



Introduction to Product Logistics

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Introduction

In a general business sense, product logistics can be described as the management of the flow of things between the point of origin and the point of consumption in order to meet the product requirements of customers.

Product logistics is a critical factor in the overall success of any project. It is inconceivable for a project to be classified as successful if the plant resulting from such a project cannot operate at planned capacity due to the following:

- Limitations on feedstock supply or feedstock quality deviations;
- Business cannot sell the product to the final customer, due to product contamination prior to reaching the customer;
- The final product cannot reach the customer according to the contracted plan due to constraints in the outgoing logistics chain; or
- The packaging of the product does not meet the customer's requirements.

All the above are examples of product logistics shortcomings that can handicap a project, even if such a capital project was completed within budget and on schedule.

Scope of the article

By its nature, a short article like this can only touch on the surface of a complex concept such as product logistics. To limit the scope of the article, only the following aspects of product logistics will be dealt with:

- Important factors during the conceptualisation, project implementation and business commissioning of capital projects, rather than the later phases of the overall project life-cycle;
- Factors pertaining specifically to the petrochemical industry;
- Product logistics, rather than the wider topic of product supply chain (see previous Insight Article 037 on Project Logistics (Steyn & Lourens, 2017) for an explanation of the difference between logistics and supply chain); and

- Incoming logistics of feedstocks and outgoing logistics of products are considered, but not internal logistics of moving the materials through the petrochemical plant or the logistics of consumables (such as process chemicals, catalysts, gaskets, safety equipment, etc.), spare parts, shutdown or turnaround materials and project equipment (for the latter topic, please refer to the previous Insight Article).

How does product logistics fit into a petrochemical project?

Product logistics forms an integral part of the project planning and execution of any petrochemical project. Like any other operational aspect of a project, such as production or maintenance, the product logistics for the ultimate operations of this petrochemical plant, must be considered throughout project development.

Figure 1 shows some of the elements of inbound and outbound logistics which must be considered; in this case for an LNG (liquefied natural gas) export project, with the inbound logistics shown as pipeline (and sometimes underground storage as well) while the outbound logistics includes LNG storage, export port, LNG ships, import port and pipeline distribution.

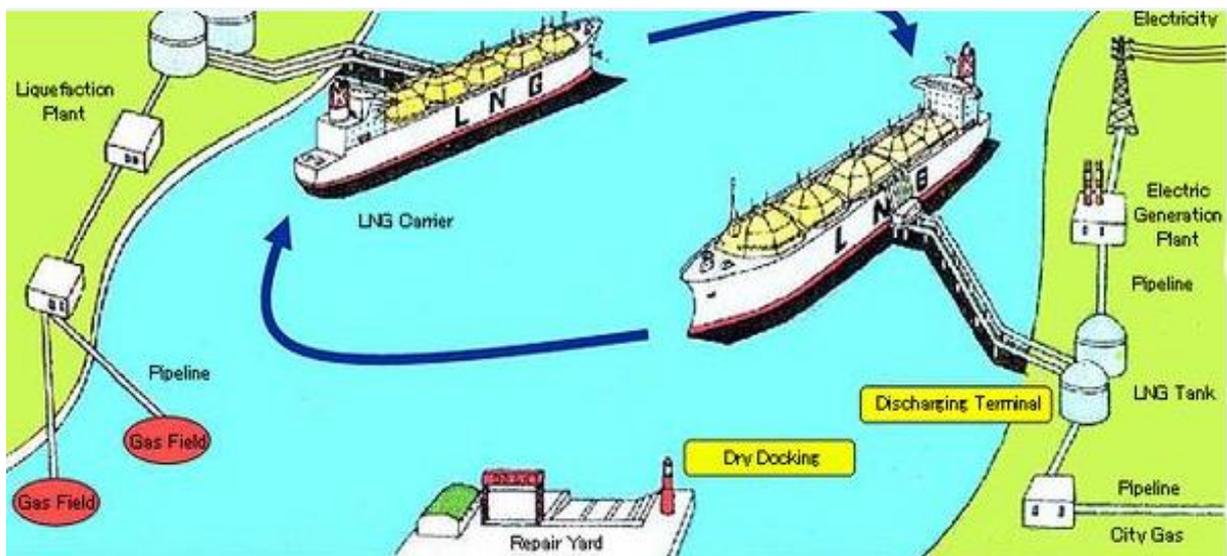


Figure 1: LNG inbound and outbound logistics chains (“K” Line, 2017)

The stage-gate model approach to project management soundly deals with the product logistics requirements of a project. At every stage of the project, it is necessary to confirm that the product logistics development is on par with the overall project's stage of development, and that the product logistics planning is fully integrated with all the other streams of the stage-gate model.

Product logistics planning commences at the early stages of a project and forms an integral part of the conceptual and prefeasibility studies. Examples of such early phase product logistics considerations are:

- **Facility and logistics infrastructure siting:** Siting and the access to transport infrastructure such as railway lines and suitable ports;
- **Feedstock sources and quality:** Feedstock source(s), quality of feedstock and possible pretreatment before incurring logistics costs;
- **Customer quality requirements:** Final product customer base and quality, and the ability to deliver the desired quality all the way to the customer; and
- **Multi-purpose logistics infrastructure:** Interface between project logistics (Steyn & Lourens, 2017) and product logistics, and possibility of creating logistics infrastructure to be used for both purposes.

Typically, the capital cost for investment in logistics facilities is a relatively small portion of the overall capital investment in a petrochemical project (normally anywhere from 2 -10%), but product logistics is crucial to the ultimate project or business success of the investment. Therefore, product logistics must be an integral part of every framing meeting as well as other stage-gate meetings of the project.

Conversely, the logistics costs of an operating petrochemical facility is typically a substantial portion of the overall operating costs (normally anywhere from 5 – 25%), and therefore logistics cost optimisation is essential to overall business success. Like the other operating costs incurred during plant operations, the logistics costs are largely determined during the design phase of the facility and must receive adequate attention to ensure the desired optimisation.

Multitude of decisions

The project phase of product logistics entails a multitude of decisions that must be taken. Many of these decisions are dependent on decisions that must firstly be taken by other business functions such as marketing, production, business management, etc., or decisions that are taken in consultation with those business functions. There is often the need for logistics input into decisions by other functions or disciplines. Examples of these multiple decisions are:

- **Mode of transport:** Mode of transport to be used at various stages of supply or distribution. Options in the petrochemical industry are normally road transport, rail transport, pipeline, barging, shipping, or conveyor belt;
- **Storage capacity:** The required storage capacity must be decided upfront during the feasibility phase of the project since this impacts the site lay-out, the basic design and the capital costs. The total storage capacity of feedstocks and products are determined by a variety of aspects such as turnaround periods (at suppliers in the case of feedstocks), required security of customer supply, strategic stockholding levels, and seasonality of feedstocks supply and product offtake. Decisions must be taken on how much of the storage capacity will be provided on-site as well as off-site (possibly closer to large customers to ensure

security of supply). The capital cost of specialised storage such as refrigerated or pressurised storage vessels can become a major consideration.

- **Product packaging:** Packaging to be provided, normally mostly for outbound logistics. This could be bulk, isotainers, drums, bulk bags, normal bags, etc., or a combination of these as determined by marketing.
- **Quality control measures:** For the outbound logistics chain, this will include third-party quality assurance and possibly blending facilities, third-party inbound product logistics and upgrading facilities close to the customers. For the inbound logistics, this could include blending facilities and third-party quality assurance;
- **Security of customer supply:** In conjunction with the marketing function, the security of supply to customers is determined. This will accordingly affect the decisions on aspects such as strategic stockholding for feedstocks and products, duplication of inbound and outbound logistics channels, contingency plans on product supply, etc.
- **Product safety:** In the petrochemical industry, the products handled during both inbound and outbound logistics could be flammable, explosive and/or toxic. Suitable measures must be put in place to ensure safe handling of these products during the logistical operations; and
- **Logistics infrastructure:** Product logistics is normally not core business for the owner or investor involved. Therefore, the default position should be for third parties to construct, own and operate the product logistics function. There are, however, many strategic considerations that could lead to alternative decisions. For instance, third parties may be hesitant to make large investments in infrastructure in some cases. This could then lead to investment and ownership of the product logistics assets by the project owner, but operations thereof by third party operators. Secondly, inbound and outbound logistics chains, or elements thereof, may be so strategically important to the overall business success, that ownership and control thereof must be retained by the project owner. Thirdly, the remote location of a petrochemical facility may force the developer to supply infrastructure, at least up to the point where it links to existing infrastructure. Lastly, there may be a strategic necessity to have two logistic channels and/or two or more logistics suppliers.

It is essential that all these decisions and risk management activities are coordinated within the overall project development and in close consultation with all the other functions. A structured process, such as the stage-gate model, is ideal for this purpose.

Third parties and contracts aplenty

The logistics activities are characterised by interfaces with third parties. These interfaces are typically regulated by contracts. A single sales contract with a customer can easily be backed up by ten contracts with logistics third parties. For an overseas

customer supplied on a CIF (cost, insurance and freight) basis there could, for example, be a need for contracts with overland transporters, a port storage provider, an affreightment provider, a third-party quality assurer, insurers, freight forwarding agents, packaging materials or equipment providers, packagers, and logistic coordinators.

A substantial portion of the products from a petrochemical plant is typically exported, normally to a variety of countries and usually requiring deep-sea logistics. This has, amongst others, the following consequences:

- The outgoing logistic chains are long, requiring careful planning and stock control;
- The logistics contracts must be concluded in various legal jurisdictions; and
- The deep-sea logistics will be governed by maritime law; a distinct and specialised body of law.

For a logistics chain that includes international shipping, the COAs (contracts of affreightment) are critical. These contracts with ship-owners may have to be concluded years in advance of any product being shipped to allow the ship-owner the opportunity to create additional shipping capacity and/or rearrange its shipping routes. This would especially be the case when there are large volumes of product shipped, when the product shipped would necessitate new shipping routes and/or when the product requires specialised shipping (for example, pressurised, specific materials of construction, or refrigeration).

The sales contracts are concluded under certain commercial terms which determines the point(s) where the buyer takes over the costs, risk and documentation of the product logistics. These commercial terms are extremely important from a logistics perspective since it determines the services and infrastructure to be provided by the owner of the petrochemical plant. These commercial terms are widely known as Incoterms® and a whole range of possibilities exist, as shown in Figure 2.

It is essential that the logistics system design is audited by a third party during the project implementation phase. This audit is primarily aimed at the operability of the logistics design, rather than the cost-effectiveness of the logistics system. The timing of this audit is important: it must be late enough during project development so that the bulk of the system is ready for audit (especially the documentation and information systems), but not so close to commissioning that there is no time to implement changes.

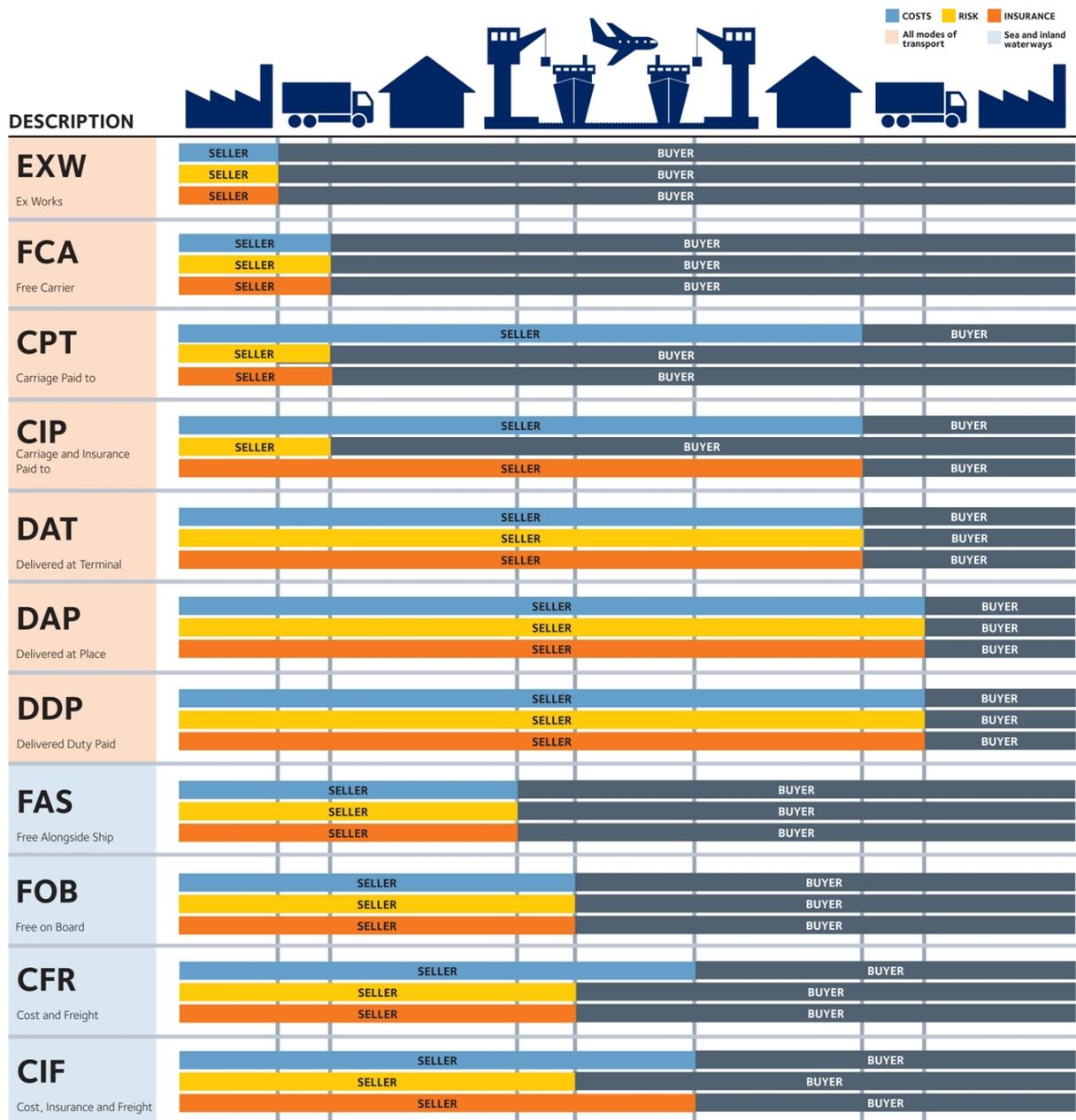


Figure 2: Incoterms® 2010 as defined by the International Chamber of Commerce (Emadtrans, 2013)

Summary

The crucial aspects of product logistics as discussed above, are:

- Product logistics is managed as part of the stage-gate approach to project implementation and commences at the earliest phase of project development;
- Logistics capital costs is normally a small portion of the overall project capital, but the success of the logistics system determines the overall project success;
- Logistics operating costs is normally a substantial portion of the overall costs and needs due optimisation during the project development phases;

- In the project phase, product logistics is characterised by a multitude of decisions to be taken on factors such as mode of transport, storage capacity, packaging, risk management, and third party versus own assets and operations;
- Numerous third parties are typically involved in the inbound and outbound logistics activities and the contracts governing these relationships must be concluded during the project phase of the development, sometimes years in advance of plant commissioning; and
- A logistics system audit must be performed by a third party during project development to ensure that the logistics will commence with limited disruptions.

References

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