

# AUTOMATION OF SRI LANKA'S DOWNSTREAM PETROLEUM INDUSTRY SUPPLY CHAIN MANAGEMENT OPERATIONS

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**Abstract** - Ceylon petroleum Storage Terminals Limited (CPSTL) is the entity responsible for handling 90% of the storage and distribution of the country's fuel requirement. This encompasses providing ERP, Laboratory and tanker operations services for the entire industry. The bulk products are received as either imported finished products from oil tankers or refined products from the CPC Sapugaskanda refinery. The product ordering process has been carried manually at the 'Stock review meeting', which is a forum constituting of petroleum industry stakeholders, representatives from Ceylon Electricity Board and Department of Meteorology. Various factors are considered for the bulk product ordering process. The bulk product ordering related decisions are reached based upon the manual forecast and analysis. In order to streamline the decision making process and provide with real-time information, the process automation is implemented. SAP ERP system is being utilized to automate the various factors that are being considered for the above mentioned decision making process. The system will provide real-time information regarding the stock levels, sales, storage tank ullage etc. Several manual processes utilized earlier are being automated to facilitate the speed and availability via the ERP system, such as the tanker programme, Refinery production plan. The system gathers all factors related to bulk product replenishment and forecasts the future consumption and bulk product availability levels on both historical and real-time information. The decision taken at the forum can be implemented via the system by generating the tanker programme for the future months and initiating purchase orders. The operations performed after tanker arrival

such as offshore operations, laboratory reports, tanker outturns are being automated via the SAP ERP system.

**Keywords**—Forecasted consumption, Downstream petroleum industry

## I. INTRODUCTION

The decisions made at the 'Stock review meeting' were partly based on SAP ERP system and manual calculations and forecasts. Since this is the most critical and sensitive decision making with respect to smooth function of the country's economy, the decision was made to utilize the SAP ERP system capabilities to facilitate the decision making. The data which were not available to the SAP ER system were gathered by automating the manual processes. The information from the newly automated processes, historical and readily available information in the SAP ERP system was utilized to forecast the future consumption. New transaction codes were introduced to implement the bulk product ordering decisions during the forum itself. Many other support applications are being developed simultaneously to facilitate other supplementary information related to the supply chain management process.

## II. METHODOLOGY

The decision made at the 'Stock review meetings' were analysed and studied with respect to data availability,

via the SAP ERP system. The data gaps were bridged by facilitating the same manual data via Sap ERP system transactions.

- 1) Tanker Programme
- 2) CPC Refinery Production plan.

The factors related to tot bulk product ordering via oil tankers were studies. The study identified the factors that impact the decision making process. The following framework was developed as the base of providing the information for the supply chain management decision making process.

The SAP ERP system implementations follow the SAP Business Process Management methodology, which is a derivative of the waterfall model of software development, which has requirement analysis, design, coding testing, implementation and maintenance phases. Each of the phases was carried with development testing, software

quality assurance, user acceptance testing, processes, impact and dependency to related processes.

Once the gap in the ERP system has been addressed, real-time details will be provided to the decision makers, with respect to above factors. This will be in ERP transaction “Details for stock review meeting”, which provides information on tabular and graphical forms.

As per the information analysis, decisions will be taken to order bulk petroleum product oil tankers according to forecasted ullage. The ERP transaction “Oil Tanker ordering as per ullage” will facilitate the forecast and will record the ordering decisions. It will have a link to the next week/month’s tanker programme.

### III. SYSTEM IMPLEMENTATION

The system implementation was carried out after the requirement analysis with the related stake holders. The

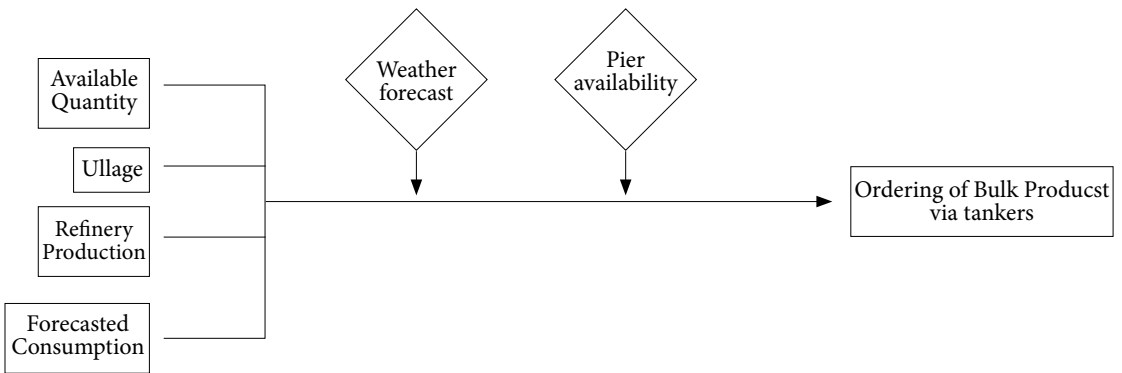


Figure 1: Framework of factors affecting product ordering.  
Source: Author

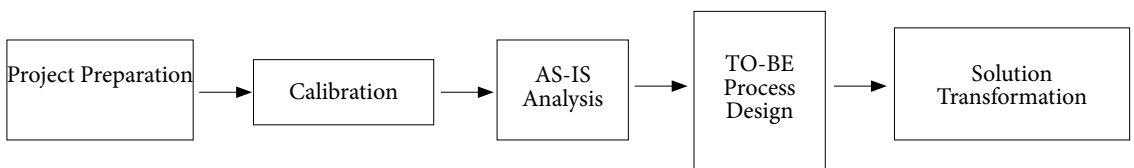


Figure 2. SAP Business Process Management methodology  
Source: SAP

# PROCEEDINGS

program development was carried out. User acceptance testing with respect to data accuracy, reflection of actual user requirement and user friendliness were the key aspects focused. After user acceptance, the two programmes were used to support the manual decision making process. Once the total solution was developed and tested, the entire programme was used in parallel with the manual process initially.

Streamlining of the solution was carried out with respect to the feedback received from the stakeholders. Various business scenarios, exception handling was incorporated to the forecasting and providing of information. One of the main concerns of the users was the maintenance of historical information, of the decision made at the stock review meeting forum.

The users have fully accepted the forecasted details reports, subject to few minor modifications. The manual process is still carried out as a precaution due to the sensitiveness of the decision taken at this forum and high risk involved. The users are slowly adapting the Oil Tanker ordering as per ullage. Since, the end users are top manager of the 03 organizations; implementation progress has been time consuming, complex and requires a complex business analysis role. Thus, far there has been no resistance to the implementation, although the progress is slow.

## IV. STRENGTHS

The system is providing online and real-time information against the provision of information manually. The system provides a uniformity of data among different stakeholders namely Ceylon Petroleum Corporation and Lanka Indian oil Corporation PLC. The incorporation of seemingly unrelated activities into one workflow strengthens the business process. This generated a flow of documents to provide a status, which was impossible in the manual system. The total solution has provisioned the users to access historical planning data. The entire planning eco system will reduce the risk of product shortage and will enable the stakeholders to more proactively mitigate scenarios uncalled for.

## V. LIMITATIONS

The system does not provide real-time location of the scheduled tankers carrying bulk petroleum products. The

ERP system is not capable of catering this requirement. Therefore a separate project “CPSTL Tanker Tracker Application” has been initiated. As the case with any computer software, the system is dependent upon the user input. Therefore, any incorrect or invalid data will affect the forecasting and analysis process, and the decisions made.

## VI. FUTURE APPLICATIONS

There is potential for many future applications, due the avenues and data provided by the solution. ‘CPSTL Tanker Tracer Application’ has been already initiated to track the real-time location of the tankers journey. The next phase of the project is to capture the events that take place after the tanker arrival. CPSTL Oil Facilities Office located in the Colombo harbor facilitates the tanker operation for 03 piers in the harbor including crude oil. The tanker operations will be automated via SAP ERP system. This will include the real-time event report via text messages and emails regarding events such as tanker arrival, sample drawing and unloading operations.

The next requirement will be to automate the manual process of the pier occupation scheduling of tankers. The automation of tanker scheduling via the EP system will facilitate the pier occupation scheduling process. This automation process will increase pier occupation efficiency and will facilitate optimum resource utilization.

The tanker outturn reports and CPSTL Laboratory certificates have been already automated by the SAP ERP system. Therefore, the total tanker operation process can be incorporated into a timeline and a document flow. This provides the opportunity to streamline the tanker operation as whole with respect to cost and benefits. This will facilitate devising of more cost efficient and effective tanker operations for CPSTL.

## VII. CONCLUSION

The project has identified the weaknesses of the manual process and addressed the information gaps. The process has automated the existing process into a more efficient and reliable form, which provides real-time information, scientific forecast. The process has added value to the business process by features like decision

making, initiating the decisions made and keeping track of decisions. The system implementation has eliminated the drawbacks and facilitated towards making better informed decisions.

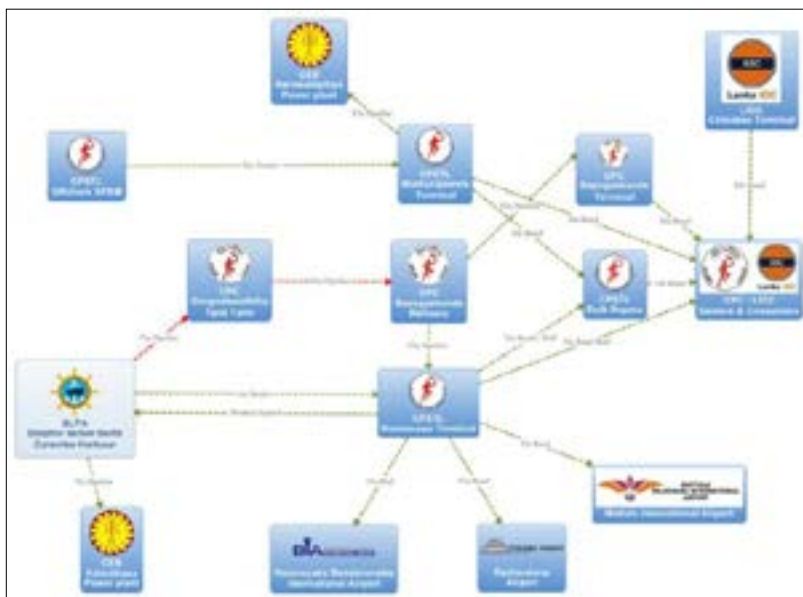
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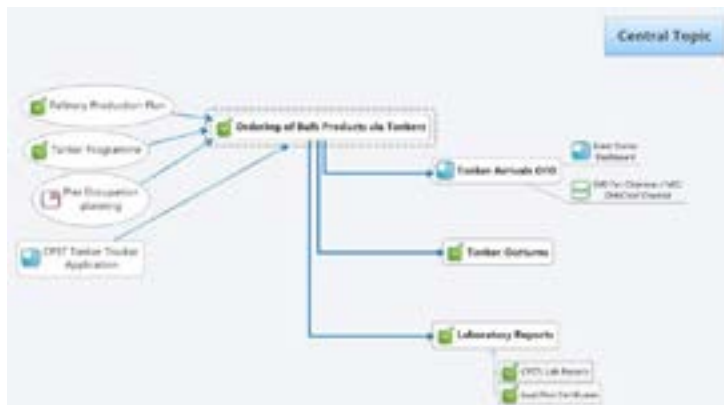
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APPENDICES

- 1) Sri Lanka's Downstream Petroleum Industry supply chain.



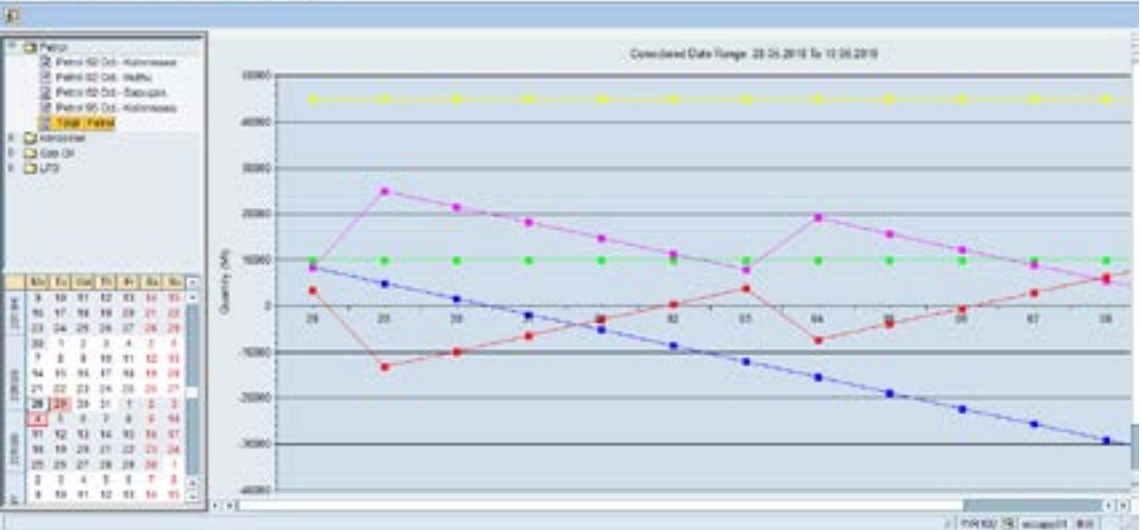
- 2) Status of Tanker operations projects



3) Details for Stock Review Meeting

Account	Stock	Q1 Legs	Q2 Legs	Q3 Legs	Q4 Legs	Q1 Trades	Q2 Trades	Q3 Trades	Q4 Trades	Q1- Q4 Trades
<b>NetNet</b>										
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
<b>NetNet</b>	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
<b>NetNet</b>										
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
<b>NetNet</b>	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
<b>NetNet</b>										
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010 - NetNet	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
NetNet (42) 010	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364
<b>NetNet</b>	11,779,190	11,917,364	11	11	1,112,278	1,200	11,917	11,917	11,917	11,917,364

SRMD: Details for Stock Review Meeting




4) Oil tanker ordering as per Ullage

SRMD: Ordering of Tankers as per forecasted Ullage

Material	Product	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
00023.00	Petro7: 92 Oct - Kotoenau	19,743	18,308	17,505	16,705	15,905	15,105	14,305	13,505	12,705
00023.00	Petro7: 92 Oct - Rutba	19,743	21,440	3,543	4,543	5,543	6,543	7,543	8,543	9,543
00023.00	Petro7: 92 Oct - Sapega	7,743	7,743	7,743	7,743	7,743	7,743	7,743	7,743	7,743
00018.00	Petro7: 95 Oct - Kotoenau	11,794	12,284	12,794	13,284	13,794	14,284	14,794	15,284	15,794
00012.00	Int. Kerosene - Kotoenau	456	456	456	456	456	456	456	456	456
00026.00	Jet A1 - Kotoenau	11,491	12,091	14,291	15,891	17,491	19,091	20,691	22,291	23,891
00017.00	Kerosene - Kotoenau	2,960	3,016	4,260	4,916	5,560	6,216	6,860	7,516	8,160
00017.00	Kerosene - Rutba	0	80	100	180	260	340	420	500	580
00017.00	Kerosene - Sapega	30	66	136	196	256	316	376	436	496
00018.00	Gas OIT (Super) - Kotoen	3,748	4,021	4,294	4,571	4,848	5,121	5,394	5,667	5,940
00012.00	Gas OIT - Kotoenau	6,053	7,753	9,453	11,153	12,853	14,553	16,253	17,953	19,653
00012.00	Gas OIT - Rutba	24,431	27,131	34,831	42,531	50,231	57,931	65,631	73,331	81,031
00012.00	Gas OIT - Sapega	7,395	7,395	8,405	9,415	10,425	11,435	12,445	13,455	14,465
00038.00	LPG 1500 - Kotoenau	19,124	19,124	19,124	19,124	19,124	19,124	19,124	19,124	19,124
00038.00	LPG 1500 - Rutba	25,101	25,101	25,101	25,101	25,101	25,101	25,101	25,101	25,101
00026.00	LPG 800 - Kotoenau	9,738	9,738	9,738	9,738	9,738	9,738	9,738	9,738	9,738
00026.00	LPG 800 - Sapega	565	565	1,765	1,765	2,165	2,565	2,965	3,365	3,765

5) Tanker Programme



**Ceylon Petroleum Corporation**  
**Tanker Arrival Program on - 27.10.2017**  
**Tanker Program No. 0**

**Harbour Master**  
Do Lanka Ports Authority

**Commander**  
S.L.N.S. Rangala

**Commander**  
Do Lanka Navy

**Director General (Naval Operations)**  
Do Lanka Navy

**Senior Staff Officers (Operations)**  
Naval Headquarters

**Manager (RM & RP)**  
CPSTL

**O.M. (Oil Purities)**  
CPSTL

Ref. No.	EK No.	PO No. / Company	Product	Description	Quantity (MT)	Allocated Laycan	Expected Arrival	Tanker	Shipping Agent
1	EK/14/017	CPC	A0018L99	LANKA PETROL 95 OCTANE	10,000.00	01PM MUTHURAJAWELA	01.11.2017	MT NEW LINE	AITKEN SPENCE
2	EK/16/017	CPC	A0021L99	LANKA PETROL 92 OCTANE	10,000.00	DUALSOUTH	01.11.2017	MT NEW LINE	AITKEN SPENCE

**Commercial Manager**  
Ceylon Petroleum Corporation

**CC :**

Chairman CPC  
Refinery Manager CPC  
Manager E & S CPC


Chairman CPSTL  
D.G.M. (Operations) CPSTL  
O.M. Muthurajawela CPSTL

Lanka SOC PLC  
Chief Librarian Lanka Ltd  
Director of Customs (Declarations)

Auto-Generated Report by LAF ERP System/Date: 06/10/2017 Time: 07:46:00



6) Refinery Production Plan



**Ceylon Petroleum Corporation**  
Refinery Production Plan Report

Week - 06.11.2017 - 13.11.2017

Ref. No.	Product	Description	Quantity (MT)	Comments
1	A0023L99	LANKA PETROL 92 OCTANE	10,000.000	-
2	A0039L99	LANKA FUEL 1500 OIL SEC. (LOW SULPHER)	15,000.000	AS PER PLAN
3	A0013L99	LANKA AUTO DIESEL	50,000.000	AS PER SCHEDULE

\_\_\_\_\_  
Refinery Manager  
Ceylon Petroleum Corporation

7) Proposed CPSTL Tanker Tracker Application

**Tanker Operations**  
Latest Tanker Operation Details as at @ 0940hrs 22/04/2018



Tanker Name	MT * Beacon HIF	
Expected Date	24/04/2018	
Pier	SPM Muthurajawela	
Products	Gasoline 92	15 000 MT
	Gasoline 95	20 000 MT

