tests can be used for further enhancement of the system under consideration. The testing phase conducts test using the Software Requirement Specification as a reference and with the goal to see whether the system satisfies the specified requirements.

Standard procedures have been followed in testing Automation System. Test cases are generated for each screen. These test cases will cover every possibility which could result in both positive and negative results. These test plans are maintained for any further testing done on the system. The test plan stores information such as, the test input, expected output, actual output, comments and the name of the tester. This plan will be followed for all types of testing done in the system.

The main types of tests carried out are:

- Unit Test
- Integration Test
- User Acceptance Testing

Test Case ID	Test Unit: Raw Material
Test Case Name	Raw Material Stock Processing
Action	Ask for stock details of the inventory
Expected Output	Display the report with the material details with the quantity available.

Test Case ID	Test Unit: Finished Component
Test Case Name	Finished Components Stock Processing
Action	Request for stock details of the finished components
Expected Output	Display the report with the stock details of the finished components.

Test Case ID	Test Unit: Full Finished Component
Test Case Name	Full Finished Component Details
Action	Request for the stock details of the full finished component per month.
Expected Output	Display the report with the stock details of the requested month.

Test Case ID	Test Unit: Job Card Completion
Test Case Name	Job Card Completion Details
Action	Request for monthly production rate.
Expected Output	Display the report with the production details of the requested month.

5.2.2 Integration Testing

Integration testing tests the process of integrating the various modules to form the completed system. Integration starts with a set of units which had been tested individually in isolation and ends when the entire application has been built up. Integration testing verifies that the combined units function together correctly. It facilitates in finding the problem that occur at interface or communication between the individual parts.

It followed top-down integration testing. Modules were linked to the main menu in a sequence as required in the real time operating mode of the system. Menu items were created as and when required for the integration. For example, The 'Job Card Preparation and Job Card Completion' screens are tested first, then 'Finished Component' screen is tested based on the inputs in the Job Card Completion screen. The available quantity should be updated based on the quantity accepted in the job card completion details. The same procedure is followed in other modules in the same level at first. Then the upper level is taken into action. The flow of data through the whole module in the upper level is taken and executed. A change of data made in one screen should be reflected in all other screens.

accuracy and what it has to perform. Each module is subjected to test and run along with sample data. The individually tested modules are integrated into a single system. The testing should be planned, so that all the requirements are individually tested. A successful test is the one that gives out the defects of the inappropriate data and produces the output revealing the errors in the system.

Preparation of Test Data

Preparation of test data plays a vital role in the system testing. After preparing the test data, the system under study is tested using the test data. While testing the system by using the test data, errors are again uncovered by using the above testing steps.

This process is continued from the page level to module level, finally to the system level. In the final stage, the whole system is taken together and tested for integration. A change in one place should be reflected through out the system. Regression testing is done after each change made into the software. This tests if the change has affected any part of the system negatively after the change was made. The whole set of test cases need to be run again to do the regression testing.

5.2.3 User Acceptance Testing

User Acceptance of a system is the key factor for the success of any system. The system under consideration is tested for user acceptance by constantly keep in touch with the prospective system users at the time of development and making changes wherever necessary in regard to the following point:

- Input Screen Design
- Output Screen Design

5.2.4 Validation Testing

Text Field

The text field can contain only the number of character lesser than or equal to its size. The text fields are alphanumeric in some tables and alphabetic in the other tables. Incorrect entries will be notified with the appropriate error messages.

Numeric Field

The numeric field can contain only numbers from 0 to 9. An entry of any character flashes the error message. The individual modules are checked for

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

The Automated Production Maintenance System enables the management to get rid of a very tedious and time consuming process which has been followed for over decades. By automating the entire raw material, component, job card details, employee details, semi finished component, full finished component, machine details, machine breakdown details, assembled components, quotation for assembling and report generation process the officials are spared of a cumbersome and repetitive task.

When fully deployed, the Automated Production Maintenance System will transform the entire working of the Production & Assembling department affairs from the usual register, log and record based exercise into computerized professionally operated process. It makes the entire procedure faster, error free, simple, efficient and more performance enhancing one. The automation provides a uniform interface for conducting queries and generating reports on demand.

It enhances the scope of the entire project by integrating with the production and assembling unit modules. The maintenance system provides the basic details and information like component, raw component, employee, job card details, machine details, assembled components, full finished components and assembling quotation details. These information should be maintained upto date with periodic updates.

Thus the Automated Production Maintenance System increases the efficiency, performance of the staff by enabling them to spend more time on

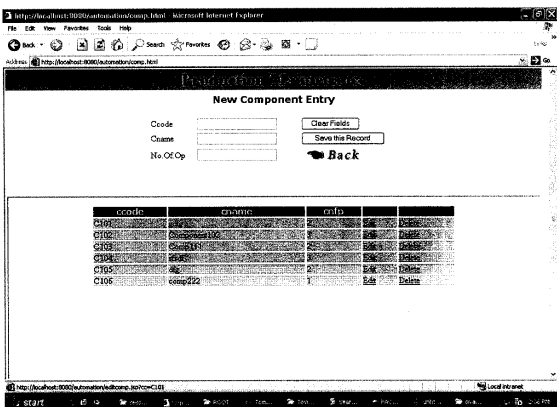
concentrating on industry's annual improvement activities. The reports provided to the management are error free and leads to improved decision making.

6.2 FUTURE ENHANCEMENT

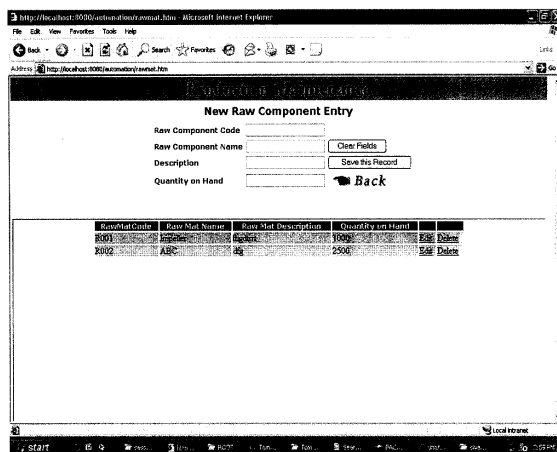
The following features listed below if introduced could benefit the users of the system.

- The system could provide a facility to the official employees to maintain the job card and assembling and processing component details through online.
- The access to the system should be limited. The user levels and rights levels should be determined and implemented.
- All the other systems like the Sales System and other systems available in the industry can be integrated to form a bigger system which can be accessed at any time by anyone in the office through the intranet.

Component Screen

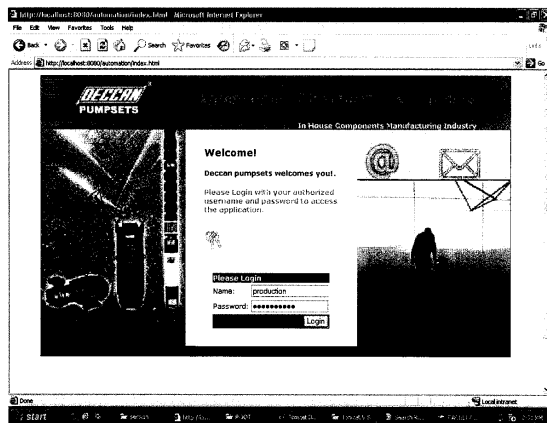


Raw Component Screen



APPENDICES

Login Screen



Component Master Screen

Microsoft Internet Explorer

http://localhost:8080/automat/compMaster.jsp

New Component Master Entry

CCode: C101
 Operation Number: 1
 Raw Component Code: R001
 Lot No:

LotNo: 2
 CCode: C101
 Operation Number: 1
 Op Desc:
 Rate:
 QtyOHRM: 1000
 IPQuantity:

LotNo	Ccode	Operation No	Operation Desc	Rate	Raw Mat Code	QtyOHRM	IPQty		
L1	C102	1	Blank	4000	R001	2000	250	Edt	Delete
L1	C102	2	Blank	500	R001	200	150	Edt	Delete
L1	C102	3	Blank	600	R001	300	100	Edt	Delete
L2	C101	1	Blank	2	R001	1750	750	Edt	Delete
L4	C101	1	Blank	400	R002	3000	300	Edt	Delete

Component Master Screen

Microsoft Internet Explorer

http://localhost:8080/automat/compMaster.jsp

New Component Master Entry

CCode: C101
 Operation Number: 1
 Raw Component Code: R001
 Lot No:

LotNo: 16
 CCode: C101
 Operation Number: 2
 Op Desc:
 Rate:
 QtyOHRM: 300
 IPQuantity:

LotNo	Ccode	Operation No	Operation Desc	Rate	Raw Mat Code	QtyOHRM	IPQty		
L1	C102	1	Blank	4000	R001	2000	250	Edt	Delete
L1	C102	2	Blank	500	R001	200	150	Edt	Delete
L1	C102	3	Blank	600	R001	300	100	Edt	Delete
L2	C101	1	Blank	2	R001	1750	750	Edt	Delete
L4	C101	1	Blank	400	R002	3000	300	Edt	Delete
L6	C101	1	Blank	22	R002	2500	500	Edt	Delete

Semi-Finished Component Screen

Microsoft Internet Explorer

http://localhost:8080/automat/compMaster.jsp

Finished Component

CCode: C101
 CCode: C101
 CCode: C101
 CCode: C101
 NO OF OP: 2
 QtyOHRM: 300

Employee Form Screen

Microsoft Internet Explorer

http://localhost:8080/automat/employee.html

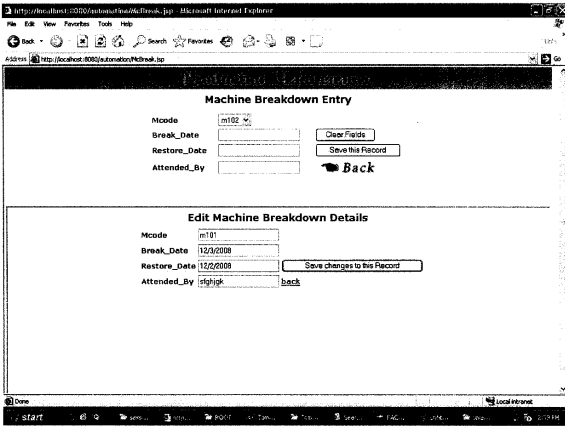
New Employee Entry

Personal Details
 Ecode:
 Ename:
 Sex: Male Female
 Age:
 Estatus:

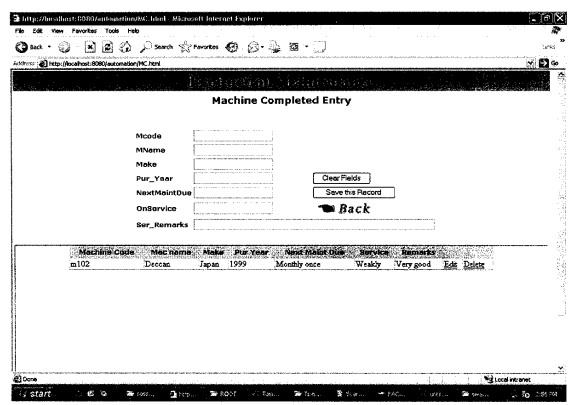
Pay Details
 EmpNo: 000 0000
 BasicPay:
 HRA:
 PF:
 EPF:
 ES:

EmpNo	EmpName	Estatus	DOJ	BasicPay	HRA	PF	EPF	ES	DOB	Address
111	0000000000	00	00-00-00	0000	00	00	00	00	00	00-00-00

Machine Breakdown Screen

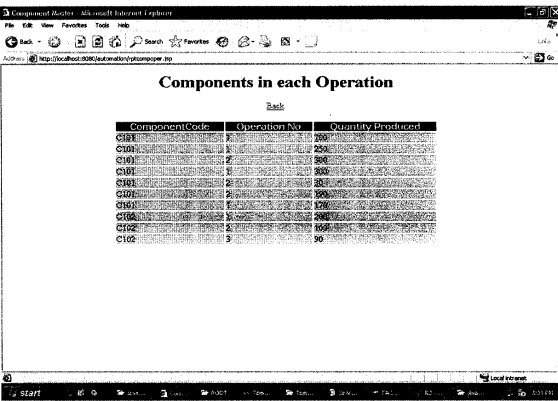


Machine Completed Screen

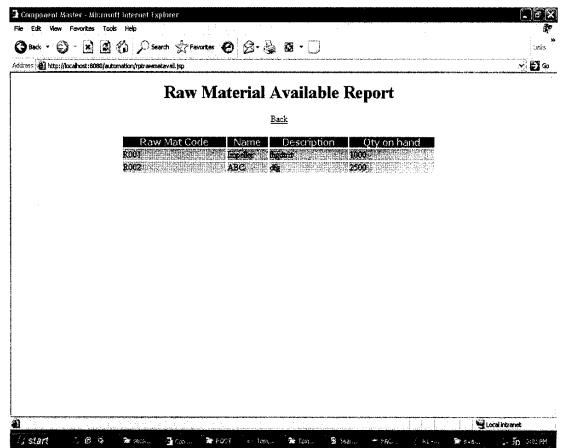


Reports

Components in each operation



Raw Materials Available



Per Month Semi-Finished Production

Component Master - Microsoft Internet Explorer

Address: http://localhost:8080/ComponentMaster.jsp

Per Month Production Report

Enter Month Number(1 to 12)

Component Code	Date of Production	Quantity Produced
C101	12/26/2007	50
C101	12/26/2007	150
C102	12/26/2007	50
C104	12/26/2007	500

Full-Finished Components Generated

Component Master - Microsoft Internet Explorer

Address: http://localhost:8080/ComponentMaster.jsp

Total Components Generated Report

ACode	AName	ADate	Finished Quantity
AD01	AD01	12/26/2007	200
AD01	AD01	4/8/2007	123

Per Month Full-Finished Components

Component Master - Microsoft Internet Explorer

Address: http://localhost:8080/ComponentMaster.jsp

Per Month Finished Components Generated

Enter Month Number(1 to 12)

ACode	AName	ADate	Finished Quantity
AD01	AD01	1/4/2008	50

Semi-Finished Components Available

Component Master - Microsoft Internet Explorer

Address: http://localhost:8080/ComponentMaster.jsp

Finished Components Available Report

Component Code	Date of Production	Quantity Produced
C101	12/26/2007	50
C101	12/26/2007	150
C102	12/26/2007	50
C104	12/26/2007	500

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