A VENDOR-MANAGED INVENTORY PROGRAMME IN THE GAS INDUSTRY IN THAILAND

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ABSTRACT

This paper summarizes a project to design a vendor-managed program (VMI) for a Gas Producer/Supplier Company in Thailand. One customer (buying one type of gas) was chosen as a pilot. The VMI concept becomes increasingly beneficial in delivery value to the customer, through cutting inventory cost, solving shortage problems, eliminating emergency transportation costs, improving reliability, and enhancing relationships between the Gas Company and its customers.

The project simulates the process design of VMI for one of the key customers in the local market. The process design, to improve the supply chain processes, focuses on removing supply planning activities from the customer site by the Gas Company. The results from the simulation provide an optimal solution before the actual implementation which will affect the flow efficiency of distribution, and cause considerable saving of resources and the creation of a value chain in the supply chain.

INTRODUCTION: THE GAS COMPANY

The Gas Company concerned in this project produces industrial gases, and supplies these to customers throughout Thailand. A wide range of gas is supplied, including hydrogen, oxygen, nitrogen, acetylene, and sulphur dioxide. Customers are involved in agriculture, medicine, mining, electronics manufacturing and glass-making. There are four supply modes: pipeline, on-site, bulk (as liquid gas), and compressed (in small cylinders). Gas distribution is on a 24-hour basis, through several distribution centers.

The customer chosen for this pilot is a glass manufacturer who uses sulphur dioxide (SO2). The problems generally experienced in supplying SO2 are:

- SO2 shortages resulting from uncontrolled consumption planning, and the need to obtain a license from the Military.

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- Consumption has violent fluctuations (by 6-25 drums per month), and there is uncertainty in orders from new export markets. The lead time for the import and production process is 3 months for a new shipment (SO2, a dangerous product, cannot be imported by air).
- Shortage in supplying customers will affect this Gas Company's reliability, and thus a chance for competitors.
- However, if this Gas Company provides too much stock, the inventory cost will be increased (and be against the Military Law as requests for more than a limited volume must be made to the Military Department). Also, because of safety considerations, the Gas Company has limited plant capability.

Supply chain management should be the vital key strategy to solve these problems, through a 'Vendor-Managed Inventory Program'. VMI is a means of optimizing supply chain performance in which the supplier has access to the customer's inventory data and is responsible for maintaining the inventory level required by the customer. Re-supply is performed by the vendor through regularly scheduled reviews of the on-site inventory. The on-site inventory is counted, damaged or outdated goods are removed, and the inventory is restocked to predefined levels. That mean the supplier takes responsibility for the operational management of the inventory within a mutually agreed framework of performance targets, which are constantly monitored and updated to create an environment of continuous improvement.

Specifically, this project: studies the existing supply chain planning strategy for the local market, and designs a VMI program to support SO2 supply reliability. The results should be:

- Improved visibility of the demand cycle: the Gas Company can agree to an official lead time, which can be reduced, and be predictable.
- Improved customer satisfaction through a reliable supply.
- Cost reduction from lower inventory and planning costs.
- Cost reduction from deleting emergency transportation costs.
- Enhanced relationship between the Gas Company and its customers.

VENDOR MANAGED INVENTORY (VMI)

VMI has recently been receiving considerable attention as a powerful tool to reduce cost in the supply chain. It is a streamlined approach to inventory and order fulfillment in which a vendor continuously and automatically replenishes a trading partner's inventory. True VMI occurs between a distributor and a manufacturer, with Electronic Data Interchange (EDI) being the crucial link. Trust is a critical ingredient in a successful VMI alliance. VMI also entails a stocking strategy, whereby manufacturers use their systems to predict and replenish the distributor's warehouse. VMI has produced remarkable results, tangible as well as intangible, enabling a reduction in customers' inventory levels and stock shortages.

Some distributors may be apprehensive about letting their vendors control their inventory, worrying that this might lead to an oversupply from their vendors. However many authors have allayed this fear by reiterating that VMI eliminates repetitive distributor purchasing activities, eliminates human errors, reduces shipping costs, improves service levels, results in shorter lead times, leads to reduced inventory investments and so on. Distributors are gaining remarkable efficiencies of scale by reducing errors, costs and backorders while simultaneously increasing customer satisfaction. Thus VMI is almost a win-win situation though there are some pitfalls. Perhaps the single most important benefit of engaging in a strategic VMI alliance could be the chance for cultivating a strong and lasting relationship between the vendor and the distributor, which in the long run can reap rich rewards for both.

A search of the literature provides an overview of the basic VMI mechanisms, which also includes an IDEF0 model that examines the VMI implementation process. Collaborative Planning Forecasting and Replenishment (CPFR), and EDI tools, are closely tied to the VMI process (Seldon, 2000).

The cost of managing inventory is a major impediment to efficient supply chain integration. Using VMI, a buyer no longer 'pulls' inventory from his suppliers with labor intensive and expensive purchase orders, complicated EDI, or time consuming phone calls. The onus in now on the Vendor. Inventory is automatically pushed to the buyers as suppliers check their buyer inventories online and respond according to pre-established inventory high and low stocking limits.

VMI leverages advanced technology and trading-partner relationships to enable the flow of information and inventory throughout the entire supply chain. It provides visibility into demand at the trading-partner level to improve the flow of products, eliminate inefficiencies, and lower costs. It creates a consumption-based demand forecast using sophisticated forecasting methods, and the distributor retains control of his inventory by setting the objectives for service level or inventory investment. Some large companies currently implementing VMI include Johnson & Johnson, Black & Decker, and Schering-Plough.

The Electronic transfer of information is the most critical part of the VMI process. The distributor usually sends point of sale and history data, discrepancy reports and electronic payments to the manufacturer and the manufacturer sends purchase orders, cost discrepancies, advanced shipping notices and suggestions for reducing excess material to the distributor. The manufacturer must fully explain how it arrives at the new stock level.

'Trust' is a vital ingredient for effective VMI collaboration. If any element of the relationship is disturbed or missing, VMI can become a nightmare. Manufacturers win because they develop close relationships with their distributors to get their product into the marketplace and they can schedule their workload to match the customer demands, thus gaining internal cost efficiencies

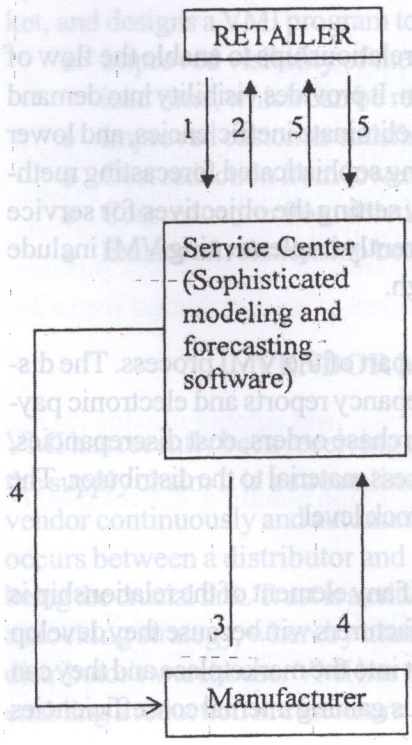
in every aspect of their business. Distributors win because they can be assured that the products covered in the VMI agreement will always be delivered on a timely basis, in the right quantities, and at the right cost.

The advent of E-commerce has heralded the arrival of sophisticated VMI systems. Nevertheless, VMI still has a few problems. Firstly, many companies find VMI software and EDI systems costs prohibitive. Also, the lack of standardized product information is proving to be a major deterrent to the spread of VMI. Many industries are still not ready for VMI because of these factors, but analysts feel that E-commerce is beginning to be a differentiator and commercial EDI standards will soon become the norm.

The benefits that accrue from a successful VMI liaison are tremendous and outweigh the disadvantages. The tangible benefits include an increase in the service level, reduced inventory and production costs, better asset utilization, and logistical savings. These are but a few of the immense benefits that can be obtained from a successful VMI arrangement. The payoff from VMI agreements has proved that the process is not just another trend (Stratman, 1997).

IMPLEMENTATION ASPECTS

In its simplest form, VMI can be schematically represented as follows (Latamore, 1999):



1. The retailer sends product activity data to the service center. This product activity is based on warehouse movement of the product sold at the retail level.

2. The service center processes this data and an acceptance/rejection advice is sent to the retailer.

3. The manufacturer connects to the modeling software and edits, approves and releases the suggested purchase order.

4. The service center sends this purchase order to the manufacturer via EDI.

5. The service center also sends a purchase order acknowledgement to the retailer who responds with a similar advice.

The following aspects are necessary for successfully installing a VMI program:

Step 1- Senior Management must commit to the process. Their support is vital.

Step 2- The employees should reorient themselves to this new concept. Without their acceptance, the VMI program cannot take off.

Step 3- Synchronize the Distributor's Product Files with the Manufacturer's. This step alone is one of the greatest benefits of VMI.

Step 4- Extensive testing of all EDI sets to be used. The manufacturer and distributor must work very closely together to validate that the data is being properly sent/received.

Step 5- The distributor must understand and agree with the Stocking Plan the manufacturer is creating, and how calculations are made. Predetermined Inventory Turns, Fill Rates and Service Levels should be targeted. The Distributor should also monitor current performance for comparison to later results. Both parties must agree upon the frequency of replenishment (daily? once/twice per week?)

Step 6- Distributor sends the Manufacturer his Point of Sale History file, usually 1-2 years (Disk or Email). The format of the file must be compatible with the needs of the manufacturer. Then the Distributor sends an EDI #852 All Item Refresh. This tells the status and stock level of every item they have. Both sets of data have to be verified.

Step 7- Distributor makes a sale and enters that transaction into the computer.

Step 8- On a daily/weekly basis the Distributor sends a #852 Product Activity. This reports a change in position on any item since the last #852.

Step 9- Manufacturer receives the #852 and updates the Distributor's Stock Plan. Once an Item has hit its Reorder Point (ROP), the Manufacturer creates an order.

Step 10- Manufacturer sends out#855 Purchase Order Acknowledgment to the distributor.

Step11- Manufacturer picks and ships the order and transmits a #857 Advance Ship Notice. This tells the distributor exactly what is being sent and when it is being shipped.

Step12- When the shipment is received, the Distributor transmits a #861 Receipt Advice. This tells the manufacturer exactly what was received. The manufacturer can then match this to his Purchase Order to determine any potential problems (mis-shipped etc)

There are two major recurring obstacles to successful VMI implementation: one is strategic and the other operational. At the strategic level, a high level decision must be made about how the company wants to position itself. Is the distributor willing to share the necessary information with the Vendor? Are there concrete benefits to stronger supply chain cooperation? Operationally, job functions, processes and performance measurements will all need to change in order to get the most benefit. Resistance will be felt from employees who fear change.

Strategic obstacles are the concerns most often expressed at the distributor level. Some distributors are concerned about letting their private information get into the hands of their vendors as they feel that this would give the vendors direct access to the distributor's customers.

However many VMI purists reject this argument as frivolous as they feel that pipelines that will be most attuned to consumer's needs are those that have a cooperative demand chain focus on the consumer. The distributors that will prosper in the coming years are the ones that will give most value to the customers and suppliers.

Operationally, the sources of resistance are many, but the overwhelming theme is change. A major change of company operations requires a cultural adjustment as well as a significant reorganization of everyday job duties. Culturally, many companies have not yet recognized the importance of supply chains and will not give supply chain managers the necessary authority and will not make the necessary investment. Without top-level support for the program there will be little attitudinal change. The new culture must acknowledge that the consumer has ultimate power, that the supply chain itself is a competitive tool, and that the cooperation between the trading partners is essential.

There are some case studies that reveal the practical implications of implementing a VMI policy. K mart for example achieved service levels of 99.5% while maintaining inventory at 70 % above objective. However they soon started to drop suppliers as they found out that most manufacturers did not have adequate suppliers. They decided that there was no reason to have suppliers manage their inventory when Kmart could do it better. Spartan Stores, a Michigan cooperative grocery wholesaler, decided to halt the VMI program after a tumultuous twelve months. The results just were not good enough and though the inventories did fall, it was only because small orders were being placed at more frequent intervals. Spartan and their VMI vendors were unable to find an effective way to deal with promotions, planning and pricing. The administrative costs too increased as the vendors failed to do a good job with forecasting.

However there are many success stories. Oshawa Foods, a large Canadian grocer distributor, which has a highly successful VMI program, says that VMI is only a temporary solution and that they expect to eventually move towards sophisticated retail managed inventory systems. VMI does make good business sense. VMI is a way for a supplier to improve the supply process for small unsophisticated customers or a way for a large customer to add value by absorbing administrative chores. Ron Barris, global leader of supply chain for Ernst &Young says that if you are smart enough to transfer the ownership of your inventory to your vendor, your raw material and work in process inventory comes off your balance sheets.

ADVANTAGES AND DISADVANTAGES OF VMI

Advantages: Data entry errors are reduced due to computer-to-computer communications. Speed of processing is also improved. Planning and ordering costs for the distributor go down due to the responsibility being shifted to the manufacturer. The manufacturer is more focused

than ever in providing good service and the overall service level is improved by having the right product at the right time. Also promotions can be more easily incorporated into the inventory plan and repetitive distributor purchasing activities can be eliminated. There is also better overall cash flow, and reduced transportation costs, and higher sales.

Pitfalls: The Vendor's administrative costs increase as the responsibilities and work increase. It is difficult to use with volume discounts and special pricing as alternate pricing strategies will have to be worked out, by agreement. It also complicates the system in the short run: new systems can start immediately, but roles of employee, vendor and customer may be unclear. The retailer risks loss of control/flexibility especially when procedures are new and understanding and ability to control procedures is low and the manufacturer takes one-time volume reduction as inventory is withdrawn from the supply chain, which reduces production requirements. Benefits are minimal for the manufacturer until a critical mass is reached, as manufacturers do not integrate MRP until 50% of overall sales volume is through VMI. Also extensive EDI testing should be done to validate the data being sent.

PERFORMANCE EVALUATION

A number of major learning points from this VMI pilot implementation has been identified. These lessons can help us to understand how the implementation of a VMI process can be more effective and efficient. These can be grouped as two business aspects: operation and organization.

Tactical:

Set up a comprehensive scorecard

- for measuring the success of implementation
- set representative KPIs which measure essential operations that are required to meet the predefined objectives
- set realistic targets

Continuous performance evaluation

- evaluate implementation progress on a constant basis
- make use of the scorecard to track performance
- provide an opportunity to identify improvement areas

Communication of changes in business processes

- frequent processes change, such as change in promotion period and product changes, are expected in response to changes in market conditions
- communicate these changes to allow alterations in the implementation process and system.

Collection and alignment of information

- ensure 'Data Completion', that is, all information necessary for analysis is collected.

- criteria for assessment must be fully agreed before implementation.

Ensure full automation of process

- eliminate manual intervention for data input and product order (P/O) confirmation
- establish automatic linkages for data input

Ensure efficient flow of information

- enable electronic transfer of information (EDI) which can provide timely and accurate data.
- provide a mechanism to increase speed of accurate information transmission, between trading partners
- can assist in decreasing replenishment lead time

Comprehensive VMI system

- to handle a great amount of data analysis
- ensure automatic generation of P/O for different business factors, such as promotions and new product introductions

Manage demand variability

- in response to changes in demand and the external business environment
- regular review of data to obtain the most updated information for analysis

Scorecard - KPIs and Targets

Regular monitoring of the implementation process is essential to ensure continuous success in the process of achieving the ultimate goals of reducing costs and improving customer service levels. Performance should, therefore, be evaluated on a regular basis to review current processes and highlight issues and improvement areas. This is an important step which forms the backbone for VMI process refinement.

Performances can be measured by means of a scorecard and the application of Key Performance Indicators (KPIs). Scorecard is a measurement tool for both manufacturer and distributor to monitor the effectiveness and efficiency of the VMI process. It highlights the opportunities for continuous VMI improvement. The major objectives of the scorecard are to assess the impact on both parties after the VMI implementation and evaluate gaps between current performance and targets.

KPIs are established for reflecting critical performances. They are grouped under two categories: success criteria and process measurements. The success criteria refers to the direct measurement of the degree to which VMI objectives have been achieved, that is, reduction in inventory and increase in service level. As for process measurements, they are related to monitoring process efficiency and effectiveness.

THE PROJECT BEGINS

Having described the background, we now turn to the actual project. After market analysis, a customer which manufactures glass was selected for the pilot project, using the following concept overview:

- VMI concept
  - The Gas Company monitors and replenishes SO2 ordering for the customer.
  - Customer allows the Gas Company to access their product activities and production activity.
  - No blanket order requirement: The Gas Company have authorization from the customer to generate a product order (P/O) by using the VMI program to calculate product quantities. But the Gas Company must send P/O acknowledgement to the customer every time before distributing the product.
- Business agreement
  - DIFOT commitment, the Gas Company agreed for response DIFOT commitment by monitoring and replenishing product. However it must have the support of valuable data from the customer as needed.
  - Supply agreement, before pilot project implementation. The customer signed a supply agreement so that it became worthwhile for the Gas Company to invest in a VMI project.

VMI Process

The process activities are:

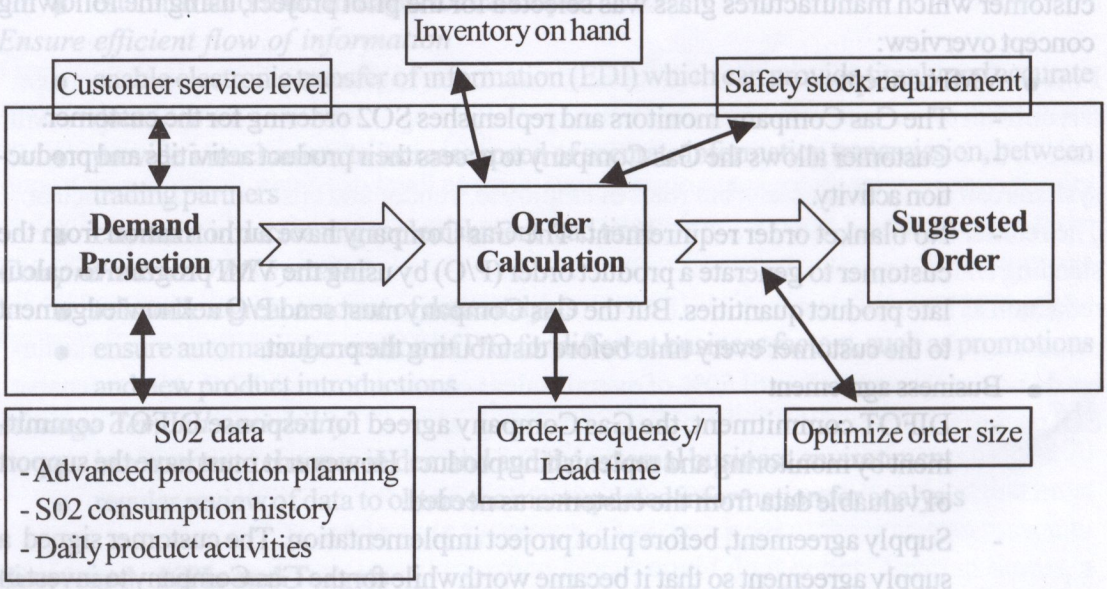
Customer sends daily *product activity* to the Gas Company via to *electronic mail.*

- Customer sends daily product activity to the Gas Company via electronic mail.
- The Gas Company accesses *product activity* through the *VMI program.*
- VMI calculate order quantities.
- The Gas Company releases P/O.
- The Gas Company sends P/O acknowledgment to the customer via *electronic mail.*
- The Gas Company sends Advance Shipment Notice to the customer via *electronic mail.*
- The Gas Company initiates shipment.
- Customer sends receipt advice to The Gas Company via *electronic mail.*

Consumer demands drive replenishment orders and shipping. This process can be distributor managed and supplier managed. For VMI to operate, The Gas Company has to receive regular SO2 consumption and inventory data from the Glass-Maker customer and to project demand and send the required replenishment quantity to the customer.

DEMAND PROJECTION AND ORDER CALCULATION

Figure 1: VMI Demand Projection and Order Calculation



A key factor for VMI success is the demand projection to cater for both normal and abnormal demand arising from the customer's production changes. Other than demand projection, consideration has to be given for factors like existing stock level, order to delivery lead time, safety stock requirement and delivery optimization on full truck load.

The main function of VMI is to generate suggested order quantity for product delivery based on SO2 consumption (daily access report) and inventory information. The logic behind VMI calculation of order quantity is illustrated below.

Demand Projection. In a VMI program, there is a built-in forecasting model for estimating daily demand of the customer. The rationale behind the forecast calculation is to predict the amount of products the Gas Company requires based on SO2 consumption history and the customer's advanced production planning. The formula for demand forecast takes into account the SO2 consumption history and advanced production planning as well as customer service level. The customer service level achieved serves as the base for future demand projection. Customer service level has been incorporated in this calculation to minimize the chances of underestimating future demand that occurred in the past.

Order Calculation. To turn the demand projection into a suggested order, it needs to take into account the requirement for stock and for delivery optimization. Stock requirement is influenced by stock on hand, safety stock to cover demand variation, and order frequency /

lead time. Safety stock requirement is based on the standard deviation of the SO2 consumption history and advanced production planning. SO2 data, in considerable detail, historical and planned, was acquired for this project (but is not reproduced here).

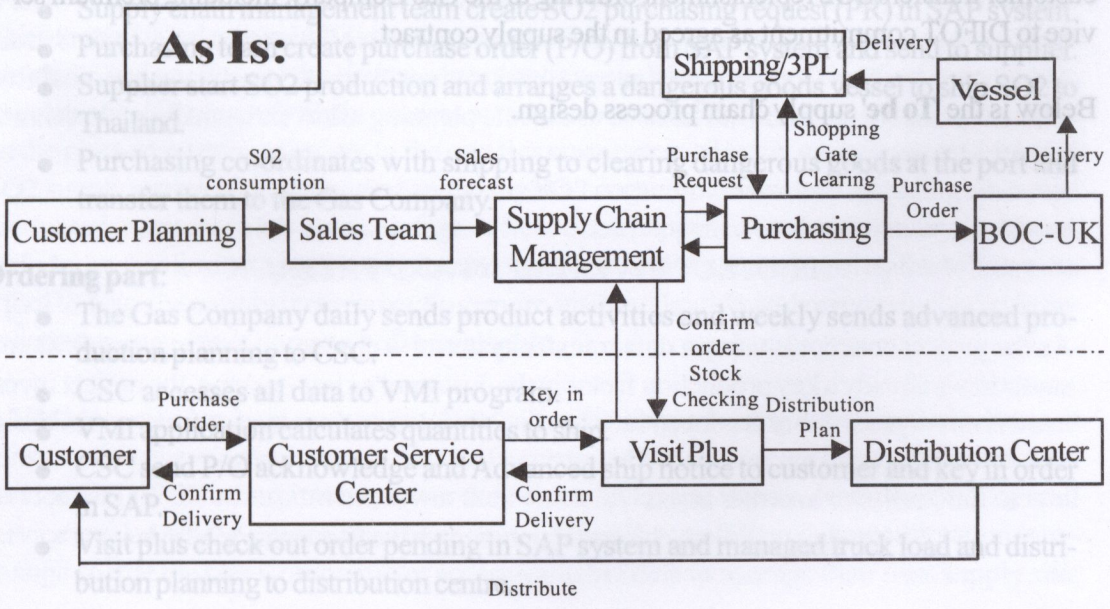
For the VMI program a new format was designed for daily SO2 consumption or daily product activities. The daily product activities were designed in a simple format as Microsoft Excel, including the data needed such as stock level, daily consumption, full cylinders, empty cylinders, and up dated production.

Detailed calculations were made, about inventory decisions, for the Gas Company's site and the customer's site, including cost analyses and EOQ - Economic Order Quantities (but are not reproduced here). These would help to plan a VMI system which avoided surplus and shortages (or indeed, out-of-stock situations).

SUPPLY CHAIN PROCESS CONTROL IMPROVEMENT

The conclusion after implementing a VMI program in an existing SO2 supply chain process, is that the Gas Company can perform a new supply chain process which is shorter and more powerful. The glass-making customer can cut its purchasing order and SO2 consumption planning activities, simply sending their daily product activities and weekly advanced production planning only. The project considered an 'As Is' supply chain process and a 'To Be' supply chain process. The 'As is' supply chain process was found to be:

Figure 2: "As is" supply chain process



Planning Part:

- The Customer forecasts and sends SO2 consumption plan (about 2 months in advance) to the Gas Company (Sales Team).
- The Sales team consider this and convert to sales forecast volume for the supply chain management team.
- The Supply Chain management team manage inventory level planning and create SO2 purchasing request (PR) in SAP system.
- The Purchasing team crate purchase order (P/O) from SAP system and send to supplier.
- The Supplier (overseas) starts SO2 production, and arranges a dangerous goods vessel to ship SO2 to the Gas Company.
- The Purchasing team co-ordinate with shipping to clear dangerous goods at the port and transfer them to the Gas Company.

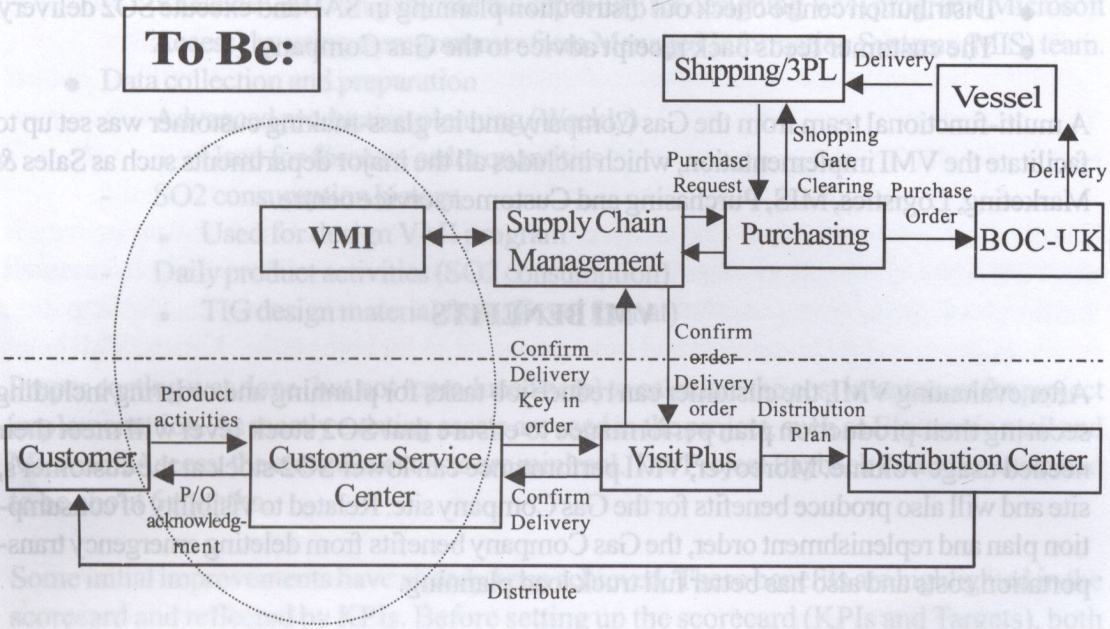
Ordering Part:

- The Gas Company send purchasing order (P/O) to its Customer service centre (CSC).
- CSC receives P/O and key order in SAP system.
- Visit plus check out order pending in SAP system and managed truck load and distribution planning to distribution centre.
- CSC check confirm-delivery and confirm that to the Gas Company.
- Distribution centre check out distribution planning in SAP and executes SO2 delivery.

Thus, after VMI implementation we can shorten the customer's purchasing activities and SO2 consumption planning activity. It just sends daily product activity (which has a format created by the Gas Company) and weekly advanced production planning to the Gas Company. The customer transfers SO2 replenishment ordering to the Gas Company, including premium service to DIFOT commitment as agreed in the supply contract.

Below is the **'To be'** supply chain process design.

Figure 3: "To be" supply chain process



Planning part:

- VMI program performed with 'Demand Projection' and 'Order Calculation' using SO2 data (SO2 consumption history, advanced production planning and product activities).
- Supply chain management team manage inventory level planning by accessing VMI data to perform inventory management.
- Supply chain management team create SO2 purchasing request (PR) in SAP system.
- Purchasing team create purchase order (P/O) from SAP system and send to supplier.
- Supplier start SO2 production and arranges a dangerous goods vessel to ship SO2 to Thailand.
- Purchasing co-ordinates with shipping to clearing dangerous goods at the port and transfer them to the Gas Company.

Ordering part:

- The Gas Company daily sends product activities and weekly sends advanced production planning to CSC.
- CSC accesses all data to VMI program.
- VMI application calculates quantities to ship.
- CSC send P/O acknowledge and Advanced ship notice to customer and key in order in SAP.
- Visit plus check out order pending in SAP system and managed truck load and distribution planning to distribution centre.

- CSC check-confirm delivery and confirm that to the customer.
- Distribution centre check out distribution planning in SAP and execute SO2 delivery.
- The customer feeds back receipt advice to the Gas Company.

A multi-functional team from the Gas Company and its glass-making customer was set up to facilitate the VMI implementation, which includes all the major departments such as Sales & Marketing, Logistics, MIS, Purchasing and Customer service centre.

VMI BENEFITS

After evaluating VMI, the customer can reduce job tasks for planning and ordering including securing their production plan performance to ensure that SO2 stock level will meet their needed usage volume. Moreover, VMI performance can lower SO2 stock at the customer's, site and will also produce benefits for the Gas Company site. Related to visibility of consumption plan and replenishment order, the Gas Company benefits from deleting emergency transportation costs and also has better full truck load planning.

Labor costs are saved from reducing call-incoming in peak times. Normally the number of calls in CSC always peak in the morning because customers call to check delivery status or would like to confirm their order. If the Gas Company can support a replenishment order there is no need to call in every time they place an order. Calls to CSC in the peak period will decrease.

When VMI is implemented, the Gas Company can perform visibility order replenishment, and better stock level management can improve the amount of stock level at the customer's site by deleting 'panic stock' which helps the Gas Company to reduce the number of cylinders in use. That means the Gas Company will receive cost savings from reduced inventory cost from deleted "panic stock", and with no need to execute planning effort and transfer replenishment order task to supplier.

PROJECT INVESTMENT AND PAYBACK

As the project concept is using a data transfer system via electronic mailing, and SO2 consumption is already a key production factor in the customer's glass-making, the project investment is not expensive but is concentrated on the VMI design, investment for program design and cost of data analysis, as detailed below;

- Internet web browser assets
  - Electronic mailàBoth companies currently have Electronic mail system

- VMI program
  - VMIàthe Gas Company has the capability for designing VMI program (Microsoft Access) by using a programmer from Managed Information Systems (MIS) team.
- Data collection and preparation
  - Advanced production planning (Weekly)
    - Used for forecast order quantities
  - SO2 consumption history
    - Used for design VMI program
  - Daily product activities (SO2 consumption)
    - TIG design material from (Excel format)

Proper costing was done (but not reproduced here) to calculate the cost investment for project implementation. As mostly existing assets are used in the project, such as Electronic mail and Microsoft Access, the extra direct costs are minimal. The Project Payback Period is estimated to be about 6 months.

Some initial improvements have already been achieved. These benefits are highlighted in the scorecard and reflected by KPIs. Before setting up the scorecard (KPIs and Targets), both teams are committed to identify criteria for performance measurement. A comprehensive scorecard for measuring the success of implementation is set up, requiring the setting of representative KPIs which measure essential operations that are required to meet the pre-defined objectives and set realistic targets. Detailed criteria for measuring performance were defined.

PROJECT CONCLUSION

The scope of this designed VMI program is to utilize SO2 supply reliability. The results from the study, and analysis of the existing supply chain planning strategy clearly show a need to develop and utilize supply chain process activities, because SO2 products have a direct effect on the glass-maker's production. In the past this customer tried many ways to secure a reliable SO2 supply source by studying and analyzing SO2 consumption history including advanced production planning. However shortage of SO2 often happened because of many problems, including some limitations affecting hazardous goods, and product control by the Military. So a tool to help the supply process become more visible, flexible and responsively fast in response to a customer's demand will be valuable.

A VMI program can help customers transfer their SO2 purchasing activities and advanced consumption planning activities to the Gas Company, and customers will receive the platinum service for DIFOT commitment, lower their stock level, and improve their supplier overall service level. A VMI program can utilize demand visibility including faster information interchange so that the Gas Company can access valuable data to manage their own supply site,

delete the shortage situation and emergency transportation. This will result in better performance effectiveness and better assets turnover, reduce the number of gas cylinders actually in traffic: all of which means a reduced asset cost while service levels never reduce.

The cost for implementation is small because we can apply existing systems and resources, existing data history and existing planning activities to design a VMI program.

The conclusion from this study and analysis of the existing supply chain planning strategy, is that VMI is highly suitable for ensuring reliability of SO2 supply. VMI benefits both customer and the Gas Company sites, also helps both their businesses to delete non-valuable activities, producing less need for investment and more cost-savings for both parties. Finally, VMI helps considerably to form a seamless business relationship.

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NOTES FOR CONTRIBUTORS

Manuscript Submission

- Manuscripts should be submitted electronically to the Managing Editor: Assistant Professor Brian Lawrence, bLawrence@au.edu

Manuscript Formatting

- Manuscripts should be typed in Time New Roman font size 12, single spacing.
- Microsoft Word is preferred.
- A supplemental document should include the title page with author names, postal address, phone number, and e-mail address.
- A short biographical sketch of each author is requested.
- Manuscripts should range from 3,000 to 6,000 words in length.
- All manuscripts must be accompanied by an abstract of 150-200 words. Include keywords that describe your paper.

Tables/Figures/References

- Tables and figures to be indicated by number separately. Location of the actual table should be marked in the text with these words: (Insert Table __ about here).
- Location of the actual figure should be marked in the text with these words: (Insert Figure __ about here).
- Present each table and figure on a separate page, gathering them together at the end of the manuscript.
- All figures and artwork must be submitted in camera-ready form, and quality must be excellent. Pure black and white is recommended.
- References should conform to the recommendations in the Publication Manual of the American Psychological Association.

Copyright

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For further information, please contact:

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Bangkok 10240, Thailand
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Email: bLawrence@au.edu

MSc. SCM

"Educating Intelligences and Active Minds to Change the World"

The ABAC School of Management was the pioneer in offering an international program in business in Thailand and over the years, the school has adhered to its high standards of excellence. As the business world has become increasingly globalized, it has opened up both opportunities and challenges in the world of business education. The ABAC School of Management, as an enterprising and forward-looking school offers a supportive learning environment in keeping with Assumption University's long tradition of providing high quality education.

Chedpong Sibunruang, Ph.D.
Dean, ABAC School of Management

ABAC School of Management

MSc. SCM MASTER OF SCIENCE IN SUPPLY CHAIN MANAGEMENT

2 years, Part-time Program [Thesis and Non-Thesis Options]

ADMISSION SCHEDULE 2008

Semester	1/2008 (Jun-Sep 08)	2/2008 (Oct 08-Feb 09)
Application period	Jan. 2 - Feb. 24, 2008	May 12 - July 13, 2008
Interview date	March 1, 2008	July 19, 2008
Interview results	March 5, 2008	July 23, 2008
Registration date	March 15, 2008	August 2, 2008
Foundation course begins	March 22, 2008	August 9, 2008
Semester begins	June 1, 2008	October 15, 2008

ADMISSION REQUIREMENTS

QUALIFICATION FOR ADMISSION

Candidates are expected to submit the following documents:

1. Bachelor's degree or equivalent from an accredited institution in any field
2. Good command of English
3. Computer literacy
4. At least 2 years of professional or practical work experience

ENTRANCE REQUIREMENTS

1. A completed application form
2. Official transcript of the previous university attended (3 copies)
3. Bachelor's degree certificate (3 copies)
4. Citizen identification card (3 copies)
5. Residence registration or passport (3 copies)
6. Eight (1 x 1.5-inch size) photographs (photo in gown not essential)
7. Reference letters from former instructors or employers (2 letters)
8. Resume (3 copies)

Note : All documents must be endorsed with signature and submitted in person within the last day of application period, otherwise the application will not be considered and the applicant will not be allowed to sit for the Admission interview.

ADMISSION & EXAMINATION FEES

Application form: Baht 500
Admission interview: Baht 500

APPLICATION FORMS ARE AVAILABLE AT:

Hua Mak Campus,
Admission Center, 'P' Building, or
Office of Graduate Studies, 'A' Building
Ramkhamhaeng 24 Road

Office hours:
Monday - Friday 8:30 A.M. to 7:00 P.M.
Saturday 8:30 A.M. to 4:30 P.M.
Sunday 8:00 A.M. to 2:00 P.M.

APPLICATION FORM CAN BE DOWNLOADED AT:

http://www.grad.au.edu

STUDY SYSTEM:

1st semester	2nd semester	Summer
June - September	October - February	February - May

VENUE & CLASS HOURS

- Hua Mak Campus, Ramkhamhaeng 24 Rd.
- Mon. - Fri. 6.30 p.m. to 9.30 p.m.
- Sat.& Sun. 9.00 a.m. to 4.00 p.m.

DURATION: 2 YEARS

Following a more and more competitive environment in all industries, the Supply Chain Management (SCM) concept has been widely accepted to be the new trend to promote business sustainability through profit and growth. This is achieved mainly by focusing on the whole Supply Chain Management process to deliver the right product or service required by the consumer, at the right place, at the right time and at less cost. This trend is at a threshold in Thailand, and it will soon be considered unacceptable for a firm not to practice SCM, and for its people not to be knowledgeable about what it is, why it is necessary, and how it works. There is thus a big and increasing need for degrees in SCM at Master level. Because of its provision of SCM courses in the past few years, and its close involvement with SCM leaders in Thailand and overseas program, the Department of Industrial Management, ABAC School of Management is well positioned to provide such a degree course.

MSc. SCM

MSc. SCM Master of Science in Supply Chain Management

ABAC School of Management

2 years, Part-time Program (Thesis and Non-Thesis Options)

STUDY PLAN

Plan A (Thesis option)
- Core Courses
- Concentration Courses
- Thesis

Plan B (Non-thesis option)
- Core Courses
- Concentration Courses
- Elective Courses
- Graduate Project

CURRICULUM

Foundation Course
- Fundamentals in Supply Chain Management

Core Courses
- Strategic Supply Chain Management
- Quantitative Modeling and Analysis
- Design and Control of Supply Chain Processes
- Information Technology in Supply Chain Management
- Financial Decision Making in Supply Chain

Elective Courses
- Customer Relationship Management
- Supply Chain Collaboration
- Government Supply Chain
- Supply Chain Risk Management
- Seminar in Supply Chain Management

Thesis / Project
- Thesis
- Graduate Project

Three Major Concentrations:

1. Supply Management Concentration
- Procurement Methodologies
- Negotiation Strategies
- Contract Analysis
- Strategic Global Sourcing
- Supplier Relationship Management
- Roles of Technology in Supply Systems

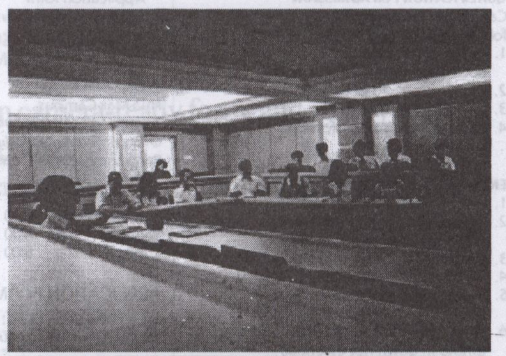
2. Manufacturing Concentration
- Advanced Production Planning
- Manufacturing Systems Analysis
- Manufacturing Strategy
- Designing of Lean Manufacturing System
- Quality Engineering and Six Sigma
- Simulation Modeling in Manufacturing Systems

3. Distribution Concentration
- Integrated Warehouse Operations
- Multimodal Transportation Systems
- Logistics and Distribution Networks
- Materials Handling and Packaging
- Strategic Retailing

ESTIMATED FEES

Estimated Expenses	Master's Degree, 2-year 4 Semesters	
Enrollment fees	Baht	US$
- Matriculation fee (Thai students)	8,000	222
- Matriculation fee (non-Thai students)	20,500	569
- Student's activities fee	6,000	167
- Newsletter	400	11
Course Registration fees / Semester		
- Tuition fee (THB 4,000 x 36 credits)	144,000	4,000
- University fee (THB 12,500 x 4 semesters)	50,000	1,389
- Annual internet & access control fee (THB 1,200 x 4 semesters)	2,400	67
- Annual health and life insurance, THB 5,000 / year (for non-Thai students)	10,000	278
Approximate total for Thai students	210,800	5,856
Approximate total for non-Thai students	233,300	6,481

NOTE:
- Fees exclude tuition fees for non-credits courses and textbooks.
- The fees are subject to change at the university's discretion without prior notice.
- Currency Exchange Rate: at Thai Baht 36 = US$ 1.



ASSUMPTION UNIVERSITY
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