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Management Information Systems of the Jamuna Fertilizer Company Limited: A Case Study

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Abstract
Through this study, an endeavour has been taken to emphasize on the need of the management information systems (MIS) in Jamuna Fertilizer Company Limited (JFCL), especially to identify the potential areas wherein the MIS could be effectively used. Management information system (MIS) or computer information system (CIS) consists of five related components: hardware, software, people, procedure, and collections of data. The term information technology (IT) represents the various types of hardware and software used in information systems, including computer and networking equipments. There is some lacking in business solving networking system like MIS/CIS/IT in the JFCL. Main barriers are a lack of leadership, motivation and shortage of skill manpower to implement MIS in JFCL.

Key words: MIS; JFCL; BCIC; Case Study

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INRODUCTION
The Jamuna Fertilizer Company Limited (JFCL) is the largest enterprise of Bangladesh Chemical Industries Corporation (BCIC). JFCL has been established in 1991 to facilitate the agriculture growth of Bangladesh through producing granular urea (Jamuna Fertilizer Company Limited, 1990; Rashid. M. M. and Islam.A.M, 2004). It is situated on the bank of the river Jamuna in the district of Jamalpur. Its urea production capacity is 1700 metric ton per day (MTPD) designed by SNAMPROGETTI and Ammonia production capacity is 1078 MTPD designed by HALDORTOPSOE of Denmark. The total plant infrastructure was constructed by Mitsubishi Heavy Industries Limited (MHI) of Japan. Bangladesh is an agrarian economy. In order to meet the increasing demand of food grain in the country. Fertilizer is one of the main inputs to agricultural sector. It is an essential prerequisite to increase food production. Bangladesh Chemical Industries Corporation (BCIC) is one of the biggest industrial organizations in the public sector under Ministry of Industries, Government of the Peoples' Republic of Bangladesh. BCIC is concerned with the setting of objectives, approval of budget, monitoring of actual performance and rendering expertise assistance for JFCL. The JFCL management has been executing required administrative, technical, commercial and financial authority to operate it efficiently and dynamically. In the plant data are continuously generating by reformers, boilers, heat exchangers, power generation units, ion-exchangers, coolers, HP stripper, urea reactor, compressors, pumps, agitators, fans and blowers at every moment. Besides sales; accounts and finance; production and maintenance; purchase and store; personnel and HRD; inspection and suppliers and customers also generate data. Now, there is no organized MIS to handle and processes for data take better decision. During this technological era it is very difficult to make profitable or running smooth such a large enterprise without MIS. Therefore, it is crucial to implement MIS in this factory. Industrial countries have increased their productivity by applying IT. The recommendations of this study may facilitate increasing productivity for the company.

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(1) Statement of the Problems

JFCL has been facing problems in many areas such as procurement of spare parts from local and foreign producer in store management, problems in: preventive maintenance, human resources development, medical centre management and finance control etc. Informative data are needed to take proper and efficient decision by the management. But the present Management cannot collect the data quickly and take decision in proper time. For this reason company is affected system and production of the company is suppressed. Therefore, the management cannot take better policy, planning and strategy for the interest of the company and cannot follow transparency of the norms, rules and guides. There are sufficient manpower, and some computer equipments and other related tools. But the main barriers are a lack of leadership, motivation and shortage of skill manpower to implement MIS in JFCL.

(2) Objectives of the Study

Objectives of the study are:

▷ To find out the nature of information management systems used in JFCL.

▷ To find the components of existing information systems of the company.

▷ To investigate the problems of existing information systems.

▷ To identify the information sources of business units in the JFCL.

▷ To make recommendations for implementation of the MIS in the fertilizer company.

(3) Rational of the Study

There are 500 chemical industries corporations in Asia. BCIC is one of them. It is undoubtedly our nation's pride. In this context, it may be noted that BCIC started its functioning from 1st July, 1976. At that time BCIC had 88 enterprises under its management but at present BCIC has 13 enterprises under its control. It means that the BCIC has been becoming smaller and smaller day-by-day for the disinvestment policies of the government. Therefore the BCIC needs to take decision for the implementation of MIS in industries to increase productivity, performance and to survive for existence and JFCL as well.

1. CONCEPTS OF MIS

A management information system (MIS) or computer information system (CIS) consists of five related components: hardware, software, people, procedure and collection of data (Post G.V and Anderson D. L., 1997). The goal of MIS is to enable managers to make better decisions can providing quality information. MIS can be the foundation of a business but it can also be expensive. It is important that the information system should be designed and organized to match the needs of the firm. Designing and creating effective information system is a complex task and several techniques have been developed to manage organizations and build information systems (Goldman, Kevin, 1995). Common techniques include the system development life cycle, prototyping and end-user development. Business managers meet to understand the strengths and limitations of one various methodologies to ensure that companies get an information system that meets their needs. Information technologies (IT) represents the various types of hardware and software used in an information system including computers and networking equipments. The physical equipment used in computing is called hardware. The set of instruction that controls the hardware is known as software. MIS components work together to provide information and help managers run the firm, solve problem and make decision. One of the most important concepts in MIS is the importance of sharing data. Computer systems that are designed to be used by many people of the same time are more complex than single user systems. MIS can help team work better with tools designed to integrate data across and organization. Managers need to know how to use a variety of tools from data sharing over networks, to dynamic linking, to groupware products.

2. EXISTING FACILITIES IN JFCL

There are about twenty-one computers in JFCL and their usages are presented in Table 1.

Table 1
List of Computers in JFCL

Sl. No.	Present using section	Present status computers & printers in JFCL	
		Computer	Printer
1	MD's office	1	1
2	Operation division	1	1
3	Ammonia plant section	1	-
4	Technical division	1	1
5	Instrument section	1	-
6	MTS division	1	1
7	Admin division	1	1
8	Account division	1	1
9	Account section	1	1
10	Computer section	3	1
11	Commercial division	1	1
12	Purchase section	1	-
13	MPIC division	1	1
14	Computer cell	3	1
15	Civil division	1	-
16	College	2	1
	Total	21	12

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Usually, the computers of divisional heads are using composing reports. There are three computers in engineering building computer lab that are using for typing, reporting and training purposes. The computer of Managing Director's office is used for official work, reporting, different meeting minutes and others. Besides, salary statement of workers, staffs & officers, monthly finance statements, manual MIS reports are using computer. Two computers are used for the students of JFCL School & college to make them familiar with modern education gateway.

2.1 Management Policy of JFCL

The management of JFCL is under planning for implementation and to install computer in all business units. JFCL is planning to setup server in computer system department with local area network (LAN) facilities. The fertilizer company face the national and global challenges in business to survive. They have a plan for MIS system in cooperation of with BCIC. Therefore JFCL one million taka budget provision and introduced basic computer training program in-house.

2.2 Computerization of JFCL

JFCL is facing significantly to implement computerization systems every business unit for proper maintenance, operation and quality control, all technical data safeguarding, all equipments and machineries and others inventory planning and information of process parameter (Jamuna Fertilizer Company Limited (JFCL), 2003c). Therefore, JFCL needs to study in every working area of JFCL; examined the demand of computer in various divisions & sections of JFCL. A guideline may be made purchase computer, printer & other necessary related spare parts. JFCL needs to communicate BCIC as well as the whole world through Internet.Thus, the communication system of JFCL will be speedy convenient & available for all Internet connection. JFCL needs to communicate properly with process licensors & vendors. Inter sectional and divisional information, i.e. all business unit of the company is not sufficient to communicate instantaneously for proper decision. It is difficult to purchase spare parts or other necessary part of equipments through manual/ traditional system. The spare parts are needed to procure properly and timely to meet the need of plants. In this circumstance, JFCL needs to plan computerization as well as MIS to face the need of factory in proper time.

3. BUSINESS UNIT OF JFCL

In this study, business unit is considered where information is generated. The Chief Executive Officer of JFCL is Managing Director (MD). Under MD there are nine General Managers (GM). There are about 50 (fifty) sections/subsections under nine GMs. The names of division and sections i.e. business units are following:

▷ Office of the Managing Director.

▷ Office of the General Manager Administration:

o Personnel Administration, Labour Section, Labour Welfare, School and College, Estate section, Transport section, CBA, Requirement Section and Common Service Section.

▷ Office of the Chief Medical Officer: Medical Centre.

▷ Office of the General Manager (Accounts and Finance):

o General Accounts, Cost & Budget, Pay & Bill, Insurance, Tax and Audit, Cash & Bank, Store Accounts and Computer Section.

▷ Office of the General Manager Commercial:

o Local Purchase, Foreign Purchase and Sales.

▷ Office of the General Manager MPIC:

o General/Chemical Stores, Spares Parts Store and Material Planning and Inventory Control (MPIC).

▷ Office of the General Manager Technical:

o Quality Control, Fire & Safety, Process Engineering and Inspection, Research and Development, Technical documentation:-Technical Services & MIS, Technical Library, Photocopy and Cyclostyle, Book Binding, Training, Computer Lab.

▷ Office of the Chief Engineer MTS:

o Machinery Maintenance, Plant Maintenance, Electrical Maintenance, Instrument Maintenance, Central Workshop, Solid Handling System Maintenance.

▷ Office of the Chief Engineer Construction:

o Civil (Housing) and Civil (Factory).

▷ Office of the General Manager Operation:

o Urea Plant, Ammonia Plant, Utility Plant and Bagging Plant.

3.1 Information in JFCL

JFCL is producing urea continuously. There are shifts in 24 hrs. There are four plants- urea plants, ammonia plant, utility plant and bagging plant. There are four individual groups of people to operate these four plants. After each 8 hrs, every shift-in-charge hands over his duty. In time of duty hand over every shift in charge writes report about plant's condition, performance, process parameter in shift report book. Daily Production and Plant Status Report (Jamuna Fertilizer Company Limited, 2003a, 2003b, 2003d) are following are shown in Table 2-6.

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Table 2
Production

Product	Unit	Last 24 hrs production	Month's cumulative	Current year's cumulative	Present stock at site
Ammonia	MT	947	6748	97659	3642
Urea	MT	1700	11566	172423	67067.69
Demin. water	MT	8340	57973	968122	2490
Nitrogen (N2)	NM3	-	3263	308961	18675
Steam	MT	8240	57508	928206	-
Electric power	MWH	196.9	1375.9	24285.75	-

Table 3
Consumption

Product	Unit	Last 24 hrs production	Month's cumulative	Current year's cumulative
NG (Titas meter)	MCF	43643	305269	4936206
UF-85/PF	MT	-	-	-
Demin. Water	M3	8465	58109	967635
Nitrogen (N2)	NM3	225	1012	314086

Table 4
Plant Operating Status

STG-1 Load	STG-2 Load	PDB Load	24hrs. Power Consumption
3.9	4.0	0.39 MW	204.78 MWH

Table 5
Utility

Sampling point	Daily report on Water condition					
	pH	Conductivity µS/cm	Total Hardness (PPM)	Turbidity (PPM)	Silica	Corrosion inhibitor (PPM)
Intake water	7.6	208	110	66	-	-
Ammonia C/W	8.5	-	-	1.1	-	6.6
Urea C/W	8.3	-	-	1.2	-	7.30
Demin Water	7.5	0.50	-	-	0.004	-

Table 6
Finished Product

Urea bagged during last 24 Hrs	Months cumulative	Years cumulative	Bagged urea stock position at site
1929	11274	176655.35	24811.40

3.2 Author's Activities in JFCL

There are six sections in Maintenance and Technical Services (MTS) division in JFCL of BCIC. These are: Electrical maintenance, Instrument maintenance, Plant maintenance , Machinery maintenance, Central Workshop and Solid Handling System maintenance Section. Author served as a Mechanical Engineer four seven years in four sections which are: Plant maintenance, Machinery maintenance, Central Workshop and Solid Handling System maintenance. During that period author gathered much information about total plant. Author has briefly expressed here his Personal, Engineering, Management and Economics, Environment, health and safety related activities in JFCL. The responsibility for supervision of plant operation, maintenance, monitoring and performance evaluation of the author were trouble-

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shooting, development jobs of programmable logic controller (PLC), purchasing, financing etc., to achieve the company goal. Sufficient knowledge & experience were also applied to the job activities for betterment of the factory, economy, safety & environmental considerations. A skilled knowledge and understanding for the progress of technology through innovative training, seminar, demonstration applied with dynamic leadership in the JFCL.

4.ELECTRONIC CONTROL SYSTEM IN JFCL

There is no direct digital control system (DDCS) or distributed control system (DCS) in JFCL. In JFCL, programmable logic controller (PLC) has been applied (BUET Team, 2001) in following areas are shown in table 7:

Table 7
List of Programmable Logic Controller

Sl. No	Location	Model number	Manufacturer	Qty. in Use
1	6.6 KV Power distribution	A1NCPU	Mitsubishi Electric Corporation	1
2.	400 V Power distribution, IGG plant, Ammonia & Urea Plant.	A2NCPU	Mitsubishi Electric Corporation	3
3.	Water Intake Plant	A3NCPU	Mitsubishi Electric Corporation	1
4.	Water Treatment Plant	115U CPU941 Simatic S5 PS 3A	Siemens	1 3
5.	Diesel Generator	Simatic S5 100U CPU 100	Siemens	1
6.	Gas Turbine	5/15 processor	Allen Bradley	1
7.	Solid Handling System	i. TSX-30 j) TSX-47 k) TSX-67 l) TSX-69	Telemechanic Services “Licences Logiciels”	7
			Total	18

The programmable logic controller is the replacement of conventional sequence system such as electromechanical relays, timers, counters etc. A PLC is a digitally operating electronic system like microcomputer. Normally it receives ON or OFF type input signals through its many input signals through its many input ports. Then it processes the received signals in accordance with the instructions (software package or the program), which have been stored into its memory previously. Then it produces ON or OFF type output signals according the instructions. It uses a programmable memory for the internal storage of instructions. Some PLC can process the varying signals as well as ON/OFF signals. There are different methods for developing the PLC program. Ladder diagram and logic instruction are two most common methods for program development. It is used for the control of start-up sequence and shut-down sequence; for annunciation of normal and/or abnormal operation; for taking safety actions; for implementing sequencing, timing, counting and arithmetic functions of different process of modern industries like JFCL. Features of PLC are rugged, noise immune equipment, modular plug in construction, allowing easy replacement or addition of units, standard input & output connections and signal levels, easily understood programming language, ease of programming and reprogramming in plant, capable of communicating with other PLCs, computers and intelligent devices, competitive in both cost and space occupied as compared with relay and solid-state logic systems. If DCS was applied, we would get the following advantages: The system is speedy & reliable. In case failure of any microprocessor, part of the process may be out of control, not the whole process. In case console failure, all field instruments remain alive. It is easy to change the control program of the process, because program is done (Japan Consulting Institute (JCI), 1998).

4.1 The Potential Area

MIS can apply for online monitoring systems as a valuable tool for machine maintenance. These systems can be recognized as a useful means of increasing availability and reducing operating costs of JFCL. Online monitoring systems can be applied to fill the gaps that result when cost saving measures lead to personnel downsizing. Early detection of equipment damage and accurate fault diagnosis can be used operators to locate and repair problems fast, thus permitting efficient use of available resources. Existing monitoring systems are designed of plants of JFCL, detecting serious damage to prevent the machine from catastrophic, costly failures. Thus, MIS focus as monitoring the most essential parts and functions of JFCL to make online monitoring affordable for every compressor, turbine, pump, equipment and each

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business unit. A check of limit values can generate three different status conditions, which can be indicated by the following three colours: Normal (green), first alarm stage (yellow) and second alarm stage (red). These three colours are shown in the graphic display to indicate the status in the various machine sections. Since users are unable to monitor the monitoring system continuously, alarm messages must be sent automatically by the system if an extraordinary event occurs. Several options for relaying alarm message are LAN, E-mail, Fax, Pager, Voice message etc. & Control systems. Design of a modern online monitoring system consists of different areas i.e. the explosion-proof zone, the switch room and the maintenance office. The decentralized data acquisition equipment is installed in the hazardous area. The intrinsically safe sensors (indicator pressure, rod drop) that are installed on the compressor are connected directly to the data acquisition unit. The measured value data are transmitted to the interface unit (IU) via the bus line. The IU and server are installed in the switch room. The server captures the data from the equipment; the PLC and the control system perform diagnosis of the measured value and then store them. The server is connected to the company's internal network (LAN/ WAN) by modem to the telephone network. This modem enables remote access to the system as well as tale-maintenance and general support. Because the server is fully integrated into the network, it can be displayed and operated via computer in the maintenance office. For example-Compressor conditioning monitoring (CCM) system (Server) can be installed on compressors both with and without electronic step less control. Cost reduction is particularly significant here for compressors with these types of controllers because of the shared hardware platform. Online data analysis and diagnosis and monitoring of piston rod position signals of compressors. Indicator pressure analysis monitoring piston rod load is important for safe operation of reciprocating compressors especially when pressure and load condition vary. Process Data Analysis can be done by MIS. Thus, depending on configuration of an individual compressor, the following parameters can be included in the monitoring and diagnostic preferences: suction and discharge pressure, suction and discharge temperature, discharge capacity, valve nest temperatures, leakage gas flow, motor power consumption oil and bearing temperature etc. Trend Value Analysis can be also done by MIS. Similar way, measured values and parameters are stored as a trend thus providing a standard data basis; Set bookmarks in the trend analysis can to document such events as inspections or equipment damage. In JFCL actually IT is not used, computers are used only for data entry. IT may be used in every business unit. JFCL may use IT for communicate with supplier, vendor, and licensor of process, foreign expert, foreign & local purchase, process optimization, internationalization & HRD.

5. SUMMARY OF MAIN FINDINGS & ACHIEVEMENTS

Existing Management Information System of JFCL has been studied thoroughly the main findings are summarized below:

▷ There are 21 computers for data entry & 18 programmable logic controllers (PLC) to control plant in the JFCL.

▷ MIS can provide information and help the managers to run the company with working better decisions. JFCL is now under planning to implement networking in each business unit. There is no distributed control system (DCS) even there is no planning to implement DCS in JFCL.

▷ Every organization takes the decision at three decision levels: operations, tactics and strategy. In JFCL, around 327 officers work for management in these three decision levels, among those about 250 officers work in operation level. The operations level do of day-to-day operations and makes decisions. There is no plan of JFCL to computerize the operation level. Next tactical decision level has permission to rearrange facilities without altering the overall structure. In JFCL, this decision level are taken by sectional & divisional heads. A plan is under process the tactical decision level (about 50 business units) will be taken under computer network soon. Strategic decision can alter the entire firm or even the industry. This type of decision can be taken by chief executive officer of a company. The strategic decision is not possible for JFCL.

▷ In JFCL, data entry works have been executing by using computer since 2000. Therefore, daily productions report, inspection report, technical minutes, different process data sheet of urea, ammonia & utility plant are preparing by computer.

▷ Manual MIS department of BCIC collects information from BCIC's enterprises monthly & offices. After compiling this data, BCIC prepares a report and circulates it to the concern ministries and all enterprises.

▷ There is no MIS section and technical services section performs all kinds of reporting.

6. RECOMMENDATIONS

The following recommends have been made to implement MIS in JFCL.

▷ It is important to provide computers in each business unit of JFCL for quality decision.

▷ All business unit are needed to connect with networking system .

▷ JFCL needs to provide training facility, for developed skilled people.

▷ The plant may make an effort to incorporate recent technological changes in respect of process, plant machinery and control strategy with the consultation with process licensors, vendors and engineering contractors .

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▷ A common information bank may be created by BCIC for spares and components for all enterprises JFCL and other plants, thereby, ensuring speedy maintenance of the .

CONCLUSIONS

A management information system (MIS) is an organized method of providing past, present, and projected information related to internal operations and external intelligence. It supports the planning, control and operational function of an organization in the proper time frame to assist the decision making process. A MIS can provide any organization with significant information at efficiently and effectively. It can provide the desired information in the proper form, to proper people and at a proper time. Thus, the management of JFCL may take proper initiative to implement MIS. The recommendations made in a study may facilitate better decision for increasing productivity of the company. This paper is an idea/motivation for implementation a management information system in Jamuna Fertilizer Company Limited. Therefore, JFCL needs rapid implementation MIS to meet national/global demand with the help of educated and skilled personnel.

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