Five Cs Strategy of Supply Chain Management in PPL: A Case Study

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"Competitive dominance will be achieved by the entire supply chain, with battles fought supply chain versus supply chain."
– Roger Blackman.

"As the economy changes, as competition becomes more global, it's no longer company vs. company but supply chain vs. supply chain."
– Harold Sirkin.

Supply chain management is the collaborative design and management of seamless value-added processes to meet the real needs of the end customer. The development and integration of people and technological resources as well as the coordinated management of materials, information, and financial flows are critical to successful supply chain integration.

Supply chain management is a vital portion of management at Untitled and other World brands. Managers in the company emphasize the importance of having the right product at the right store at the right time, as a way to maximizing profitability. Consequently, forecasting, inventory planning, manufacturing processes, and supplier relations play a crucial role in the company.

Industrialization is an important means of modernization in supply chain management. The increased swiftness of it has given rise to a number of managerial problems in decision space. Among them, the problem of SCM is significant to take optimum decision. Supply chain planning is the process of coordinating production, distribution strategies and storage requirements to efficiently allocate supply chain resources to maximize profits or minimize system wide costs. The present case analysis is about the supply chain management at Paradeep Phosphate Limited, an Odisha based fertilizer company.

Paradeep Phosphate Limited captures 5Cs of the supply chain from the suppliers to the dealers. It covers the operational details of supply chain, which are required to clearly define the optimization problem. It captures details of different supply chain nodes and the business processes relevant to this study. Operational objectives of logistics like Right Response, Right Quality, Right Quantity, Right Value, Right Cost Trade-offs, Right Information are incorporated with Paradeep Phosphate Limited.

1. Paradeep Phosphate Limited (PPL): At a Glance

Paradeep Phosphates Limited (incorporated in 1981) is a premier fertilizer company engaged in manufacturing and marketing of complex Phosphatic fertilizers. The company was initially commissioned as a joint venture between Government of India and Republic of Nauru and subsequently, in 1993 it was changed into a wholly owned Government of India Enterprise. After disinvestment by Government of India in February 2002, the management of the company is presently with the fertilizer majors - Zuari-Chambal Group and OCP of Morocco. PPL is a prime player in the phosphoric fertilizers which have applications in a wide range of crops.

PPL produces about 1.2 million metric tonnes of Di- Ammonium Phospahtes (DAP) and other complex fertilizers annually. The plant also produces intermediary products like Phosphoric Acid and Sulphuric Acid, which are critical raw materials in the manufacture of Phosphatic fertilizers. The plant, located in the port town of Paradeep in the district of Jagatsinghpur in Odisha, has an installed capacity of 7, 20,000 metric tonnes per annum of DAP (2,400 metric tonnes per day). PPL is one of the largest integrated DAP plants in India. With a market share varying around 13%, it has a strong presence in the complex fertilizer market. Their product marketed under the popular "Navaratna" brand represents a combination of multiple nutrients like Nitrogen, Phosphorus, Potash and Sulphur etc. PPL's range of products caters to almost all agricultural applications. PPL has its largest storage capacity in India.

With a stellar turnaround, PPL is a case study in favour of privatization. The company's focus on performance and continuous efforts towards development are reflected in the FAI awards for improvement in overall performance of the company in 2002-03, 2005-06, 2008-09 and the best technical innovation in the year 2005 - 06. PPL received the ISO 14001: 2004 certification in May 2006 for good environment management systems, reflecting the fact that along with technical advancement, the company also values maintaining and working towards a clean and safe environment.

2. Plants in PPL

The Plant with an installed annual capacity of 7,20,000 metric tons (MT) of DAP and other Phosphatic fertilizers was commissioned in 1986 along with off-site facilities with a 3.4 km closed conveyor from port to plant site as well as a railway

siding, raw material storage yards and a 3.1 km long pipe rack.

In 1992 a Sulphuric Acid Plant having an annual capacity of 6,60,000 MT and a Phosphoric Acid Plant having an annual capacity of 2,25,000 MT, designed to meet 50% of the total requirement were installed. The Plant also has two captive power units of 16 MW each, designed to run on excess steam generated by the Sulphuric Acid Plant. Major raw materials like phosphoric acid (60,000MT), ammonia (50,000MT), rock phosphates (60,000MT), Sulphur (45,000MT) and MOP (25,000MT) are imported from Morocco, Tunisia, Indonesia, Gulf countries, Jordan, Saudi Arabia and CIS countries. PPL has a captive Berth at Paradeep Port with facilities to unload solid & liquid cargo.

PPL plant (see **Exhibit 7**) produces about 1.2 million MT of DAP and other complex fertilizers annually. The plant also produces intermediary products like Phosphoric Acid (60,000MT) and Sulphuric Acid (36,000MT), which are critical raw materials in the manufacture of Phosphatic fertilizers. The plant, located in the port town of Paradeep in the district of Jagatsinghpur in Odisha, has an installed capacity of 7, 20,000 MT per annum of DAP (2,400 MT per day). PPL is one of the largest integrated DAP plants in India. With a market share varying around 13%, it has a strong presence in the complex fertilizer market. Its products marketed under the popular NAVRATNA brand represent a combination of multiple nutrients like Nitrogen, Phosphorus, Potash and Sulphur etc. PPL's range of products caters to almost all agricultural applications. In **Exhibit 4** marterial flow and conversion points covering in PPL are shown.

Exhibit 7 *PPL Plant in Paradeep*

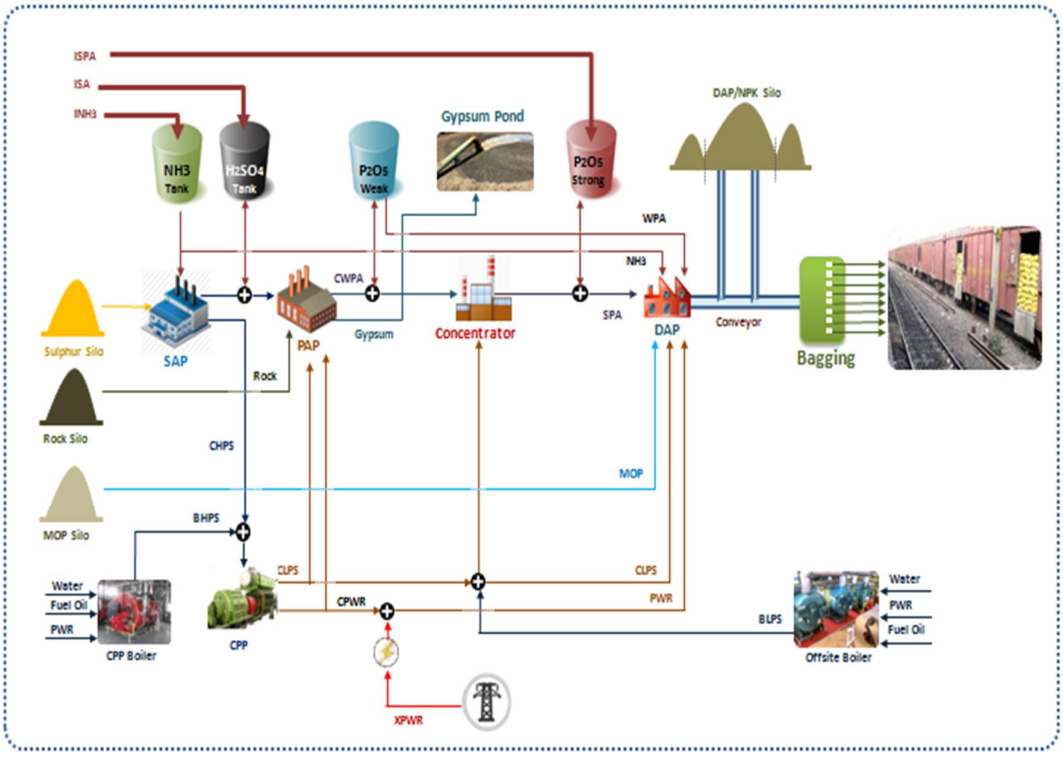


Exhibit 4 *Marterial Flow and Conversion Points Covering in PPL*

With a stellar turnaround, PPL is a case study in favour of privatization. The company's focus on performance and continuous efforts towards development are reflected in the FAI Awards for Improvement in Overall Performance of the company in 2002-03, 2005-06, 2008-09 and the Best Technical Innovation in the year 2005 - 06. PPL received the ISO 14001: 2004 certification in May 2006 for good environment management systems, reflecting the fact that along with technical advancement, the company also values maintaining and working towards a clean and safe environment.

3. Products

PPL manufactures market various grade of fertilizers. These fertilizers are marketed under the brand name 'NAVRATNA'. **Exhibit 10** provides some selected products of PPL.

Exhibit 10 *Products of PPL*

NPK-12:32:16

It contains three plant nutrients 12% Nitrogen, 32% Phosphate, and 16% potash. Nitrogen in NPK 12:32:16 is entirely in Ammonia form.27.2% phosphorous and 16% potash are available in water soluble form making it easily and quickly available to plants. Qualities of NPK-12:32:16 are:

- Contains three major plant nutrients.
- Highest total nutrient among NPK containing product (60%) with three major plant nutrients in granule form.
- Nitrogen in Ammoniacal (Ammonium Sulphate) form.
- Phosphates (P_2O_5) and Potash (K_2O) contents are almost wholly in water soluble form making it easily and quickly available to plants.
- Phosphorous & Potash nutrient ratio of 12:32:16 is 2:1 most suitable fertilizer for basal application, where high rate of P_2O_5 is recommended as compared to potash.
- Less time and labor required to apply a single fertilizer than to apply straight fertilizer separately.
- Also contains 2% Sulphur enhances the yield and quality of crops such as Onions, Tobacco, Ginger, Garlic, Tomato, Cabbage, Oil Seed etc.

NPK - 10:26:26

It contains 13% 'extra Sulphur'. This Sulphur is very beneficial to the crop in various ways and is a valuable input to the crop, particularly in the context of chronic deficiency of Sulphur in Indian soil. It is particularly suitable for potato, cotton and sugarcane in states like West Bengal, Maharastra, Andhra Pradesh and Odisha. Qualities of NPK-10:26:26 are:

- High constituent NPK containing (62%) three major plant nutrients.
- 1:1 ratio of Phosphorous & Potash most suitable fertilizer for sugarcane & potato cultivation.
- More than one essential plant nutrient are available in packet.
- Less time and labor required.
- 26%potassium in water soluble form.

PPL Phospho Gypsum

It contains 17% Sulphur, Calcium 21%, Phosphorus 0.7% and some amount of Zinc, Iron, Copper and Magnesium. It is a byproduct of DAP. It is experimentally found out that PPL Phospho-Gypsum has the capacity to increase the crop yield from 5-10%. All the fertilizer produced by PPL strictly adhere to specification as per the fertilizers control and movement order. All the products are packed in 50 kg HDPE/PP laminated bag.

DAP - 18:46:0 (Di - Ammonium Phosphate)

It is a major product of PPL. It contains 2% 'extra Sulphur'. Apart from the major nutrients, it also contains specially micronutrients viz. Zinc, iron, Copper, Magnesium and Manganese which are essential for crops. It is suitable for all types of crops. The Qualities of DAP-18:46:0 are:

- Highest nutrient content – More than 64%.

- Contains 18 % Nitrogen, 46% Phosphorous, and 2% Sulphur.
- Ammonia cal nitrogen improves phosphorous availability as compared to nitrate nitrogen.
- Best basal fertilizer for all crops.
- Suitable for all types of soil.
- Less labor intensive.

NP - 20:20:0:13 (Ammonium Phosphate Sulphate)

NPK(20:20:0:13) on the other hand is particularly suited for vegetable and oil seeds, due to its high Sulphur content. Qualities of NPK(20:20:0:13) are:

- Ammonium Phosphate Sulphate.
- Best fertilizer for Oil seed crop and pulses.
- Ideal for application in vegetables where frequent fertilizer application is done.
- The high Sulphur content improves the milling and baking quality of cereals.

MOP

Muriate of Potash (MOP), one of the major plant nutrients, is imported by PPL through various ports of India and is sold in the marketing territory along with other complex fertilizers. Qualities of MOP are:

- Provides strength to the stems and develops the root system
- Increases resistance to diseases in plants
- Improves nitrogen and phosphorous uptake.
- Essential for grain filling and grain weight.

Ammonia & Sulphuric Acid

Ammonia is required by refrigeration units and steel plants. Sulphuric Acid is demanded by Alum manufacturing units, chemical units and steel plants. PPL has large storage capacities for these products, which are available for industrial consumption in and around Odisha.

Zypmite

Zypmite is a micronutrient mixture containing Sulphur, Zinc, Boron, Calcium and Magnesium. Zypmite fortified helps improve soil fertility, increases the intake of NPK fertilizers and improves quality of yield.

4. PPL Supply Chain

PPL has its manufacturing plant in Paradeep where it is engaged in the manufacturing and the trading of DAP / NPK complexes. In addition, it is also engaged in the trading of gypsum, zypmite and MOP. PPL is importing DAP directly into 7 other ports across India. PPL has contracted 3rd party logistics companies to receive, store and bag the imported DAP at various ports. For the imported DAP, purchase is handled by PPL from the supply side. On the distribution side, PPL takes care from the primary freight. Supply chain management of raw materials and finished products from suppliers to distributors in PPL is shown in **Exhibit 2.** All raw materials and traded goods are imported from overseas. The goods are sold in 11 states of India. PPL is also exporting to Bangladesh (bulk gypsum) and Nepal (DAP/ NPK).

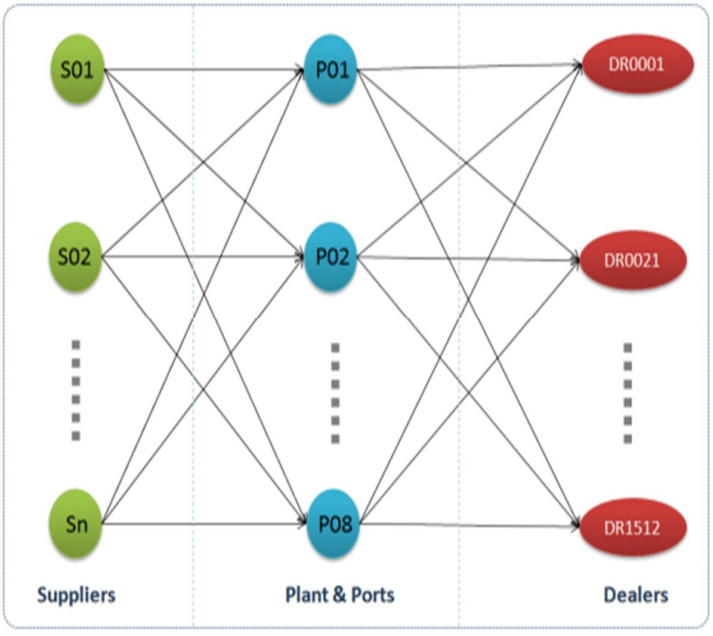


Exhibit 2 *Supply Chain of PPL*

Raw material and Finished Products Suppliers

PPL procures raw material and finished goods from various suppliers across the globe. Raw materials are mainly consumed in manufacturing plant at Paradeep. A small fraction of raw materials are also traded. PPL also imports finished goods (DAP) to seven other ports in India for distribution. In bound supply chain of raw materials and finished products starting from suppliers to PPL plant where the mode of transport is water is shown in **Exhibit 3**. A lead time of 3 to 4 months is required for procurement planning. (For Dec-2014 production, the procurements are planned during August / September-2014).

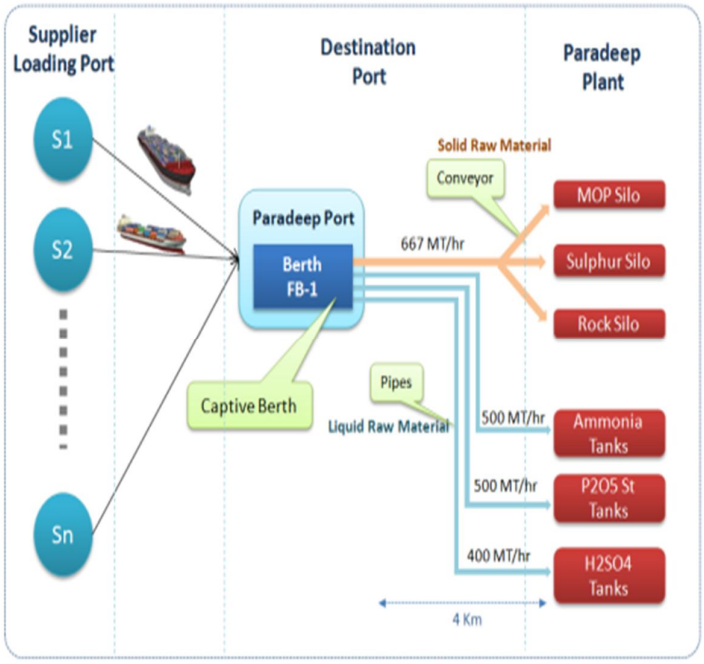


Exhibit 3 *Inbound Supply Chain in PPL*

Exhibit 11 shows the raw material sourcing details in entire globe. The list of raw material and the current procurement policy are explained in **Exhibit 13** and **Exhibit 14** shows details about the suppliers.

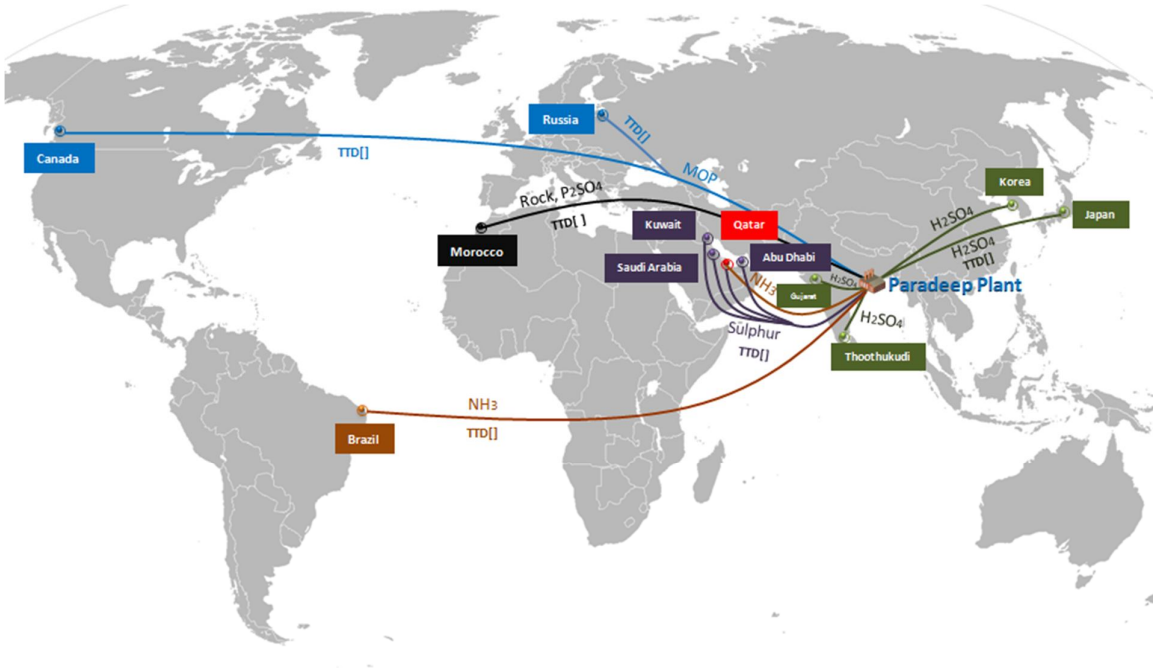


Exhibit 11 *Import of Raw Materials from Entire Globe*

Raw material - Procurement details				
Raw Material	**Size of each consignment (KMT)**	**Frequency of arrival (days between two arrivals)**	**Notes**	**Pricing**
Rock Phosphate	55 [or 60]	15	OCP is the only supplier; recently another supplier is tested for quality and yield.	Price is set on quarterly basis. Price is set based on P2O5 price.
Sulphur	35	60	It is the by-product from Refinery. Price has a dependency on oil consumption, which is again, depend on world economy.	It is sold in auction and price varies widely. PPL buys it from Intermediaries (Traders / Agencies)
MOP	35 [or 20]	90 to 120		Contracted on quarterly basis; price setting mechanism???
Ammonia	23 [or 25]	15	Consignment can come in two vessels (Split Delivery)	
P2O5 Strong	20		OCP is the only supplier; Ordered on need basis; no regular pattern; Consignment in a vessel is split between many buyers. It is on short supply.	Price is set on quarterly basis. Price depends on market price in Europe. As OCP is the part owner of the company, the contracted prices are less than the market price.
H2SO4	19 [or 12]	30		Contracted on quarterly basis; depends on market prices.

Exhibit 13 *Raw materials Procurement in PPL*

Supplier - Cost & Constraints			
Supplier	**Country**	**Raw Material**	**Shipping Term**
OCP	Morocco	Rock	CFR
OCP	Morocco	P2O5 St	CFR
Qatar Oil	Qatar	Ammonia	CFR
	Brazil	Ammonia	CFR
Intermediaries	Middle East	Sulphur	CFR
	Korea	H2SO4	CFR
	Japan	H2SO4	CFR
SPIC	India	H2SO4	CFR
	India (Gujarat)	H2SO4	CFR
	Canada	MOP	
	Russia (Baltic Sea)	MOP	CFR

Exhibit 14 *Cost and Constraints of Supplier of Raw Material in PPL*

In-Bound Transport and Shipping

PPL has opted for (CFR) shipping agreement with the suppliers. Insurance is paid by the PPL. Following is the list of suppliers and the lead time from the shipping port to the Paradeep plant. Tab-c It has been observed that the lead time for importing strong phosphoric acid from OCP Morocco falls outside of the given total lead time window. In many cases, the delays are as many as 10 days, mainly caused by delay in starting the loading at the shipping port. Following are the sequence of activities and the cost incurred at the Paradeep port for unloading the raw material.

In-Bound Transport from Port to Plant

PPL owns a captive berth (FB-1) and jetty in Paradeep port. It can handle unloading both solid and liquid raw materials. One conveyor is used to unload all the three solid raw material (Rock Phosphate, Sulphur and MOP). Three separate pipes are used to offload the liquid raw materials (Ammonia, Strong P2O5 and Sulphuric Acid). The conveyor and the pipes are terminated at the Paradeep plant. The conveyor requires cleaning before unloading a different material. Unloading of solid raw material is semi-automatic; whereas the liquid raw material does not require manual labour once the pipes are connected to the vessel. The unloading capacity of solid material is 16 KMT / day. However, the effective throughput is only 12 KMT / day due to break during the operator shift-change.

5. Manufacturing Plants

high level view of the Paradeep plant covering mainly the material flow and conversion points. The maximum and usable capacity of various plants are estimated in a year.

Storage

In **Exhibit 15** the list of silos and tanks used to store raw material, intermediate goods and finished goods are presented.

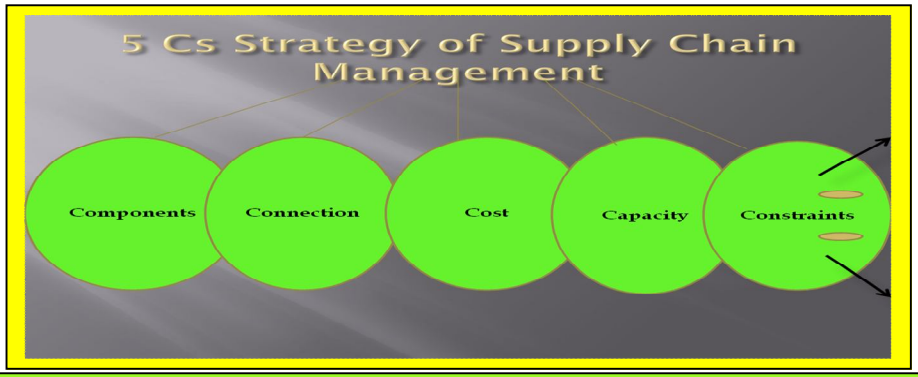
Storage – Details					
Material Type	**Storage Type**	**Storage Id**	**Max Capacity (KMT)**	**Available Capacity (KMT)**	**Maintenance**
Finished Goods					
DAP/NPK	Silo	DAP-Silo 01	30	30	NO
DAP/NPK	Silo	DAP-Silo 02	15	12	NO
DAP/NPK	Silo	DAP-Silo 03	10	8	NO
Gypsum	Pond	GYP-Pond	110	110	NO
Raw Materials – Solid					
Rock Phosphate	Silo	ROCK-Silo	120	120	NO
Sulphur	Silo	SUL-Silo	50	50	NO
MOP	Silo	MOP-Silo	30	30	NO
Raw Material – Liquid					
Ammonia					
Ammonia	Tank	NH3-TK01	10	8	??
Ammonia	Tank	NH3-TK02	10	8	??
Ammonia	Tank	NH3-TK03	10	8	??
Ammonia	Tank	NH3-TK04	10	8	??
Ammonia	Tank	NH3-TK05	10	8	??
Total			**50**	**40**	
Sulphuric Acid					
H2SO4	Tank	H2SO4-TK01	10	10	??
H2SO4	Tank	H2SO4-TK02	10	10	??
H2SO4	Tank	H2SO4-TK03	10	10	??
H2SO4	Tank	H2SO4-TK04	10	10	??
H2SO4	Tank	H2SO4-TK05	5	5	??
Total			**45**	**45**	
Phosphoric Acid					
P2O5	Tank	P2O5-TK01	10	Decreases	2 to 3 years
P2O5	Tank	P2O5-TK02	10	Decreases	2 to 3 years
P2O5	Tank	P2O5-TK03	10	Decreases	2 to 3 years
P2O5	Tank	P2O5-TK04	10	Decreases	2 to 3 years
P2O5	Tank	P2O5-TK05	10	Decreases	2 to 3 years
P2O5	Tank	P2O5-TK06	10	Decreases	2 to 3 years
Total			**50**	Decreases	

Exhibit 15 *Storage of Finished Products and Raw Materials in PPL*

1. For safety reasons, 20% is kept empty in ammonia tanks.
2. Sledge gets accumulated in phosphoric acid tanks. This results in slow decrease in capacity over time. The sledge is removed once in 2 to 3 years. The tanks are cleared in rotation. Mixing of imported and manufactured strong phosphoric acid is permitted.
3. DAP/ NPK was a single silo with a capacity of 70 KMT. Then it was split into 3 separate compartments with overall capacity of 55 KMT. However, the actual usable capacities are 30 KMT, 12 KMT, and 8 KMT. Each compartment can hold any of the products.

6. 5Cs Strategy of Supply Chain Management in PPL

The 5Cs of the supply chain (see **Exhibit 1**) from the suppliers to the dealers (end-to-end). It covers the operational details of the supply chain, which are required to clearly define the optimization problem. It captures various details of different supply chain nodes, and the business processes relevant to this context. This document generally does not carry any requirement for the project.



VISION

Our vision is to be a major fertilizer company of India, capable of meeting the challenges of free market economy.

MISSION & CORE VALUES

Mission

Our mission is to become more profitable, debt free and be ready for the 'free market' scenario, by optimizing/enhancing capacities, reducing costs, focused marketing, financial restructuring and improved productivity.

We will be committed to our core values, be good corporate citizens and develop a workforce of committed employees who would take initiative and contribute to our goals.

Core Values

- *Honesty and Integrity*
- *Excellence*
- *Discipline and Hard Work*
- *Caring for People*

GUIDELINES

Strategy & Excellence

- *Part of Total Farm Solutions*
- *Leveraging our existing channel strength*
- *Strengthens our Brand equity*
- *Profitability on its own to channel and company*
- *Establishing and maintaining the necessary systems, procedures and training so as to guarantee exemplary standards of quality in accordance with and even surpassing the expectations of the customers.*
- *Continuously adopting and applying technology towards enhancing these standards.*
- *Strictly complying with all statutory regulations and implementing international norms and practices.*
- *Ensuring that each and every individual in the organization as well as business association, contributing agencies and other stake holders respect and implement company's Quality Policy at all times*

Environmental

- *Environment Monitoring Van*
- *Respirable Dust Samplers*
- *High Volume Dust Samplers*
- *Spectrophotometers*
- *Electronic Balance*
- *DO meter*
- *PH meter*
- *BOD incubator*
- *COD digester*
- *Oil & Grease digester*
- *Water bath*
- *Flame photo meter*
- *Water bath*
- *On line AAQ monitor for SO2, NOx and NH3*

Exhibit 1 *5Cs Strategy Supply Chain Management Model in PPL*

The 5Cs Strategy of Supply Chain are:

1. Supply Chain **Components** (aka nodes) – Ex: Supplier, Port, Plant, Warehouse etc.
2. **Connection** between various components (nodes)
3. **Cost** / **Contribution** - incurred at each component and at connections. This cost covers both visible and notional cost
4. **Capacity** – Production, Storage and transportation capacities
5. **Constraints** – Limitation on various components. Ex: 4 DAP plants (see **Exhibit 8**) can produce only two products simultaneously

Exhibit 8 *DAP Plant in Paradeep*

7. 5Cs Strategy in DAP Plant

There are four identical DAP plants (see **Exhibit 5**), each with a recommended capacity of 1 KMT/day. Each plant (aka train) can be configured to produce one of the DAP or NPK products. The plants throughput varies based on the manufactured product. At the most, only two products can be manufactured from these four trains. It takes between 4 hrs and 8 hrs to change from one product to other. At any time, maximum one product can be sent to bagging plant and maximum one product to DAP/NPK Silo. In **Exhibit 16** the bills of material (BOM) and calculation of cost of DAP in PPL are explained in detail and in **Exhibit 17** details of DAP cost and import plant are shown.

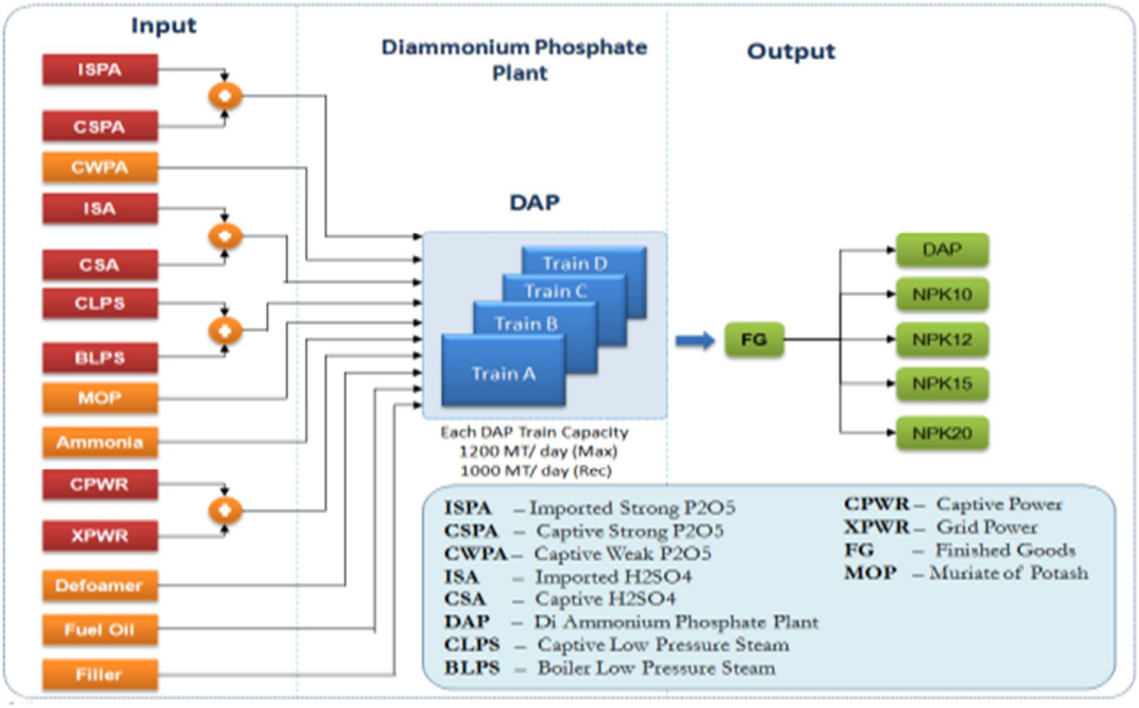


Exhibit 5 *Model of DAP Plants*

DAP/NPK - BOM & Cost Calculation												
RM	P2O5	NH3	H2SO4	Defoamer	PWR	LPS	FO	Filler	MOP	Conversion Cost (INR)	MAX WPA %	FG Cost (INR)
Unit	MT	MT	MT	KG	KWH	MT	KL	MT	MT			
RM Unit Cost (INR)												
DAP	0.472	0.223	0.01	0.10153	41	0.08	0.00658	0.0421	0	881.04	35%	
NPK10	0.27	0.125	0.01	0.09596	41	0.08	0.00633	0.0339	0.448	919.49	30%	
NPK12	0.332	0.15	0.01	0.10078	38	0.08	0.0065	0.0436	0.275	929.90	30%	
NPK15												
NPK20	0.212	0.25	0.424	0.09894	42	0.07	0.0066	0	0	847.80	100%	

Exhibit 16 *Bills of Material and Cost Calculation of DAP/NPK*

Product (DAP) Cost @ Import Plant				
Items	**DDV**	**Variable**	**Rs. (for 1 MT)**	**Notes**
Product Cost @ dealer location - Calculation				
Landed cost of DAP @ port	N	a	39,523	This includes all cost such as raw material, conversion, bagging and loading into rakes.
Storage Charges	N	b	500	1 month storage assumed
Bagging Charges	N	c	50	
Loading to rake charges	N	d	100	
Product Cost @ Port Rail Head	C	e = a + b + c + d	40,173	

Exhibit 17 *Product (DAP) Cost in Import Plant*

Capacity

There are 4 DAP plant namely Train A, B, C and D; each with the maximum capacity of 1200 MT/day with a recommended capacity of 1000 MT/day.

Constraints

- Maximum allowed weak phosphoric acid usage. (Strong P2O5 is in short supply and costly)
- Maximum 2 products at any time
- Product change over time (4 hours to 8 hours)
- Maximum one product to bagging & max one product to FG Silo at any time
- Depends on external grid power for operations (Power cut will affect the plant operations)

Maintenance

***Daily Maintenance*:** Plants need to be cleaned every day; 30 to 45 minutes are spent cleaning each train in every shift; Time Required – 3 hours / train / day.
***Monthly Maintenance*:** Every train goes through preventive maintenance once in a month. Time Required: 36 hours / train / month.

***Yearly Maintenance*:** The yearly maintenance is carried out on need basis, which is based on the plant condition. Currently, each DAP train is down for around 85 days in a year. These days include planned and preventive maintenance time, scheduled (2 hours per day) and unscheduled power cuts, and plant failures.

Thus the DAP plants are available for production for 280 days in a year. The plants are operated in all three shifts continuously. Plants are either closed or production disrupted during the natural calamities such as hurricane or earthquake. Such days need to be subtracted from the available 280 days for planning.

Problems Faced

- Raw material unavailability – due to delay in RM arrival or scarcity of RM.
- RM Storage Capacity Limitations: Forced to change the production plan to deplete certain RM, so that incoming RM from ship can be accommodated. This is done to avoid or to minimize demurrage cost at the port. However, this leads to change in production plan. Marketing department changing the current month production plan due to change in demand pattern.

- Railway restriction and congestion leading to change in despatch plan, which affects the proposed / currently running production plan.
- Labour Relations – Labour productivity, thus plant throughput, affects the execution of the production plan. Such variation in labour productivity can have domino effect on subsequent month production plans and other derived plans.
- Natural calamities – such as hurricane or earthquake -- can cause plant shutdown.
- Plans are changed based on change in contribution (profitability) of the products.
- Unexpected plant breakdown or power outage.
- Finished Goods Silo Space constraint.
- Delay in getting bags when the material requirement planning (MRP) price changes.

Distribution Side

The distribution side of the supply chain has four components (aka nodes): Plant / Port Railhead, Receiving Rail Head, Warehouse and Dealers. Although the farmers are the end users, they are not shown in this picture, as they do not affect the planning process directly. In **Exhibit 6** outbound supply chain with distribution side in PPL is shown.

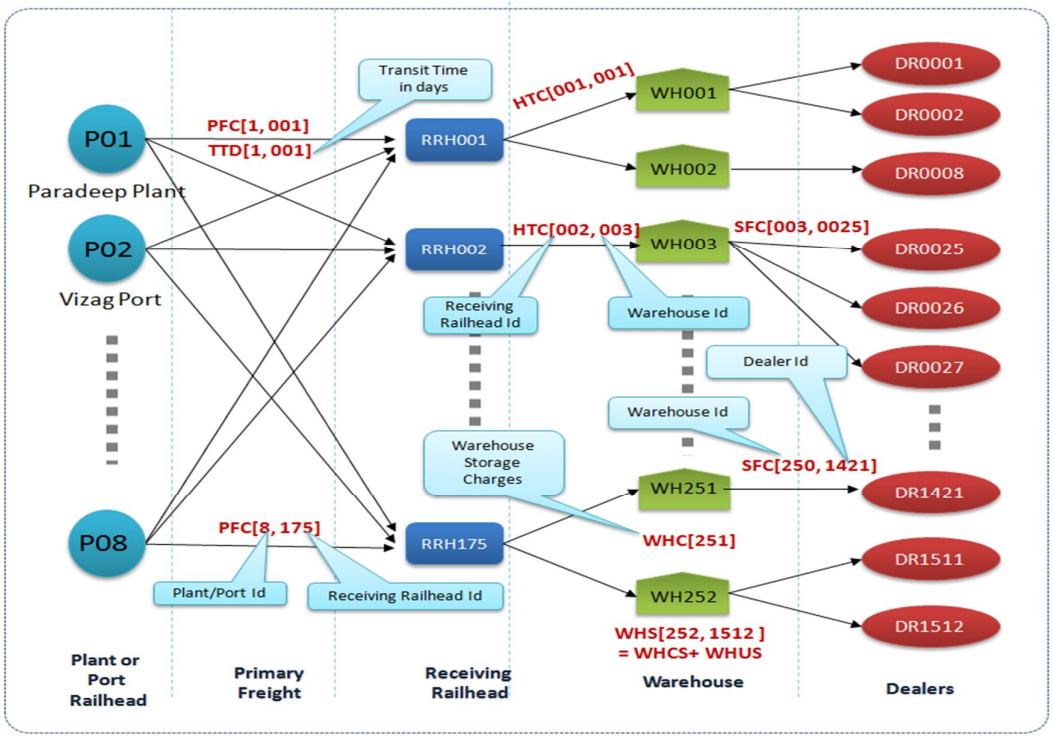


Exhibit 6 *PPL Supply Chain Distribution Side (Outbound Supply Chain)*

Legends

P01	– Plant / Port Id #1
RRH001	– Receiving Railhead #001
WH001	– Warehouse Id #001
D0001	– Dealer Id #0001
PFC[x, y]	- Primary Freight Charges from Plant or Port X to Receiving Railhead Y.
HTC[x, y]	- Handling and Transportation charges from Railhead X to Warehouse Y.
SFC[x, y]	– Secondary Freight Charges from Warehouse X to Dealer Y.
WHC[x]	– Warehouse Storage Charge at Warehouses X.
TTD[x, y]	– Transit Time in Days from Plant or Port Railhead X to Receiving Railhead Y

Various charges involved in moving the goods to the dealer are: Primary Freight Charges, Handling and Transport changes at the receiving railhead, Warehouse Storage Charges and Secondary Freight Charges.

***Primary freight subsidy*:** Government reimburses primary freight charges up to 1400 KM from the loading railhead. It can be reimbursed as soon as the goods reach the destination warehouse (receipt basis).

Steps to get primary freight charges reimbursed

a. Upload all proof of documents
b. Generate bill
c. Submit the bill to the government at end of every month
d. Reimbursement received between 4 months and 12 months

Currently around 170 railheads are receiving goods from PPL. Sales and distribution department looks at the despatch plan for the given day and contacts railway for the rake allocation. Each morning, Railways confirm the rake availability based on supply and demand. Rake intents are prepared 48 hours in advance. Rs.50,000/- is paid as rake booking advance. This advance will be forfeited if PPL cancels the intent. Railways Receipts (RR) are prepared at the Paradeep or at other ports. FSO can authorize H & T agents to receive the goods by signing at the back of the RR. Each rake has 42 wagons. Capacity of each rake is 2700 MT. PPL uses 2 point rake system. PPL need to pay demurrage charges (Rs.150 / wagon/hr) in excess of 9 hours. Railways have recently revised the demurrage charges. The average transit time varies based on location. The transit time varies from less than a day to 10 days. The average transit time is 4 to 5 days. H & T agents / FSO receive the goods and move them to warehouse. PPL has contracted various 3rd party logistics companies to handle transporting goods from receiving railheads to the warehouses. In addition, these 3rd party logistics companies are contracted to store the goods temporarily at their warehouses. They also handle secondary freight transportation. The contracts are signed for the duration of 1 to 2 years and the rates are fixed during the contract period.

The H & T charges include:

- Unloading from rake at the receiving railhead.
- Loading them into trucks at RRH.
- Transportation charges to warehouse.
- Unloading at warehouse.

Loading into the trucks at the warehouse (For secondary freight). The average H & T charge is Rs.250/MT. However, this charge varies from railhead to railhead.

(One Reason: Labour charges are different at different locations)

There are around 250 warehouses currently used by PPL. These warehouses hold 2 kinds of stocks:

1. Company Stock – Unsold stock, waiting for buyers.
2. Unlifted Stock – Already sold to dealers, but yet to be lifted from the warehouse.

Following is the monthly despatch plan, which is prepared based on input from marketing and production departments.

8. Marketing & Sales

Distribution Centres

PPL products are distributed in a widespread market covering 16 states: Andhra Pradesh, Assam, Bihar, Chattisgarh,

Exhibit 12 *Distribution Centres of PPL*

Haryana, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh, Uttaranchal, West Bengal (see **Exhibit 12**). PPL also has a selling arrangement through its sister concerns viz. Zuari Industries Ltd. (ZIL) and Chambal Fertilizers & Chemicals Ltd. (CFCL) to cater to markets in other parts of the country. PPL's sales network comprises of private as well as institutional channels. The strength of each channel varies from state to state. They have been able to tap both channels successfully.

Market Overview

The annual turnover, production, and import data for the past five year are presented in **Exhibit 9**.

Exhibit 9 *Volatility of Rock Phosphate in the International Market for the Past 10 Years*

PPL Market Presence

There are around 1,500 dealers representing PPL products in their respective regions. There are around 100 FSOs managing the dealer network. Each FSO is given a list of districts to manage, and the dealers within these districts. FSOs report to Regional Managers (15+1 regions). The regional managers report to the marketing head at the corporate office. PPL products are sold in 11 States in India. In addition, PPL products are exported to Bangladesh and Nepal. In **Exhibit 18** the details of the dealer, mainly covering their location, credit terms, supply warehouse and the secondary freight cost are presented. Such details are looked at before coming up with the despatch plan. Marketing department prepares the following demand forecast sheet every month for the next twelve months in rolling basis. Demand along with stock availability at the warehouse, minimum required sales at each region/dealer, credit limit for the dealers, production and distribution capabilities are looked before coming up with the dispatch plan.

State	Pvt. Dealer	Inst. Dealer
Orissa	242	1
West Bengal	198	-
Bihar	147	-
Jharkhand	39	-
Chattisgarh	70	1
Madhya Pradesh	156	3
Maharashtra	138	1
UP (W) – Bareilly	74	3
UP (E) – Varanasi	62	3
UP (C) – Lucknow	65	3
Andhra Pradesh	349	3
Total	1540	18

Star Dealers' Village

State	Dealers' Name	Village
Orissa	Padmalaya Store, Padiabahal	Baidharkanta (Sambalpur)
	R.K. Agro Sales, Jaipatna	Kapurmala (Kalahandi)
	Santilata Transport,Chandikhole	Sarvana (Jajpur)
UP (C) – Lucknow	Daruka Fertiliser	Bandipur
UP (W) – Varanasi	Krishna Enterprise	Tikra
UP (E) – Varanasi	Chetaram Motilal	Ramchaura
Bihar	Ambika Sales Corpn.	Deokuli
	Sawali Enterprise	Mastalipur
Maharashtra	Parsewar & Co.	Baigaon
West Bengal	Tarun Traders	Bergum
	Tapas Trading Co	Laxmanpur
Jharkhand	P. K. Bahalpuria	Chotamadhupur
	Santoshlal Gutgutia	Ratubahiyar
Madhya Pradesh	Agarwal Brothers	Lohraura
Chattisgarh	Madhu Fertilisers Ltd.	Sindhurikala
Andhra Pradesh	Diyalal Madhusudan Rao	Thimmapuram

Exhibit 18 *Dealers' Network of PPL in India*

9. Conclusion

This document will serve as a case history to understand the "as-is" processes and policies of PPL. This will be a living document, which need to be updated periodically, as the environment / processes / policies change.

This document will form the basis to come up with System Requirement Document (SRD) and Solution Architecture Document (SAD) for the Supply Chain Optimization Project. The SRD will cover the "to-be" processes and the solution expectations. The SAD will cover how these requirements will be implemented. The content in SAD includes high level optimization models, data schemas, the detailed data requirement and the high level UI requirements. The SRD will also cover the Proof-Of-Concept (PoC) requirements.

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