



# MAINTENANCE SERVICE INFORMATION SYSTEM FOR PETROCHEMECAL COMPANY

By

Mr. Bamrung Pinthong

Final Report of the Three - Credit Course  
CS 6998 System Development Project

Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Master of Science  
in Computer Information Systems  
Assumption University

November, 1998



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Project Title : Maintenance Service Information System  
for Petrochemical Company  
\*The title has been changed according to the final approval the committees  
Name : Mr.Bamrong Pinthong  
Project Advisor : Dr.Thotsapon Sortrakul  
Academic Year : 1998


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The Graduate School of Assumption University had approved this final report of the three-credit course, CS 6998 System Development Project, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer Information Systems.


Approval Committee :

  
(Dr.Thotsapon Sortrakul)  
Advisor

  
(Prof.Dr.Srisakdi Charmonman)  
Chairman

  
(Air Marshal Dr.Chulit Meesajjee)  
Dean and Co-advisor

  
(Dr.Sudhiporn Patumtaewapibal)  
Member

  
(Assoc.Prof.Somchai Thayarnyong)  
MUA Representative

December 1998

## ABSTRACT

This project is a study of Maintenance Service Information System for the proposed company which sells instrument equipments such as ultra sonic flow meter, pressure gauge, gas sampling and also has after-sales service. The existing information system is manual based system. The main points which this study based on are to reduce the response time to a customer, to lessen the duplication and to improve the control over the overall operations. From the study, it was recognized that the proposed system should provide users with full computerized information system that helps to provide the continuous information.

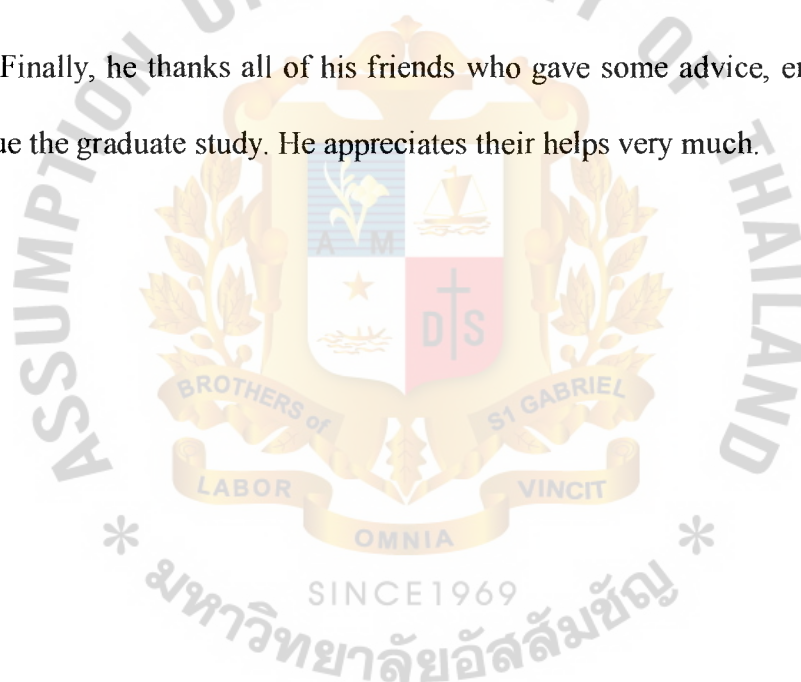
The Propose of new Maintenance Service Information System proposes to improve the management information system and provides better information, accurate and up-to-date information for staff in order to respond to customers as quickly as possible and to maximize customer satisfaction which is the main objective of Maintenance Service Information System. The system provides management with more valuable and meaningful information on the performance of Maintenance Service Information System which supports planning and cooperation with other departments.

## ACKNOWLEDGEMENTS

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# I. INTRODUCTION

## 1.1 Background of The Project

Eastern Energy Service Co., Ltd. ( EEST) was established in 1991 and operated in instrument and control equipment and company's work was not complicate. In the past, the company concentrated on selling many types of instrument product such as control valve, pressure gauge, temperature sensor, annunciators and ultra sonic flow meter.

At present, most of the businesses are facing high competition situation. The company's management system has to be developed because the existing system could not support a large amount of customers any more. The old service system of the company is based on manual system which is not used effectively. It takes a long time to find the customer records and sometime gives incorrect information.

The proposed system will make all departments of company operate efficiently. It will help better service performance. Furthermore, it will help to increase the staff's performance. It also supports accurately customer service information. The most important thing is collecting the record of repair and maintenance which make to solve the problems effectively an efficiently.

## 1.2 Objective of the project

The objective of this project is to implement the New Service Information System in order to give a good performance to all users.

1. To analyze the existing system of Service department in order to develop the service system properly for the present situation. System should be designed according to users requirements in order to get the better service management.
2. There are more customers and information to manage bill in the service department so the proposed system or the new system is designed to cope with all information.
3. The proposed system will use less man power or utilize the human resource of the Company.
4. To reduce company's expense in the future because the new system uses less office supply such as paper and tuner.
5. The new system that designed should provide accurate information at any time for service system of the company.
6. The database of the proposed system can be shown information for customer service
7. To reduce routine job for admin. staff
8. To provide accuracy of the Service Information System
9. To bring in a good cooperation for each section in the service department.



### 1.3 Scope of the Project

1. Database for the customers list that asking service in the company.
2. Database of various problems for case study
3. Database of spare parts used for repairing the meters
4. MIS reports for management such as
  - Customer list report
  - Frequency problem of meter
  - Finished job report
  - Unfinished job report
  - Receipt report
  - Warranty report



## II. EXISTING SYSTEM

### 2.1 Background of the Organization

EEST Co.,Ltd was established in 1991 and located on 8<sup>th</sup> Jit-u-thai Bldg. Since its inception, the instrumentation utilizing mechanical, capacitance, conductance and ultrasonic technology.

Controlotron's Clamp on Ultrasonic Flow meters are providing essential liquid measurement, controlling and alarm service in every industry. These multi- function measurement and control systems provide reliable instrumentation for simple, as well as complex, industry processes. The ultrasonic meter use TRANSITE TIME technology, which provide high accuracy. Moreover, they can be measured with any type of material, which are conductive sound, for example, fiberglass, plastic, PVC, stainless steel and etc.

The Clamp On Ultrasonic Flow Meter has 2 categories. The first one is permanent meter and last one is portable. The advantages of meter are long duration because of no mechanic movement part, low cost maintenance and easy to calibrate meter with prover meter or prover tank.

EEST staff include many highly skilled engineers and technicians with intensive experience in Ultrasonic Flow Meter. The customer service department provides in-plant or on-site service. At first, these meters “ CONTROLOTRON ” were not widely used in Thailand but now they are more widely used. In various petrol refinery

such as Star Petroleum, Rayong refinery Co.,Ltd., and so on are the reference of EEST meter.

## 2.2 The Organization Chart of the Service System

The Organization of service Department composes of three sections, which are spare parts, technician and admin. staff. All of them will report directly to Service Manager. In Technician Department which separate two parts which are portable meter and permanent meter

**Administration's staff:** is responsible for the process which deals with customers starting from the process of service request from customers until customers press order and return meter to customer. The duty of Administration's staff is including the process of answering customers about the status of the repairing meter, informing on repairing quotation. In addition, a administration's staff has to answer the basic questions to the customers such as part number of spare part referred to spare part section and giving some advice to customer's symptom of machine, asking for warranty card or proof of purchase and giving cooperation with other sections.

**Technician:** is responsible for inspection and repairing or service meter. The process starts from receiving service request from adminin. staff. After inspection is complete technician will send all information to administration department to run file service number. Administration's staff will give information and symptom to customer

with quotation. Another duty of the technician is to give some advises or solve the technical problem of customer via phone.

**Spare parts Dept.:** is responsible for keeping stock of spare parts needed by technician including order the new spare parts for the meter which have to replace the old part.

The following figure shows the overall organization chart of service organization chart in Figure 2.1 in the next page.





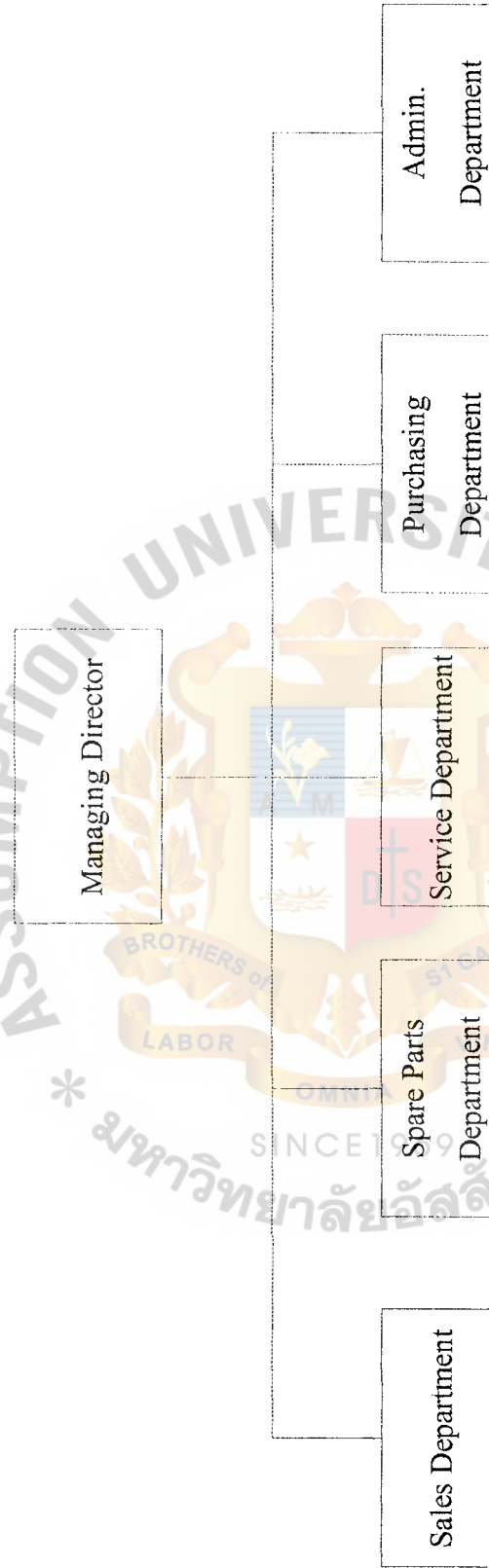


Figure 2.1. Organization Chart

## 2.3 Existing Business Function

After we have studied the existing system of the Service System, we can divide the main activities into:

Process 1.0: Accept request customer

Process 2.0: Verify warranty

Process 3.0: Define Problem

Process 4.0: Quotation

Process 5.0: Spare Parts Request

Process 6.0: Return Equipment

### **Process 1: Accept Request Customer**

When a customer calls to the staff of Administration Department to ask for service, the staff get information from the customer then issues the service number to the customer.

### **Process 2: Verify Warrantee**

The staff will check customer's meter warranty from the record file. If the meter is under warranty period, it will be free of charge. In other case, the customer has to pay for the replacement parts including service charge.

### **Process 3: Define Problem**

After the technician receiving the customer's information, he will define problem from customer's information, then update information service number.

### **Process 4: Quotation**

Technician issues quotation and waits for the answering from the customer. If the customer accepts the quotation, technician will issue technician I.D. which shows the technician who takes charge of this job.

### **Process 5: Spare Parts Request**

The process of making request for spare part, the technician writes the request to the Spare Parts Department. The Spare part Department's staff sends spare parts to the technician and updates spare parts file.

### **Process 6: Return Equipment**

After technician repairing the equipment completely, he will inform to the Administration Department which asks for payment from the customer. The customer makes a payment and then the staff of Administration Department sends cash receipt to the customer.

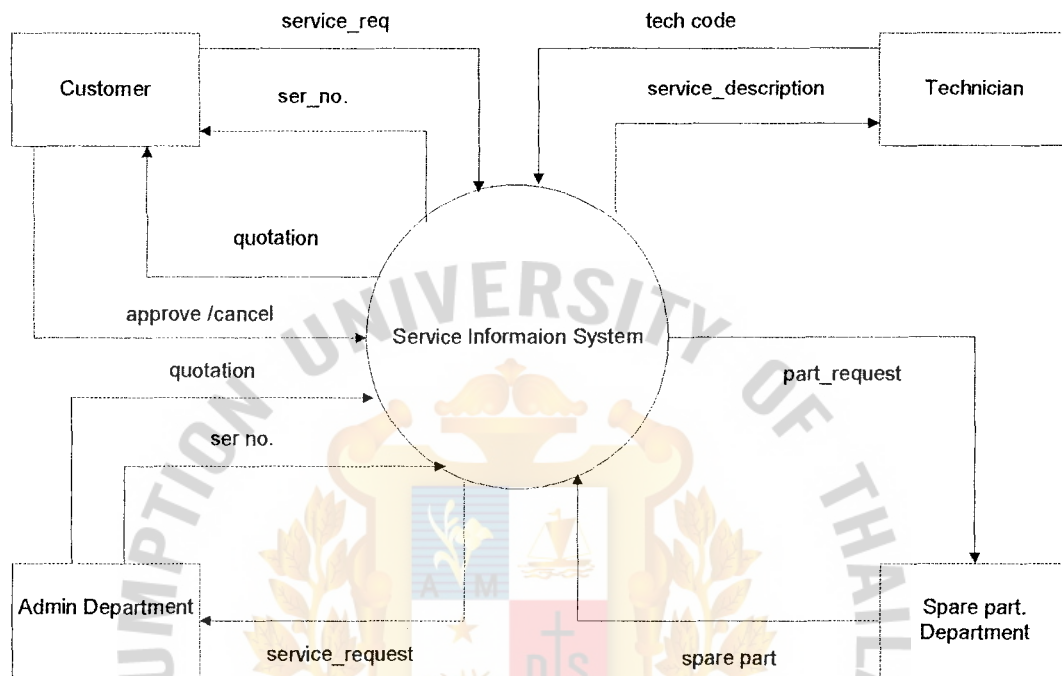


Figure 2.2. Context Diagram of Existing System



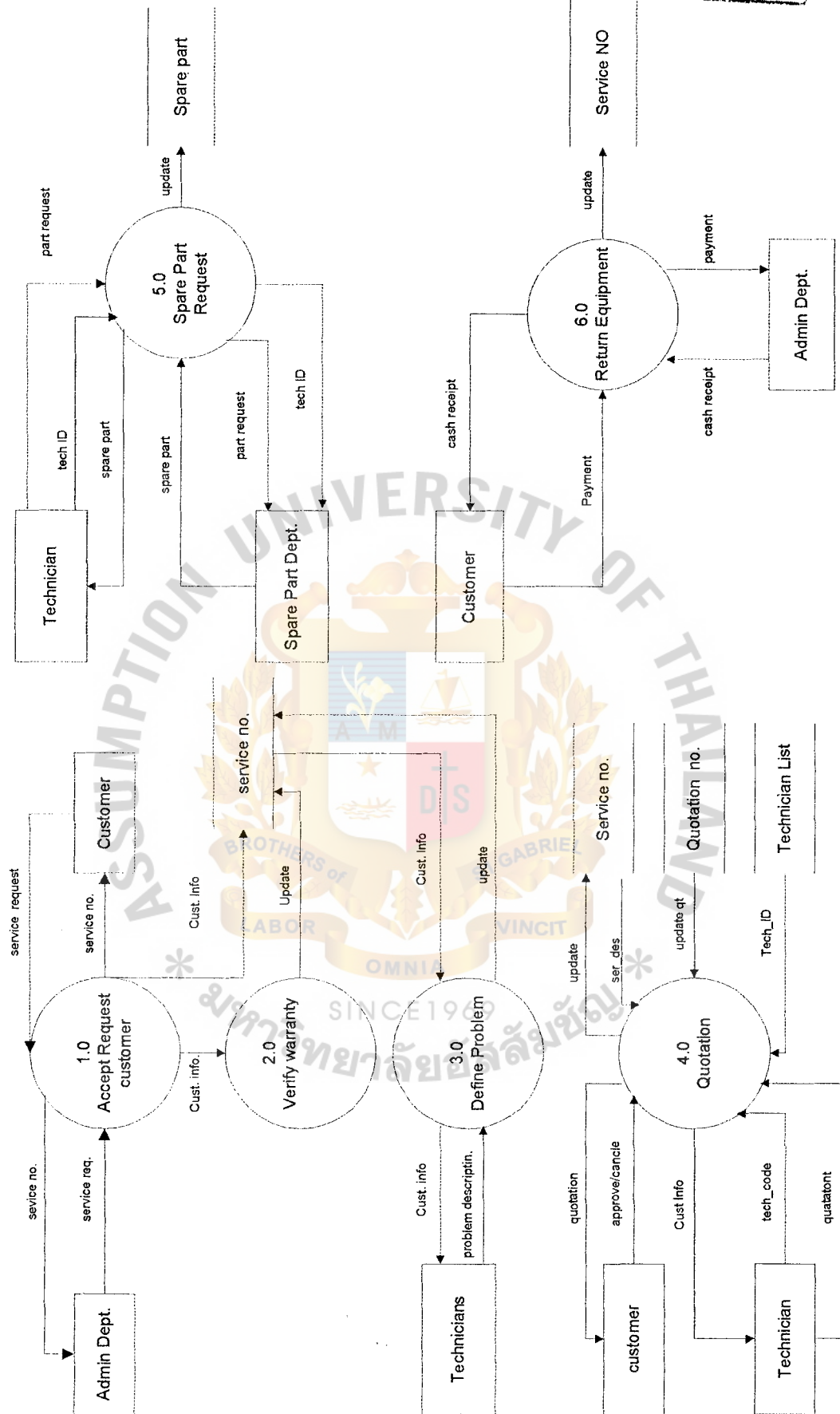


Figure 2.3. DFD Level 0 of Existing System

## 2.4 Current Problems and Areas for Improvement

After studying the existing system, we found many problems in Service department. We divided the problems into three parts: Administration's staff problems, spare parts problem and technician problems.

The problems which administration's staff encountered were as follows:

1. Administration's staff could not utilize the old system, because the existing system is processed by manual system, which is complicate to utilize.
2. Administration's staff found that it was hard to summarize the monthly report. They had to count the record by hand and the occurred mistakes could not be avoided.
3. Administration's staff had to check the pending meter and finished ones by hand, so customers had to wait for a few minutes to get the answer whether their meters had already checked or repaired.
4. Customers were wasted their money and time, especially the long distant call for holding the phone line in order to get the answer.
5. Administration's staff could not report the status the customers' meter to them because technicians did not inform.
6. Administration's staff could not manage the quotation and calculation system.

The problems that technicians encountered were as follows:

1. They could not check whether meters were in warranty period or not because the warranty information was not updated.
2. They forget the meters, which was waiting for the spare parts because they did not get the report of pending meters.
3. They did not know how much the daily incoming jobs were so they could not manage their time effectively.
4. Technicians did not co-operate their performance because there was no assessment.
5. They do not have symptom history files, if they have symptom database it will help them to save a time to define problem and service the meter.

The problems that the spare parts department encountered were as follows:

1. Staff of this department can not give a report like who withdraw what spare parts.
2. Staff could not make reports which parts were used for service number.
3. They could not remember when did they have to order spare parts which means they have to know reorder point for every parts.

After the company knew these problems, the company intended to improve the existing system of Service system. To improve Service Information System, we have focused on the function of Administration's staff, Spare parts department and

technicians since Administration's staff receive meters from customers until technicians already repair meter and return them to customers. The assessment of technician's performance will be done monthly. The control of pending and finished meter will be followed up monthly.





### III. PROPOSED SYSTEM

#### 3.1 Users' Requirements

After studying the existing system, we have some additional requirements in order to support the work flow in the service system together with full range of management of its function. we could summarize the users' requirement as followings:

1. The Administration's staff did not know the status of meter because technicians did not inform it.
2. The Administration had to check the pending and finished meter by hand.
3. Technicians had to delay their works because they waited for warranty cards or proofs of purchase from customers.
4. The administration's staff had no accurate information to inform customers about their meter.
5. Technician did not have history of inspection record. It will support service slowly.
6. Staffs of spare parts department have to perform all reports manually.

The improvement needed are as follows:

- 1 The system should be on line because the administration can retrieve the information of meter from system. This system will save the time and money

2. The system should provide necessary reports to control over the function.  
The pending and finished report should be done in order to control the amount of meter in Service System.
3. The Meters have to be checked whether they are in warranty period before repairing in order that technicians will not delay their works.
4. The Meters have to be inspected hardware and software then administration's staff will inform customer and quote the price of service.
5. All service requests from customer have to pay minimum charge before inspecting the service, because some meter just need optimization.
6. The assessment of technicians' performance is needed because technicians can know their capacity and then they can improve themselves. In addition, the management can use it as a device to consider the salary and bonus promotion to technicians.
7. The Spare part Department should know amount of spare parts in the stock in order to inform the period of time for repairing.

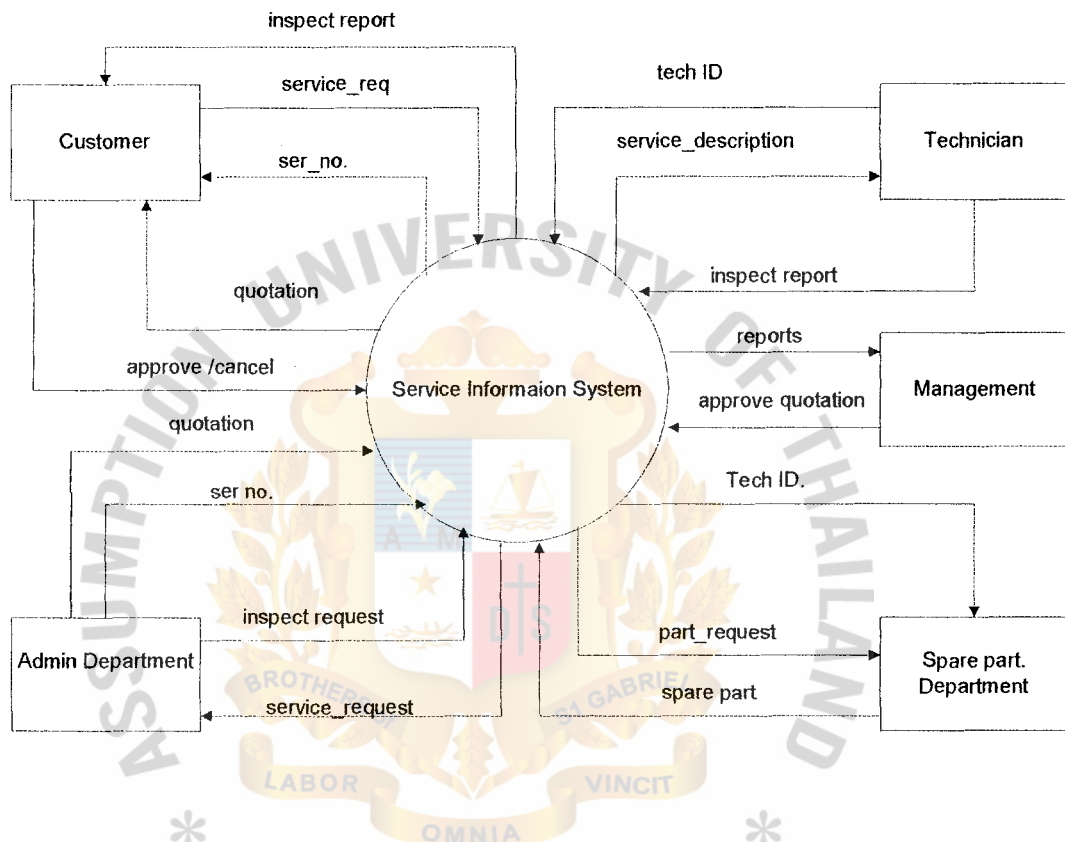


Figure 3.1. Context Diagram of Propose System

## Context Diagram of Propose System

After we had study and analyze the existing system, we found that the existing system has many elements for improving and developing. The existing system has many process that when working need too much time as it should be.

For instance, The existing system quotes the service price from technician. The Technician will quote the price by estimating from the problems that the customer inform to admin. Occasionally, Repaired problem may be more or less than the existing problem, and that causes the problem of the overvalue or undervalue which finally leads to company's accounting system. Company may lost from the undervalue the repaired price and that both customer and company are unsatisfied.

For the new system, management is brought for the process and that yield more right decision in administration and management which the existing system didn't provide such fine management and information for more right decision and effective. For instance management will tell the exact provide of repairing from the information in the company system.

Knowing the exact repaired period of meter and the sequence of the customer were importance factor, because, occasionally customer 's meters may be fault at the same time so an urgent repair with limited time is needed. Otherwise it may cause disaster to customer's plant. So sequence of the job and customer's priority will be informed to technician by service system from Figure 3.1 and also we can confirm the

status to customer that when the job will be finished by the service status menu that is shown on Figure 3.2

All the above information is some parts of the proposed system that have been developed to be more effective for today competition.





Service Status Menu

Service No.

Customer No.

S/N

Status Date

Tech ID

Model

Edit

Save

Cancel

Print

Exit

Figure 3.2. Service Status Menu

The service status menu is used when user wants to know the current status of the service such as when the customer asks for information. User will print report by pressing print button.

## Quotation Menu

Quataion No.

Date.

Service No.

Customer No.

Item	Part No.	Description	Unit Price	Total Price

Grand Total

Edit

Save

Cancel

Print

Exit

Figure 3.3 Quotation

Admin staff will use quotation menu to quote the price to the customer by typing the part number then the price of the spare parts will show on the screen. After the user typed all parts that change for meter, the system will calculate and give the Grand total for the customer.

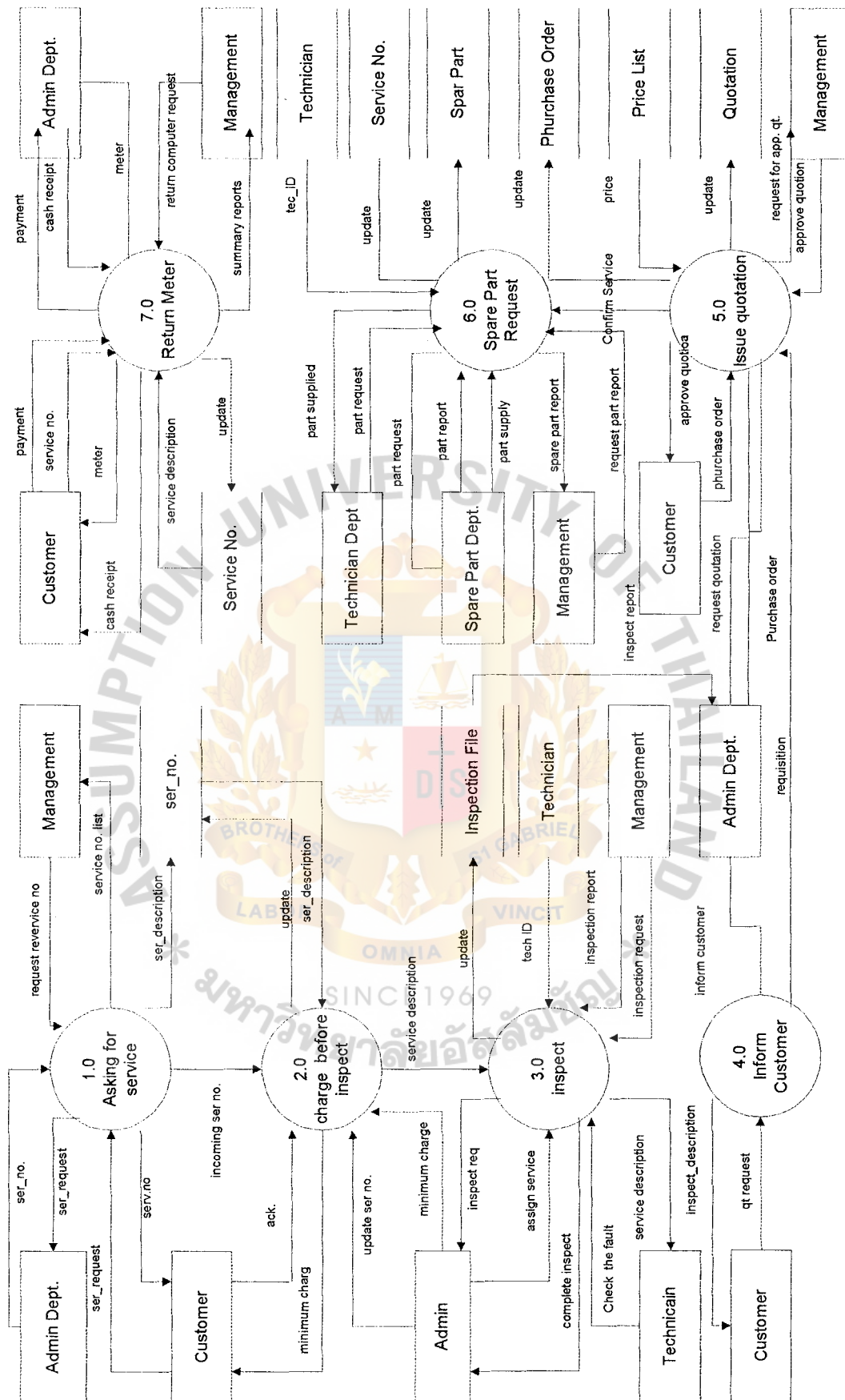


Figure 3.4. DFD Level 0 of Propose System

### 3.2 The Proposed System

After we have studied the existing system and known the requirements, we can summarize and divide the proposed system into seven processes:

- Process 1.0 : Asking for service
- Process 2.0 : Charge before inspect
- Process 3.0 : Inspect meter
- Process 4.0 : Inform customer
- Process 5.0 : Issue quotation
- Process 6.0 : Spare part request
- Process 7.0 : Return computer

#### Process 1: Asking for Service

When customer requests services to admin. staff and gives all descriptions such as fault problem, and serial number of meter. Admin staff will key data into the system to make a service number. Admin staff will send the report of service requests to Management Department.

This process consists of three activities: -

Process 1.1 Process fined customer record

Process 1.2 Process verify warranty

Process 1.3 Process incoming service report

## **Process 2: Charge before Inspection**

This process is the activity when has incoming service request from the customer. Admin staff will send quotation to inform minimum charge to customer.

## **Process 3: Inspect Meter**

This process is the activity when customer accepts for the minimum charge, then admin staff will assign service to technician department. Technician department will assign job to technician after inspecting completely technician will key data to system and update in inspection file. Inspection report will give to management department by Admin. staff.

This process consists of three activities: -

### **Process 3.1 Check Meter**

This process also consists of

Process 3.1.1 Installation check

Process 3.1.2 Hardware and software test

Process 3.1.3 Summary fault

Process 3.2 Record fault description

Process 3.3 Inspect meter report



#### **Process 4: Inform Customer**

This process is the activity when process of inspection meter complete and Admin staff will inform inspection description to customer.

#### **Process 5: Issue Quotation**

This process is the activities when customers know all details on the meter then they request quotation to Admin staff. After customer receives quotation, then they will send purchase order to admin staff.

This process consist of Three activities:

Process 5.1 Calculate quotation

Process 5.2 Request for approval quotation

Process 5.3 Run purchase order

#### **Process 6: Spare Part Request**

This process is the activities when the admin department received order from customer then technician will request spare part for service meter to Spare part department. After service finishing technician will update data to service no. files and Spare Parts Department will send report to Management department.

This process consists of five activities:

Process 6.1 Incoming service

Process 6.2 Check spare part

Process 6.3 Part request

Process 6.4 Supply part

Process 6.5 Spare part supply report

### **Process 7: Return Meter**

When admin. staff checks and updates service no. Admin. Department will know which meter is finished. Admin Department will inform the customer to collect money and give report to Management.

This process consists of four activities

Process 7.1 Complete service report

Process 7.2 Inform customer

Process 7.3 Correct money

Process 7.4 Print complete service no.

## **3.3 Hardware and Software Specification**

There are two parts of configurations, one is hardware configuration and the other is software configuration.

### **3.3.1 Hardware Specification**

#### **1. File Sever**

- CPU Intel Pentium II 300 MKZ. 1 set
- RAM 32 MB.

- Cache Memory 512KB.
- Hard disk 4.5 GB. Seagate
- Mini tower case & Power 250 Watt
- Disk drive 1.44 MB.
- CD-ROM drive 32x speed
- Monitor 14" Res. 1280x1024 Low Radiation
- Keyboard 104 keys support Windows 95

## 2. Workstation

- CPU Intel Pentium MMX 200 MKZ. 5 set
- RAM 16 MB.
- Cache Memory 512KB.
- Hard disk 3.2 GB. Seagate
- Mini tower case & Power 250 Watt
- Disk drive 1.44 MB.
- CD-ROM drive 32x speed
- Monitor 14" Res. 1280x1024 Low Radiation
- Keyboard 104 keys support Windows 95

## 3. Printer

- Laser printer 2 set
- (HP 4P)

## 4. UPS (Uninterruptible Power Supply) 600 VA 1 set

## 5. Network Peripheral

- UTP

- Hub

### **3.3.2 Software Specification**

#### 1. Operating System

- MS Dos Ver. 6.22

#### 2. MS Windows 95

#### 3. MS Office 97

#### 4. MS Windows NT Sever Ver. 4.0



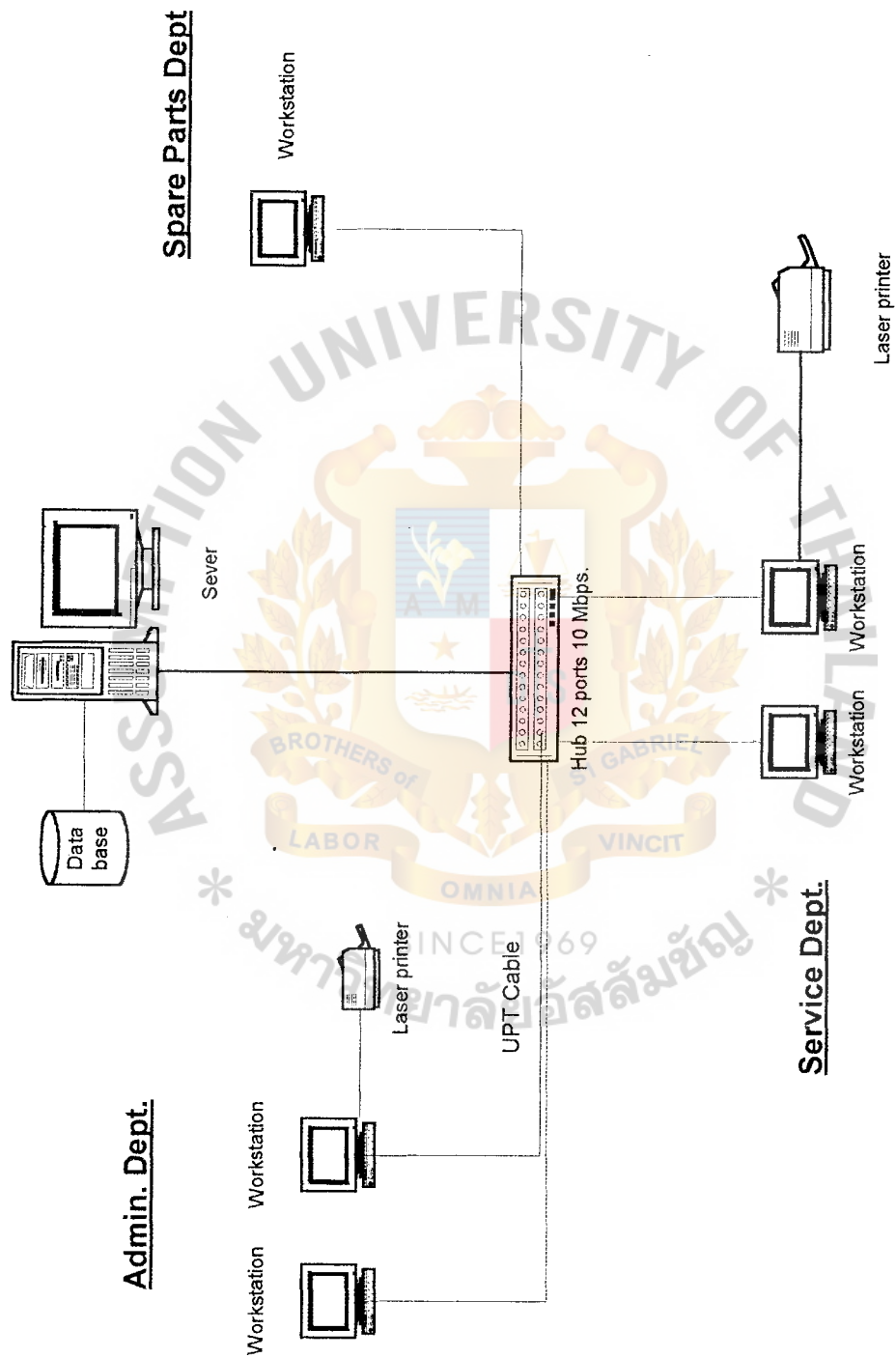


Figure 3.6. Network Configuration



## Network Configuration

The objective of network connection is sharing database or source of data. This system is designed by using Star topology that uses hub for center of connecting workstations. The advantages of this network system are easy to maintain, and use less wire than other topology.

Network Details :

- |                       |                   |
|-----------------------|-------------------|
| 1. Network Topology : | Star Topology     |
| 2. Interconnection :  | Hub 12 ports      |
| 3. Wiring & Cable :   | UTP 4 pairs CAT-5 |
| 4. Sever :            | PCs Files Sever   |
| 5. Workstation :      | PCs               |
| 6. Protocal           | TCP/IP            |

### 3.4 Security Control

To protect unauthorized persons accessing into data and the hardware threats, the management needs the security measures to protect the hardware and software. We divide the security measures into three categories as follows:

#### 3.4.1 Operational Security

### **Hardware Security**

This control exists in form of locked cover of PC and locked each technician's room. This method will prevent the theft of parts such as CDROM Drive, RAM and harddisk.

### **Password Security**

This control exists in form of logon procedure. A user can gain access to a computer system through logon password. In addition, the system will disconnect after three invalid logon attempts.

### **Software Security**

This control exists in form of a virus-checking program. It will be installed to scan for viruses before the computer system will be infected. Service Information System will update a virus-checking program every seven months.

### **Data Security**

This method involves in minimizing data destruction risks. Backup data will be done in storage media every month.

### **User Security**

This method will allow only authorized users access data within scope of their responsibilities. So the users will be classified into three levels according to their duty as follows:

Table 3.1 Access Authorization

Level	Authorized Access	
	Program	Data
System Manager	All	All
System Administrator	All	All
User	R/A	R/W/A

Where: R = Read

A = Access

W = Write

D = Delete

### 3.5 Cost and Benefit Analysis

#### 3.5.1 Cost analysis

There are three categories that must be taken into consideration when development the proposed system. These three categories are :

- I. Investment Cost
- II. Implement Cost
- III. Annual Operation Cost

## I. INVESTMENT COST

### Hardware

• File Sever	1 set	50,000
• Workstation @30,000	5 set s	150,000
• Printer @ 30,000	2 sets	60,000
• Lan Card (Fast Ethernet10/100 Mbps.)		3,000
• Hub		5,000
• Cable		3,000
• UPS 1000 VA		10,000

### Software

• Windows NT Sever 4.0	20,000
• Windows 95	5,000
• MS Office 97	<u>6,000</u>
<b>Total Investment Cost</b>	<b>301,000</b>

## II. IMPLEMENT COST

• Software Development & Training Cost	<u>50,000</u>
<b>Total Implement Cost</b>	<b>50,000</b>

## III. ANNUAL OPERATING COST

• Paper	7500
• Cartridge	4000
• Annual Expense	30,000

• Stationery	<u>10,000</u>
<b>Total Annual Operating Cost</b>	<b>51,500</b>

### 3.5.2 Benefit analysis

#### Tangible Benefit

The proposed system provides tangible and intangible benefits as follows :

• Salary 120,000 Baht x 1 persons	120,000
• Fringe benefit	12,000
• Over time	20,000
• Paper	5,000
<b>Total Tangible benefits</b>	<b>157,000</b>

#### Intangible Benefit

The proposed system provides the tangible benefits as follow:

- There is higher database security and system controlling. The proposed system is designed by using user ID and password to access the system. It provides more security than the old one. The only authorized person can access the system
- The proposed system helps to reduce redundant process. The details of meter are kept in file of database system. It makes the staff work step by step according to the designing of the system.

- The proposed system reduces some redundant tasks and time to calculate the quotation. The proposed system is designed to help and support staff to work by combining some parts of work together. It also automatically calculates amount of money in quotation and service charge rate is built in the proposed system.
- The proposed system provides the better service to customer and controls capabilities when any the problem occurs. Because the customer information is recorded in database, it makes the staff retrieve or fine customer information quickly.
- The proposed system improves the quality of service to the customer. In case, there are many customers ask for service, the staff can think over that who should be get the service first. It may depend on the serious case or other reasons.
- The proposed system provides more timely, accurate and up-to-date information.
- The proposed system can generate many reports for management level for making decision and planning.
- The proposed system provides the smooth operation for service. Because the complete database.
- The proposed system increases the better management and control because of the many kinds of reports that support the management and control of the management level.
- The proposed system increases the productivity in organization since it works systematically.



- The proposed system makes the good image and trust for the customer because of the modern system.
- The proposed system will lead to the first step of system development. In the near future, the other systems have more chance to further develop and know that what and how system to be designed.

### Payback Period

Payback period is the exact amount of time required for the company to recover its initial investment as calculated from cash flows. The after taxes payback period is :

$$P = \frac{I}{(1-T) R}$$

where

P = Payback period

I = Initial or capital expenditure

R = Annual saving realized by investment

T = Corporate tax rate in percent (30%)

The payback period of the proposed system can be calculated as follows:

$$I = 273,500$$

$$R = 157,000 - 21,500 = 135,500$$

$$P = \frac{I}{(1-T) R}$$

$$= \frac{273,500}{(1-0.30) * 135,500}$$

$$= 2.5 \text{ years}$$

### NPV (Net Present Value)

Net Present Value is a sophisticated capital budgeting technique which is founded by subtracting the project's initial investment from the present value of cash inflows discounted at a rate equal to the firm's cost of capital. The basic formula for NPV is:

$$NPV = \frac{R}{(1+k)^1} + \dots + \frac{R}{(1+k)^n} - PV$$

Where NPV = Net Present Value

PV = Cost of the new system = 273,500

R = Annual cash inflows (saving) = 157,000

N = Number of years the saving is available = 2.8

K = Annual rate of interest = 15%

$$= \frac{157,000}{(1+0.15)^1} + \frac{157,000}{(1+0.15)^2} + \frac{157,000}{(1+0.15)^3} - 273,500$$

$$= 85,025.77$$

**Decision Criteria:** If NPV is more than zero, accept the project. If NPV is less than zero, reject the project. In this case, NPV that can be derived from developing the proposed system which is 85,025.77 Baht. We should accept this project.



Table 3.2. Total Cost of Proposed System\*

Description	Year 0	Year 1	Year 2	Year 3	Year 4
I. Investment Cost	301,000	-	-	-	-
II. Implement Cost	50,000	50,000	50,000	50,000	50,000
III. Operating Cost	51,500	51,500	51,500	51,500	51,500
<b>Total</b>	<b>402,500</b>	<b>101,500</b>	<b>101,500</b>	<b>101,500</b>	<b>101,500</b>

Table 3.3. Cost and Benefit

Year	Cost	Cumulative Cost	Benefits	Cumulative Benefits
0	295,000	295,000	0	0
1	51,500	346,500	157,000	157,000
2	51,500	398,000	172,700	329,700
3	51,500	449,500	189,970	519,670
4	51,500	501,000	208,967	728,637

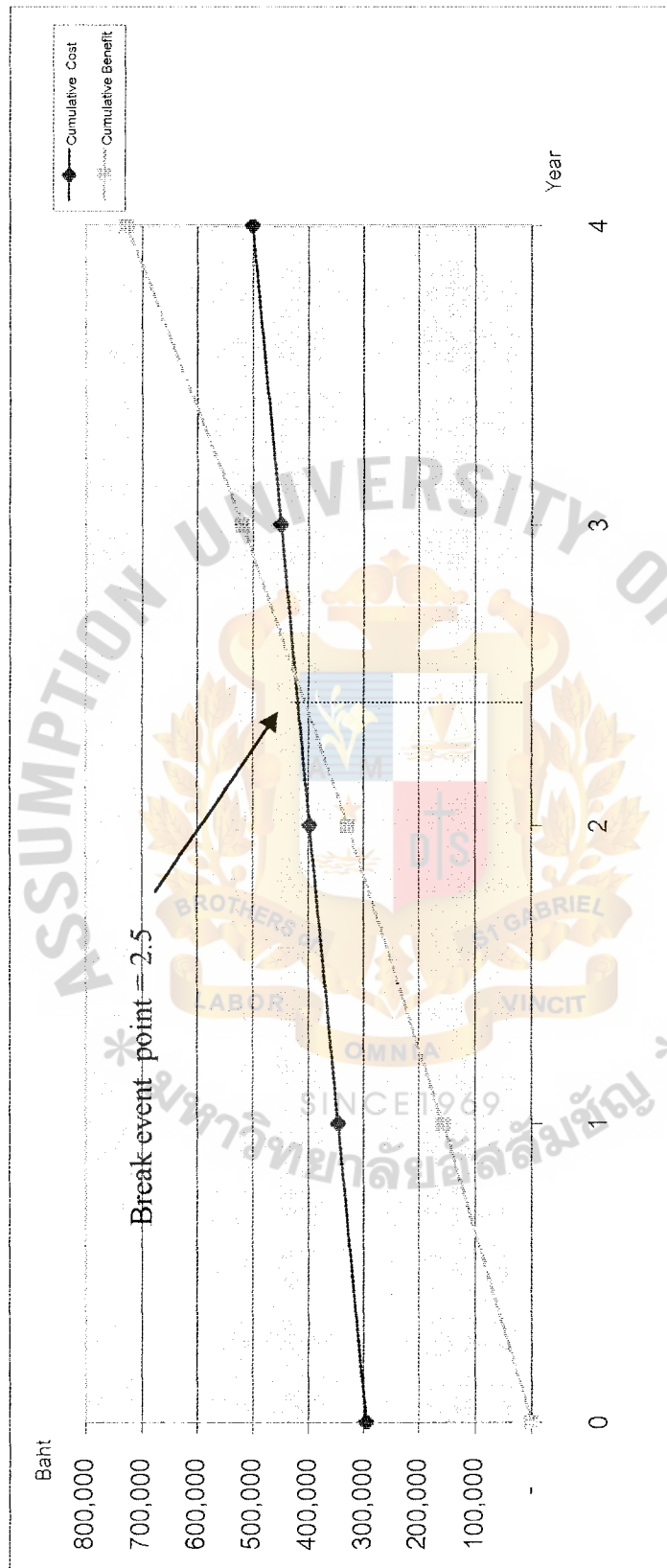


Figure 3.7. Cost and Benefit Graph



## **IV. PROJECT IMPLEMENTATION**

### **4.1 Project Management**

Project management consists of installation, conversion, and training. These three activities involve staff, process, and organization. The project schedule is planned well in order to control the project performance to meet the project plans. System analyst will be responsible for the following:

1. The quality of the execution of the project.
2. The management of staff who involve in the project.
3. The interface with some internal departments such as Admin department, Spare Part Department, and Technician Division.

To make sure that the proposed system can work well, a system analyst must test it before the changeover process begins.

Service Information System chooses Pilot Changeover. System analyst will install the proposed system in one of technician's rooms and another computer of Admin. staff to test. If the problems occur while testing, it will not affect the existing system and will be improved or changed later.

## 4.2 Project Planning

The project planning is the important stage for project management because system analyst can know the total time consuming of the whole project. It will force the system analyst to follow up the activities defined in the schedule and to define the time needed for each task.

For this project, we divided the schedule into 3 phases based on System Development Life Cycle (SDLC) as follows:

1. Studying of the Existing System.
2. Design of the Proposed System.
3. System Implementation.

## 4.3 Project Schedule

The project schedule will show all of the procedures that will be performed in the project and the period to start each task.

The project schedule will be divided into 3 phases as follows:

1. Studying of the Existing System
  - 1.1 Study of the Existing System Processes.
  - 1.2 Analysis of the Existing System.
  - 1.3 Prepare for the Analysis Documents.

## 2. Design of the Proposed System

### 2.1 Study of the users' requirements.

### 2.2 Design of the Proposed System.

#### 2.2.1 Design of Proposed System Processes.

#### 2.2.2 Design of Proposed System Database.

#### 2.2.3 Design of Proposed System Hardware and Software Configurations.

### 2.3 Analysis for Project Cost.

### 2.4 Proposed for the new system.

## 3. Implementation

### 3.1 Programming

#### 3.1.1 Database

#### 3.1.2 Screen

#### 3.1.3 Execution Programs

#### 3.1.4 Report Generating

### 3.2 Testing

### 3.3 Implementation

#### 3.3.1 Installation of New system

#### 3.3.2 End User Training

#### 3.3.3 New System Documentary

ACTIVITIES	June				July				August				September				October			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>1. REQUIREMENT ACQUISITION</b> - Identify raw data and problems	X																			
<b>2. STUDY EXISTING SYSTEM</b> - Define requirements - Context diagram		X																		
<b>3. DETAILED ANALYSIS AND DESIGN</b> - Data flow diagram - Data dictionary - Screen layout - Report layout				X		X	X	X		X										
- Network configuration - Cost/Benefit analysis						X		X		X			X							
<b>4. IMPLEMENTATION</b> - Data conversion - Testing - Presentation - Reviewing - Documentation													X	X				X	X	X

Figure 4.1. Project Plan

## V. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

This project concerns with Service Information System. The existing system is manual system. The manual system does not work well anymore when the volume of customer gradually increases. The errors occurred in manual system are shown and our customers complaint. Therefore, the full-computerized system of information is designed and developed in order to solve these problems such as forecast exact service period of repairing and maintenance.

The proposed system is designed to lessen the errors of the old system. The new system will keep records of customers, finished meter and give accurate information to customer. In addition, customers will not waste their money and time to follow up their meters

The main points of the proposed system are :

1. The system provides accurate information to customers and helps them save money and time to follow up their meters.
2. Better information for management. Management will get reports which help his decision-making.

The proposed system does not require new hardware because it can utilize from the existing system. However, the software is needed to install. After analyzing costs and benefits of the new system, the break-even point is 2.5 year. That is the investment cost will equal to the profit at 2.5 year so this system will get profit after that.

## 5.2 Recommendations

After testing and using the proposed system, it appears that the system helps and supports in issuing quotation, assigning job for the technician, receiving summary reports and collecting information of the customers and meters.

In the future, using bar code for all spare parts will be developed. In addition, the database of estimated service charge for customer, will be provided for Admin. Staff.

The current network system that designed is suitable in service system. In the future, if there are more customers and services, this network system may not be able to support increased works. It may be developed about speed, bandwidth and communication equipment. Moreover, the remote access may be used in the future.

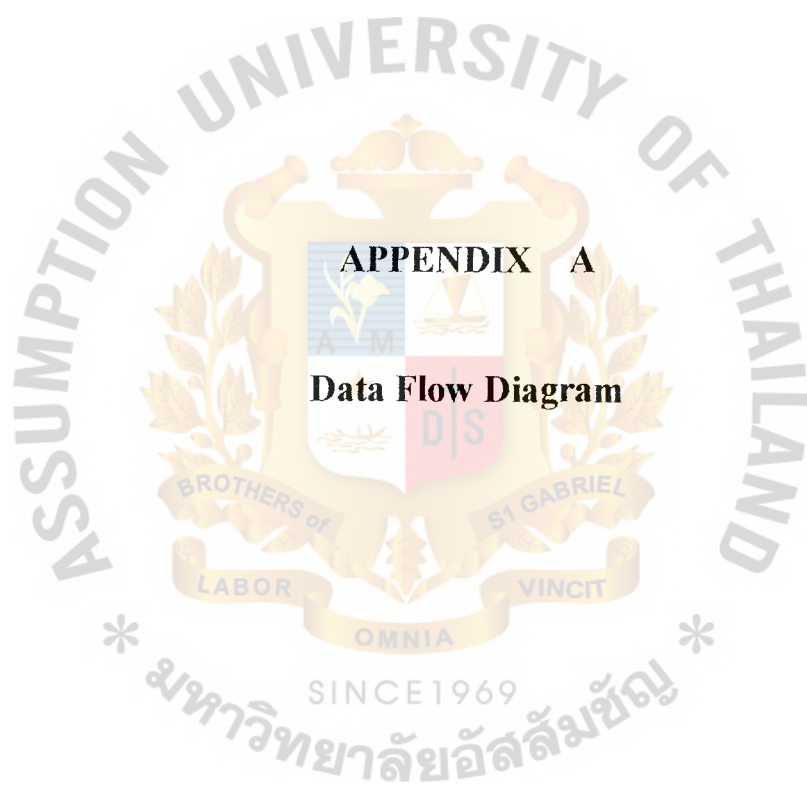
Lastly, the designed system is suitable in the service system in current situation. And the staffs are satisfied about this system. However, the system can be designed more high capability, it depends on the cost of company. From the calculation of Break Event Point, is equal to 2.5 years. It is acceptable investment. If we select the best system, we will invest with high cost.



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2. Kendall, K.E. and Julie E. Kendall. System Analysis and design, 3<sup>rd</sup> Edition. Prentice Hall, 1995.
3. Page-Jones, Meilir. The Practical Guide to Structure System Design, 2<sup>nd</sup> Edition. Prentice Hall, 1998.
4. Mary E.S. Loomis, Data Management and File Structure, New Jersey, Prentice Hall, 1998.





## APPENDIX A

### Data Flow Diagram

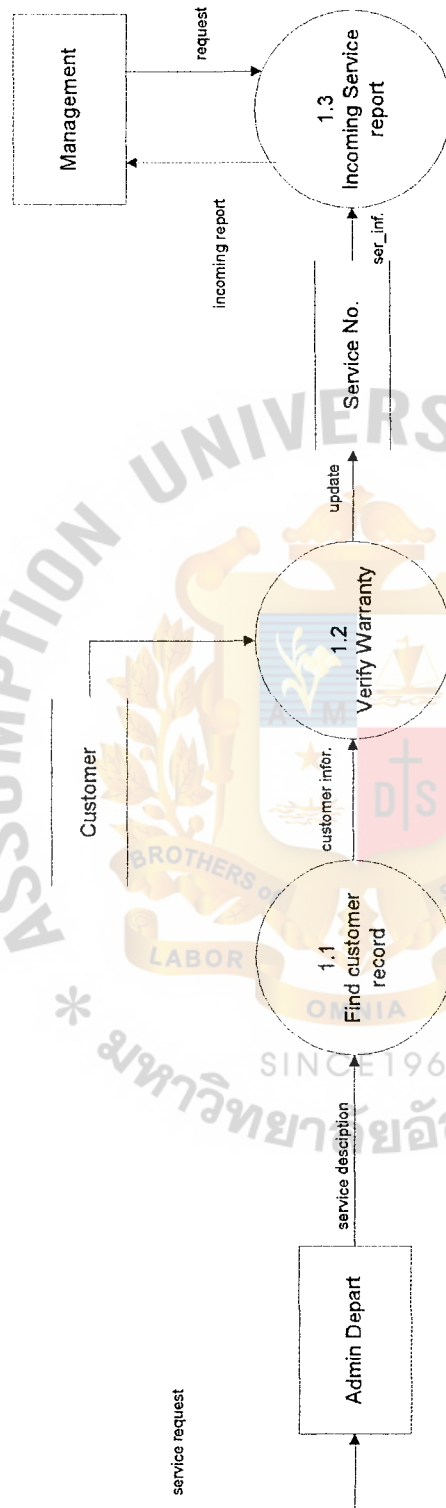


Figure A.1. DFD Level 1 of Propose System : Process 1.0

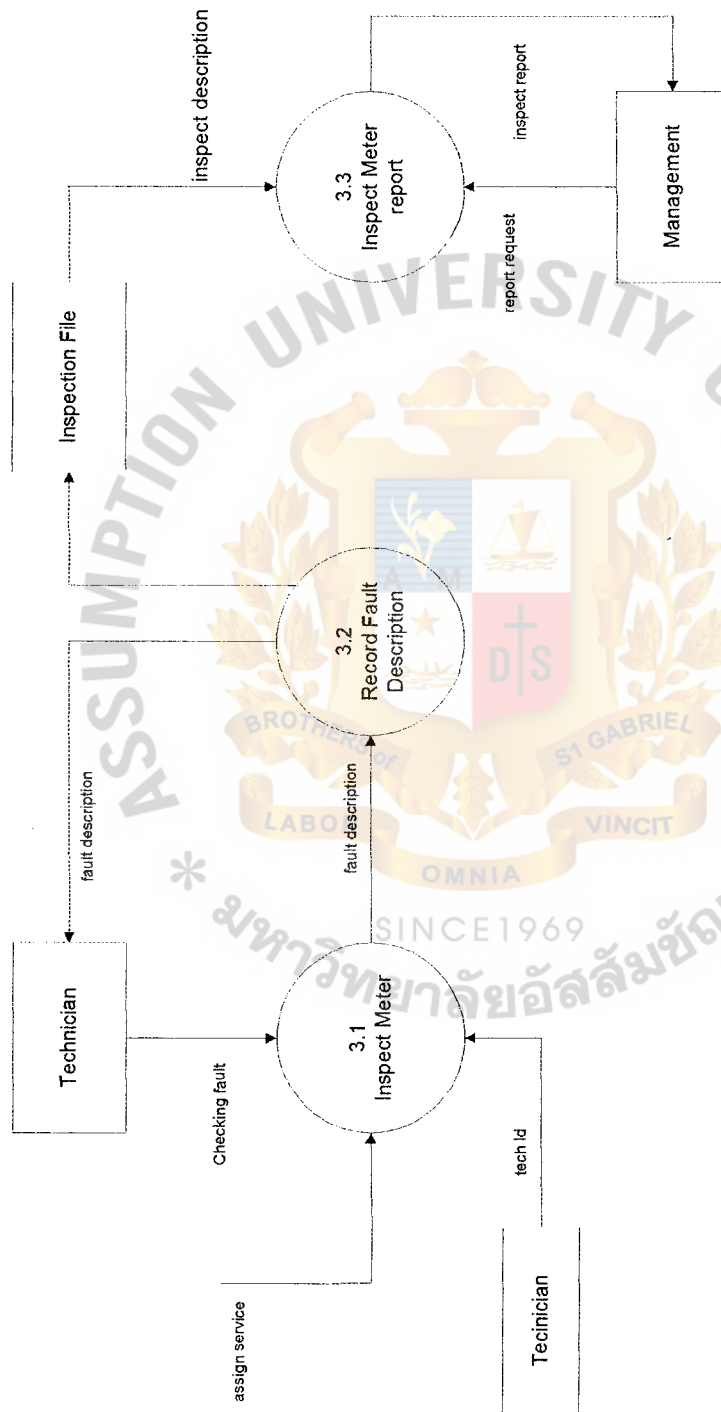


Figure A.2. DFD Level 1 of Propose System : Process 3

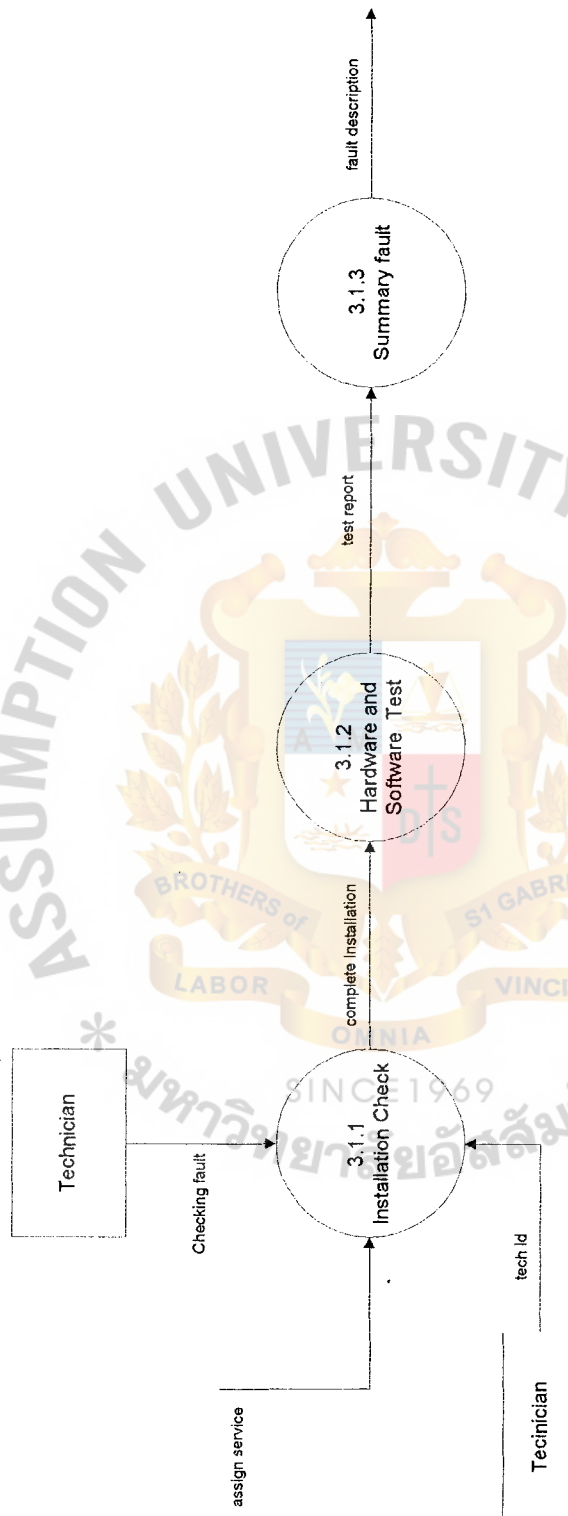


Figure A.3. DFD Level 2 of Propose System : Process 3.1

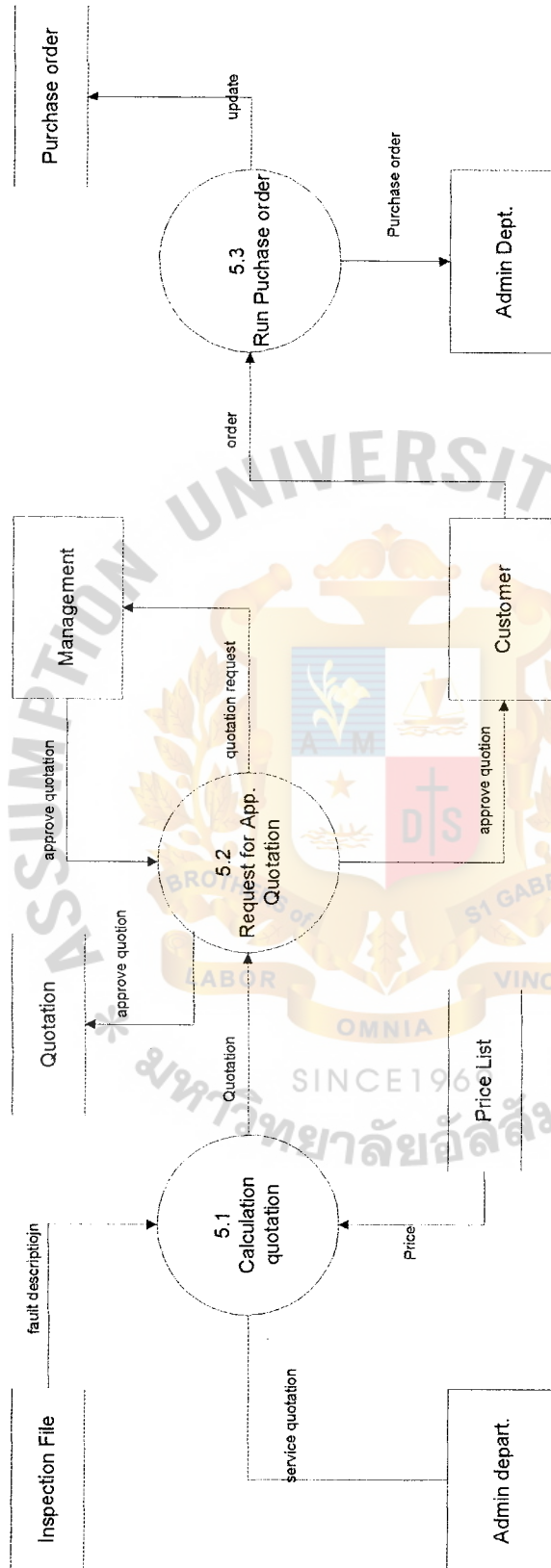


Figure A.4. DFD Level 1 of Propose System : Process 5



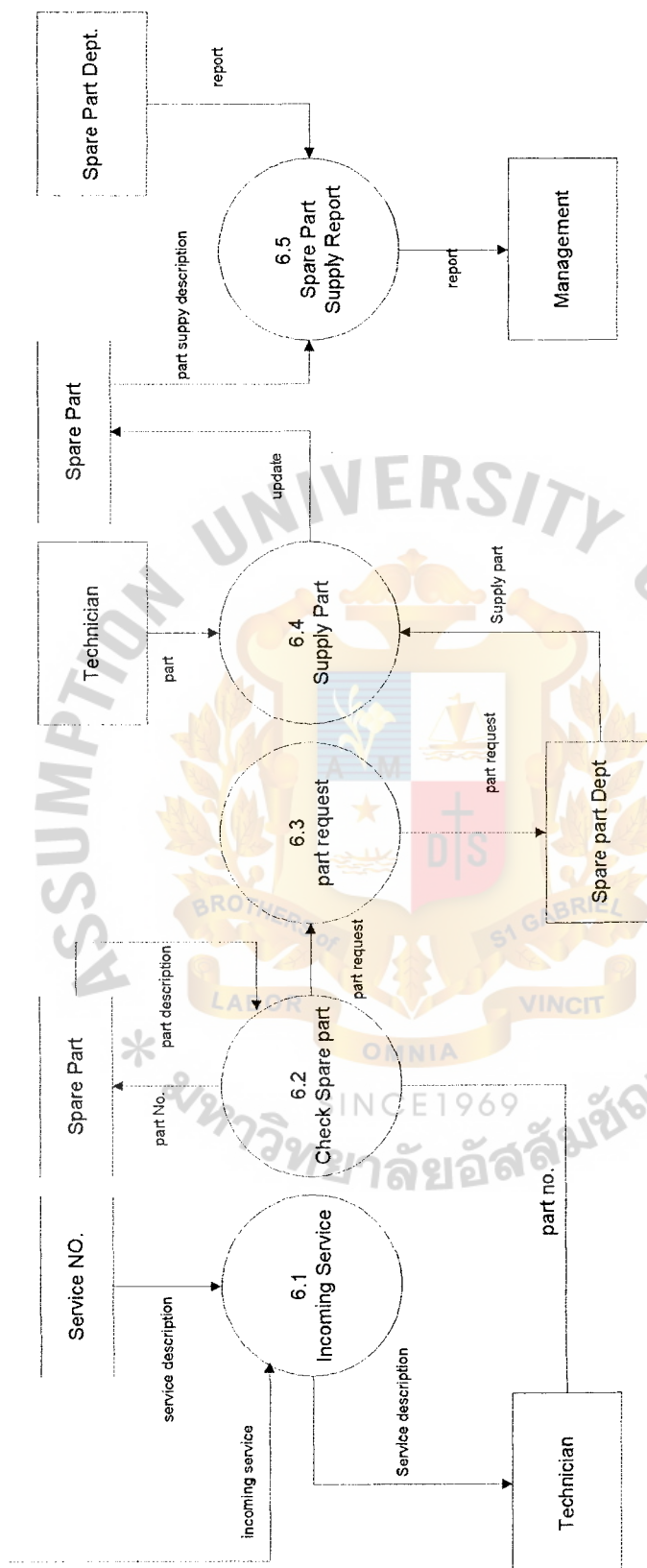


Figure A.5. DFD Level 1 of Propose System : Process 6

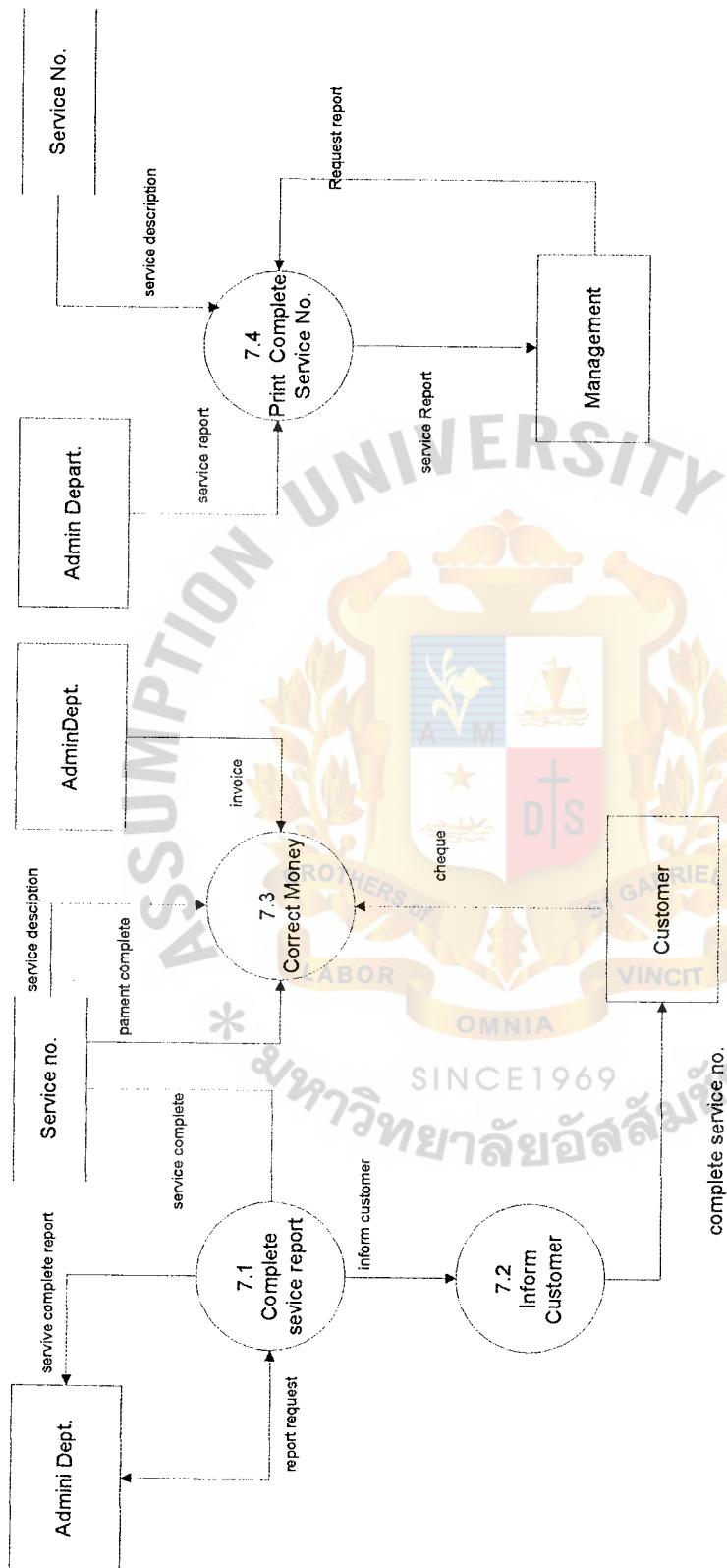


Figure A.6. DFD Level 1 of Propose System : Process 7



## DATA DICTIONARY

CUSTOMER	=	CUSTOMER}
Customer	=	*Rayong Olifins Co., Ltd customer*
		@customer ID + company+ address+ tel+fax
Customer No.	=	*Idenfificaion of customer * {numeric-digit}
Company Name	=	Name of customer*
Address	=	Address where we send document or contact customer
Tel	=	*Telephone number for contact customer*
		{7 numeric digit}
Numeric digit	=	[0-9]
METER	=	{Instrument equipment that customer have used}
Meter	=	*Meter information *
Serial no	=	*Identification of meter no sold by EEST*
Model	=	*Model of the meter*
Problem	=	*Problem that customer wants to fix*
Problem	=	*The date that record the problem*
Status date	=	*Status date of service meter*
Technician	=	*Detail of technician*
Technician ID.	=	*Identification of technician*
Service No.	=	* detail of service provided to customer to fix problem*
Unit price	=	*the selling price of each part*
Grand total	=	* The summary all amount of service charge

Part No.	=	*Identification of part*
Quotation No	=	*The identification of the quotation*
Part description	=	*the detail of spare part that have to use for repair+ @partn no.+part name +description
Part No.	=	*Identification of part*
Warranty	=	*Time period for meter*
Expiry date	=	* The date that meter is over warranty period*
Purchase date	=	* The date that customer bought the meter from EES*
Installation date	=	* The date that meter was installed in the plant*
Pipe OD.	=	*The outside dimension of the pipe*
Pipe mat'l	=	*The material that use to make the pipe*
Thickness	=	*The thickness of the pipe that meter has installed*
Software Version	=	*The detail of software that use in meter *
Transducer Size	=	*The size of transducer that use with the meter*
Fluid type	=	*The detail of fluid that fill in the pipe*
Inspection date	=	*The date that meter has inspected from technician*
Inspection No	=	*The sequence of inspection of service system*
Lastest Ins.	=	*The final date that meter has inspected *
Priority	=	*The priority of service will tell technician which job- Have to be done*
S/W check	=	*This is the result of software test *
H/W check	=	*This is the result of hardware test *
Stock quantity	=	*The quantity of spare part which have in EES stock*





## PROCESS SPECIFICATION

Process 1.1 : Process find customer record

Precondition :

Receive Service request from Customer

Send Service request and description to admin

Postcondition :

Send customer information to Process verify warranty

Begin

Receive Service request from Customer

Send Service request detail to admin staff

Send customer information to Process verify warranty

End



Process 1.2 : Process verify warranty

Precondition :

Receive customer description from process find customer records

Get customer record form customer files

Postcondition :

Update warranty period of meter to service no. files

Begin

Receive customer description from process find customer records

Get customer record form customer files

Add warranty period of meter to service no. files

End



### Process 1.3 : Incoming service report

Precondition :

Receive Incoming service request from management

Get service information from service no. file

Postcondition :

Send service report to management

Begin

Receive Incoming service request from management

Get service information from service no. file

Process incoming service report

Send service report to management

End



### Process 3.1 : Inspect meter

#### Precondition :

Receive Assign service from admin staff

Get Tech Id from technician files

Get inspect the meter from Technician

#### Postcondition :

Send fault description to Process record fault description

#### Begin

Receive assign service from admin staff

Get Tech Id from Technician files

Get inspect the meter from Technician

Process Inspect meter

Send fault description to Process fault description

#### End



### Process 3.2 : Record fault Description

Precondition :

Receive fault description from Process inspect meter

Postcondition :

Send fault description to Technician

Record fault description to Inspection files

Begin

Receive fault description from Process inspect meter

Process record fault description

Send fault description to Technician

Record fault description to Inspection files

End



### Process 3.3 : Inspect Meter Report

Precondition :

Receive report request from Management

Get Inspection description

Postcondition :

Receive inspection report from Process inspect meter report

Begin

Receive report request from Management

Get Inspection description

Process inspect meter report

Receive inspection report from Process inspect meter report

End



### Process 3.1.1 : Installation check

#### Precondition :

Receive Assign service from admin staff

Get Tech Id from technician files

Get inspect the meter from Technician

#### Postcondition :

Send complete installation to Process hardware and software test

#### Begin

Receive assign service from admin staff

Get Tech Id from Technician files

Get inspect the meter from Technician

Process Installation check

#### End





### Process 3.1.2 :Hardware and Software Test

Precondition :

Receive complete installation description

Postcondition :

Send hardware and software test report to Process summary fault

Begin

Receive complete installation description

Process Hardware and Software test

Send hardware and software test report to Process summary fault

End



### Process 3.1.3 : Summary fault

Precondition :

Receive test report from Process hardware and software test

Postcondition :

Get fault report from Process summary fault

Begin

Receive test report from Process hardware and software test

Process summary report

Get fault report from Process summary fault

End



## Process 5.1: Calculation quotation

Precondition :

Receive service quotation request from admin staff

Get fault description from inspection files

Get price for calculation from price list files

Postcondition :

Send quotation to Process request for approve quotation

Begin

Receive request quotation from admin staff

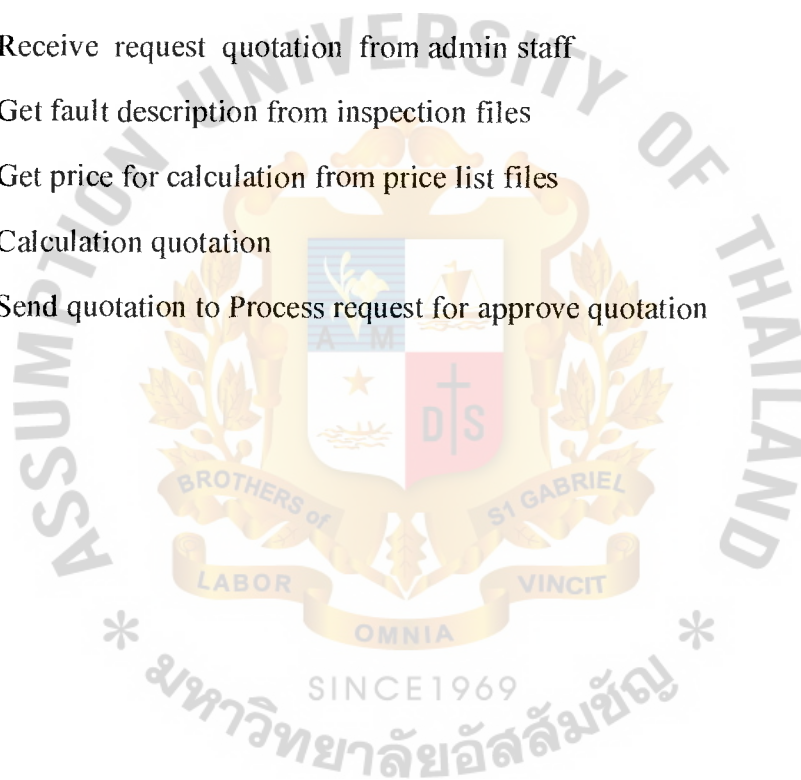
Get fault description from inspection files

Get price for calculation from price list files

Calculation quotation

Send quotation to Process request for approve quotation

End



Process 5.2 : Request for approve quotation

Precondition :

Receive quotation from Process calculation quotation

Send quotation to Manage to approve

Postcondition :

Get approved quotation from Management

Record Quotation No. to quotation file

Send quotation to customer

Begin

Receive quotation from Process calculation quotation

Send quotation to Manage to approve

Get approved quotation from Management

Add Quotation No. to quotation file

Send quotation to customer

End

### Process 5.3 : Run purchase order

Precondition :

Received order from customer

Postcondition :

Send purchase order to admin staff

Add customer purchase order to purchase order file

Begin

Received order from customer

Run purchase order

Send purchase order to admin staff

Add customer purchase order to purchase order file

End



Process 6.1 : Incomming service

Precondition :

Receive incoming service from admin staff

Get service description from service no. file

Postcondition :

Send Service description to Technician

Begin

Receive incoming service from admin staff

Send incoming service to Technician

Get service description from service no. file

Send Service description to Technician

End



Process 6.2 : Check spare part

Precondition :

Get part number from customer

Get part description from Spare part file

Postcondition :

Send request to process part request

Begin

Get part number from customer

Get part description from Spare part file

Check spare part

Send request to process part request

End





### Process 6.3 : Part request

Precondition :

Receive Part request from Process check spare part Technician

Postcondition :

Send Part request to Spare Part Dept.

Begin

Receive Part request from Process check spare part

Prepare part request

Send Part request to Spare Part Dept.

End



## Process 6.4 : Supply part

Precondition :

Receive Part supplied from Spare Part Dept.

Postcondition :

Send Part supplied to Replace spare part

Record and update Spare part files

Begin

Receive Part supplied from Spare Part Dept.

Distribute spare part

Record and update spare part file

Send Part supplied to Replace spare part

End



## Process 6.5 : Spare part supply report

Precondition :

Receive report request from Management

Get part supply description from Spare part file

Postcondition :

Send part supply report to management

Begin

Receive report request from Management

Get spare part description from Spare part file

Process part supply report

Send part supply report to management

End



## Process 7.1 : Complete service report

### Precondition :

Receive complete service report request

Get service description from service no. file

### Postcondition :

Send report to admin staff

Send inform customer for complete service

### Begin

Receive complete service report request

Get service description from service no. file

Send report to admin staff

Send inform customer for complete service

### End



## Process 7.2 : Inform customer

Precondition :

Receive to inform customer for service is completed

Postcondition :

Send Complete service no to customer

Begin

Receive to inform customer for service is completed

Inform customer

Send Complete service no to customer

End



### Process 7.3 : Correct money

#### Precondition :

Receive service complete from service no. file

Send invoice to customer

#### Postcondition

Received cheque from customer

#### Begin

Receive service complete from service no. file

Send invoice to customer

Received cheque from customer

#### End



Process 7.4 : Print complete service No.

Precondition :

Receive request to print complete service no. from Management

Get service description from service file

Postcondition :

Send complete service report to Management

Begin

Receive request to print complete service number from Management

Get service description from Service file

Print complete reports

Send complete service report to Management

End







## APPENDIX D

### File Layout

## File Layout

Table D.1. Service No.

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
SERVICE_DATE	Date/Time	8	0
CUSTOMER_ID.	Text	8	0
CUSTOMER_NAME	Text	50	0
CONTACT_NAME	Text	20	0
ADDRESS	Text	100	0
TEL	Text	20	0
FAX	Text	20	0
SERIAL_NO.	Text	10	0
MODEL	Text	10	0
PROBLEM	Text	200	0

Table D.2. Service Status

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
SERVICE_DATE	Date/Time	8	0
CUSTOMER_NO	Text	8	0
SERIAL_NO.	Text	10	0
MODEL	Text	10	0
STATUS_DATE	Date/Time	8	0
TECH_ID	Text	8	0

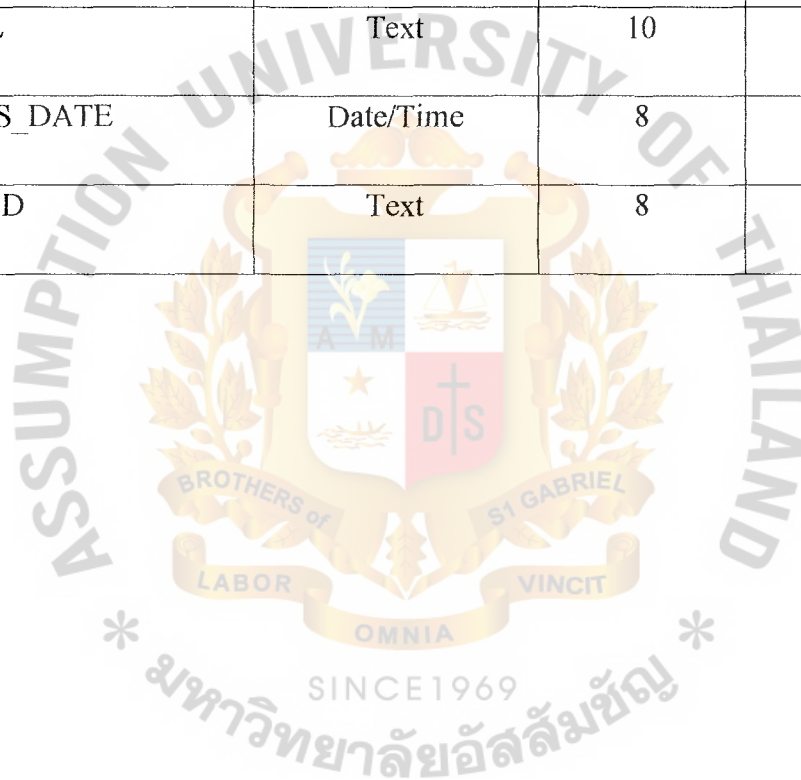


Table D.3. Quotation

Field Name	Type	Width	DEC
QUOTATION_NO.	Text	8	0
SERVICE_NO.	Text	8	0
QUOTATION_DATE	Date/Time	8	0
CUSTOMER_NAME	Text	50	0
ITEM	Text	3	0
PART NO.	Text	15	0
DESCRIPTION	Text	100	0
UNIT PRICES	Number	10	2
TOTAL PRICES	Number	15	2
GRAND TOTAL	Number	15	2

Table D.4. Warranty

Field Name	Type	Width	Dec
SERIAL_NO.	Text	8	0
SERVICE_NO.	Text	8	0
CUSTOMER_NO.	Text	8	0
SERIAL_NO.	Text	10	0
MODEL	Text	10	0
PURCHASE_DATE	Date/time	8	0
EXPIRERY_DATE	Date/time	8	0

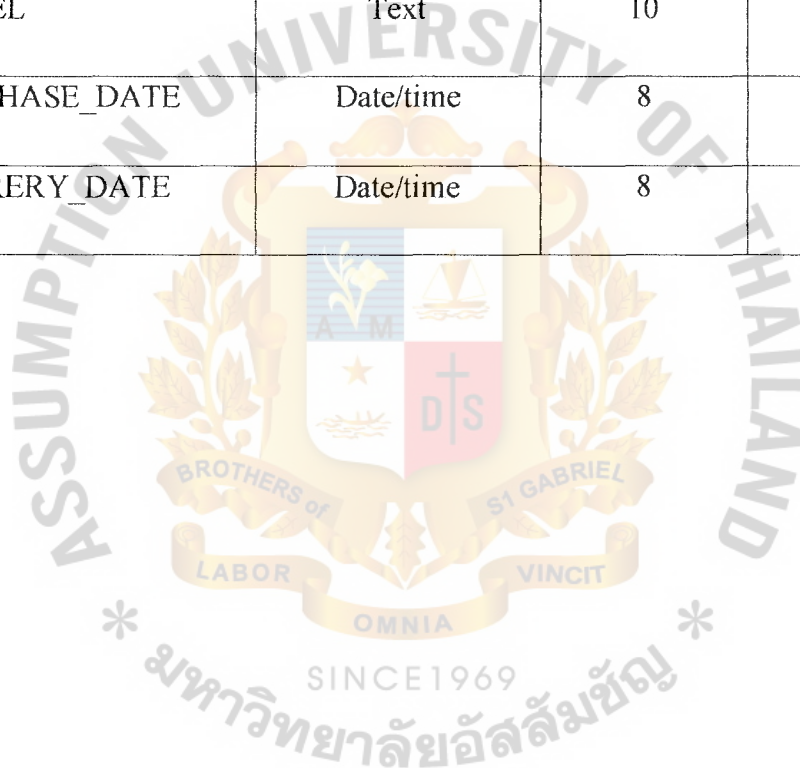


Table D.5. Equipment Description

Field Name	Type	Width	DEC
SERIAL_NO.	Text	8	0
CUSTOMER_NO.	Text	8	0
MODEL	Text	10	0
INSTALLATION_DATE	Date/time	8	0
PIPE O.D.	Text	5	0
PIPE_MAT'L	Text	15	0
TRANSDUCER_SIZE	Text	10	0
THICKNESS	Text	10	0
FLUID_TYPE	Text	15	0

Table D.6. Assign Inspection

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
DATE	Date/time	8	0
MODEL	Text	10	0
SITE_ADD.	Text	50	0
TECH_ID.	Number	8	0
LAST_INSPECTION	Date/Time	8	0





Table D.7. Assign Service

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
DATE	Date/time	8	0
TECH_ID.	Text	8	0
PRIORITY	Text	2	0
LAST_SERVICE	Date/Time	8	0



Table D.8. Inspection Description

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
CUSTOMER_NO.	Text	8	0
DATE	Date/time	8	0
MODEL	Text	10	0
SERIAL_NO.	Text	8	0
TECH_ID.	Text	8	0
SOFTWARE_CHECK	Text	5	0
HARDWARE_CHECK	Text	5	0

Table D.9. Update Service Status

Field Name	Type	Width	DEC
SERVICE_NO.	Text	8	0
DATE	Date/time	8	0
PART_NO.	Text	15	0
QUANTITY	Number	8	0



Table D.10. Spare Parts

Field Name	Type	Width	DEC
PART_NO.	Text	8	0
DESCRIPTION	Text	50	0
STOCK_QTY	Number	10	2
UNIT_PRICE	Number	10	2



Table D.11. Billing

Field Name	Type	Width	DEC
INVOICE_NO.	Number	8	0
QUOTATION_NO.	Number	8	0
DATE	Date/time	8	0
CUSTOMER_NO.	Text	8	0
ITEM	Text	5	0
PART_NO.	Text	8	0
DESCRIPTION	Text	50	0
UNIT_PRICE	Number	10	2
TOTAL_PRICES	Number	10	2
GRAND_TOTAL	Number	10	2

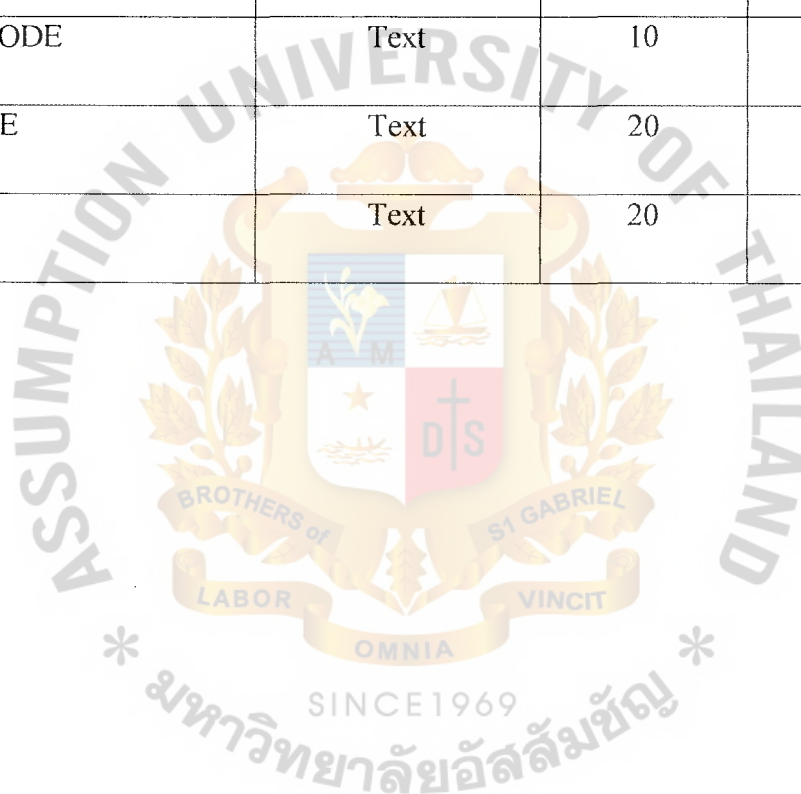
Table D.12. Technician

Field Name	Type	Width	DEC
TEXT_ID.	Text	8	0
TECH_NAME	Text	20	0



Table D.13. Customer

Field Name	Type	Width	DEC
CUSTOMER_ID.	Text	8	0
CUSTOMER_NAME	Text	30	0
ADDRESS	Text	50	0
CITY	Text	30	0
ZIP_CODE	Text	10	0
PHONE	Text	20	0
FAX	Text	20	0







**APPENDIX E**

**Screen Design**

## Service Information System

User Name	<input type="text"/>
Password	<input type="password"/>
<input type="button" value="Enter"/>	<input type="button" value="Cancel"/>

Figure E.1. Log in Menu

## Service Information System

### Main Menu

Service System

Technician Menu

Spare parts Menu

Billing Menu

Exit

Figure E.2. Main Menu

## Service System Menu

New Service	Service Status
Quotation	Equipment Description
Warranty	Exit

Figure E.3. Service System Menu

## Quotation Menu

Quotation No.  Date.

Service No.  Customer No.

Item	Part No.	Description	Unit Price	Total

Grand Total

Edit

Save

Cancel

Print

Exit

Figure E.4. Quotation

## Warranty Menu

Service No.

Customer No.

S/N

Model

Expiry Date

Purchase Date

Find

Edit

Save

Cancel

Print

Exit

Figure E.5. Warranty



## Service Status Menu

Service No.	<input type="text"/>	Customer No.	<input type="text"/>
S/N	<input type="text"/>	Receive Date	<input type="text"/>
Expected Date	<input type="text"/>	Finish Date	<input type="text"/>
Tech ID	<input type="text"/>	Model	<input type="text"/>
Remark	<input type="text"/>		
<div><input type="button" value="Update"/> <input type="button" value="Save"/> <input type="button" value="Cancel"/> <input type="button" value="Print"/> <input type="button" value="Exit"/></div>			

Figure E.6. Service Status



## Equipment Description Menu

S/N	<input type="text"/>	Customer No.	<input type="text"/>
Model	<input type="text"/>	Installation Date	<input type="text"/>
Pipe O.D.	<input type="text"/>	Software Version	<input type="text"/>
Pipe Mat'l	<input type="text"/>	Transducer Size	<input type="text"/>
Thickness	<input type="text"/>	Fluid Type	<input type="text"/>
<input type="button" value="Edit"/>		<input type="button" value="Save"/>	<input type="button" value="Cancel"/>
		<input type="button" value="Print"/>	<input type="button" value="Exit"/>

Figure E.7. Equipment Description

## Technician Menu

Assign Inspection

Inspection Description

Spare Part Request

Exit

Figure E.8. Technician Menu

## Inspection Description Menu

Service No.	<input type="text"/>	Customer No.	<input type="text"/>
Cont. Name	<input type="text"/>	Inspector Name.	<input type="text"/>
S/N	<input type="text"/>	S/W Chec	<input type="checkbox"/> OK <input type="checkbox"/> no
Model	<input type="text"/>	H/W Che	<input type="checkbox"/> OK <input type="checkbox"/> no
Remark	<input type="text"/>		
<div><input type="button" value="Edit"/> <input type="button" value="Save"/> <input type="button" value="Cancel"/> <input type="button" value="Print"/> <input type="button" value="Exit"/></div>			

Figure E.9. Inspection Description

## Assign Inspection Menu

Service No.	<input type="text"/>	Date	<input type="text"/>
Site Add.	<input type="text"/>	Model	<input type="text"/>
Tech ID	<input type="text"/>	Lastest Ins.	<input type="text"/>
<hr/>			
<input type="button" value="Edit"/>	<input type="button" value="Save"/>	<input type="button" value="Cancel"/>	<input type="button" value="Print"/>
<input type="button" value="Exit"/>			

Figure E.10. Assign Inspection

## Spare Part Menu

Part No.	<input type="text"/>	Part Name	<input type="text"/>
Stock Qty	<input type="text"/>	Unit Price	<input type="text"/>
Stock Qty	<input type="text"/>		
<input type="button" value="Edit"/>	<input type="button" value="Save"/>	<input type="button" value="Cancel"/>	<input type="button" value="Print"/>
<input type="button" value="Exit"/>			

Figure E.11. Spare Parts

## Billing Menu

Invoice No.

Date.

Quotation No.

Customer No.

Item	Part No.	Description	Unit Price	Total

Grand Total

Edit

Save

Cancel

Print

Exit

Figure E.12. Billing







**Eastern Energy Service CO., Ltd.**  
30 /10 Srinakarin Rd. Nongbon.  
Prawet Bangkok 10260

## **Quotation**

**Qoutation No. :** EEST/0191/CT

**Qoutation Date** 12-06-98

**Customer no. :** 0027

**Customer name :** Rayong Olifin Co.,Ltd.

**Address :** 23/1 Ramkhamhaeng Rd. Bangkapi Bangkok 10240

**Telephone :** 732-0975-8

**fax:** 732-0979

**Attention :** Khun Pongsit Srijan

Item	Description	Qty	Unit Price	Total Price

**Grand Total**

**Your sincerely,**

**Bamrung Pinthong**  
(Service Manager)

Figure F.1. Quotation

**Eastern Energy Service CO., Ltd.**  
30 /10 Srinakarin Rd. Nongbon.  
Prawet Bangkok 10260

## Invoice

**Invoice No.** : EEST/0191/CT

**Invoice Date** 12-06-98

**Customer no.** : 0027

**Customer name** : Rayong Olifin Co.,Ltd.

**Address** : 23/1 Ramkhamhaeng Rd. Bangkok 10240

**Telephone** : 732-0975-8

**fax**: 732-0979

**Attention** : Khun Pongsit Srijan

Item	Description	Qty	Unit Price	Total Price

**Grand Total**

\_\_\_\_\_  
**Receiver**

\_\_\_\_\_  
**Sender**

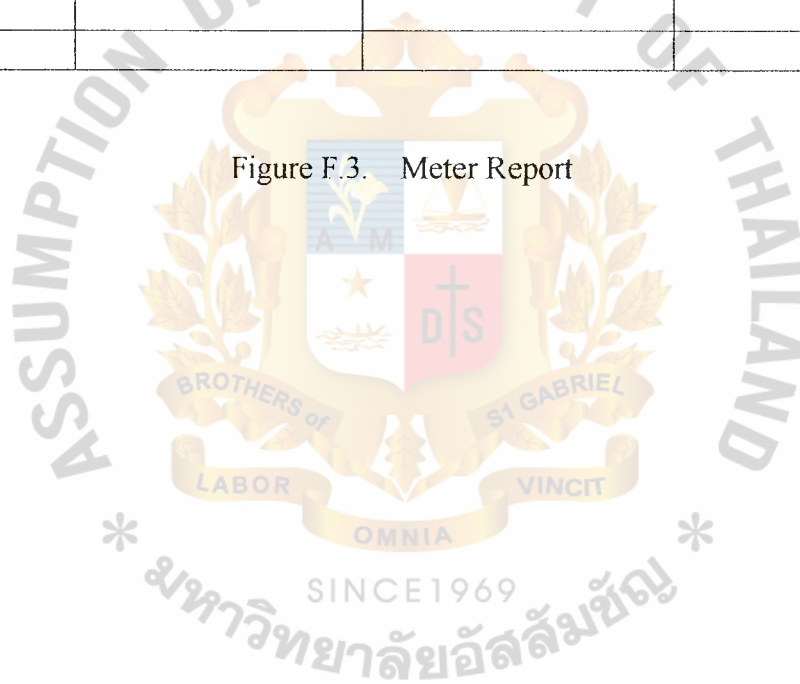
\_\_\_\_\_  
**Manager**

Figure F.2. Invoice

## Meter Report

Serial no.	Meter Model	Transducer Model	Remark

Figure F.3. Meter Report



Eastern Energy Service CO., Ltd.  
 30 /10 Srinakarin Rd. Nongbon.  
 Prawet Bangkok 1026

## Inspection Report

<b>Customer no. :</b>	<b>DATE : 28/07/1998</b>
<b>Customer name :</b>	<b>P.O. no.:</b>
<b>Address :</b>	<b>Serial no.:</b>
<b>Contact name :</b>	<b>Tel:</b>
<b>Service no :</b>	<b>Fax:</b>

### Description

- ☐ No Power      ☐ Low Signal      ☐ Memory Fault  
☐ Detecion Fault      ☐ High Signal      ☐ Pipe is empty  
☐ XDCRS Spacing      ☐ Make up      ☐ Software Problem  
☐ XDCR broken      ☐ Interface Liquid      ☐ Nouise  
☐ Flow unstable      ☐ Empty Pipe      ☐ High Terbulence  
☐ Add Compound gel  
☐ Others \_\_\_\_\_

Comment \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Figure F.4. Inspection Report

**Date :**

[illegible]

Figure F.5. Customer Report

**Date :**

[illegible]

Figure F.6. Technician Report

## Date : dd/mm/yy

[illegible]

Figure F.7. Service Status Report



## Date : dd/mm/yy

Figure F.8. Customer and Meter Report

## Date : dd/mm/yy

Figure F.9. Meter Repair History Report

From the month of November 1998

Figure F.10. Monthly Parts Consumption Report

## Date : dd/mm/yy

[illegible]

Figure F.11. Incoming Service Report

## Date : dd/mm/yy

[illegible]

### Figure F.12. Finish Service List Report

## Date: dd/mm/yy

[illegible]

Figure F.13. Unfinish Service Report