Digitalization of Supply Chains in Chemical Logistics

More transparency and efficiency from shipment creation to delivery

May 2016
Editorial

1. Digital supply chains in chemical logistics

2. Requirements to IT-based supply chain management in the chemical industry

3. From shipment creation to delivery:
   a. Initial creation of shipment data by chemical factories
   b. Transmission of shipment data to a large number of forwarders
   c. Monitoring of shipment progress & reporting
   d. Special case: Handling of samples

4. SPECIAL: Supply management for chemical parks

5. Benefits of digitalization
EDITORIAL

An important element in the chemical industry's growth process is logistics. But it is only in connection with modern IT that it becomes a highly effective solution. Modern IT for processes as World 4.0 describes: everything runs on its own.Congestion-free, stress-free.

Nothing other than that is said in the report "Excellence in Chemical Logistics" by Worldwide Business Research which was published prior to the LogiChem 2016: It is a top priority for companies of that industry to maximize the advantages of digitalization for their own business.

Important factors: The solution must allow for collaboration with partners and customers. It must make processes transparent and provide information which allows for reliable planning of available resources. Hence it is no surprise that 86 per cent of the respondents said: Digitalization becomes more and more important for optimizing supply chain processes.

But how to make the step into the digitized world of chemical logistics? How can the complex requirements in managing the supply chain or the inbound and outbound transports in chemical parks be mastered more easily?

This expert paper demonstrates you the various options which are possible in the combination of powerful logistics and modern IT in the chemical industry.

We wish you an inspiring read!
Modern IT systems help to master the complexity of supply chains in the chemical industry. They manage the flow of information which accompanies the physical flows of goods. And they deliver the infrastructure for the digitalization of processes in the new world of Logistics 4.0. But in order for processes to be able to be automated continuously from delivery call-off at the supplier up to delivery to the customer it takes one basic requirement: Full integration of the logistics partners involved. Integration is the prerequisite for collaboration in complex supply chains. It creates networks in which information flows and can be shared. The cost saving potential in global supply chains is massive due to such networked logistics.

In the age of digitalization cloud technology delivers an essential contribution to more efficient organization of logistical processes. Especially sensitive distribution logistics in the chemical industry can benefit from the advantages of IT-based supply chains as

a) it is about integrating many different parties with the logistical process. While on the procurement side there are often complete transports for large volumes delivered by a rather small number of suppliers, distribution is characterized by smaller volumes and a large number of different consignees.

b) the supply chains in distribution are often global. Long transport routes across country borders require a high degree of transparency.

c) in distribution it is often that different carriers and significantly more forwarders are employed than in procurement. While in procurement logistics rail freight transport plays a big role, distribution is done in multimodal transports via road, sea and partly by airfreight.

“Through AX4 we can present our processes in an even more transparent way and deliver important information in a timely manner so that if necessary our customer can adapt his production in time and without downtimes.”

Harald Gort
CIO, Lexzau Scharbau
The goal is to be able to quickly, easily and flexibly manage cross-company logistical processes in a global network of a large number of forwarders and locations and to ensure smooth cooperation between the various participants along the transport chain. This kind of interaction between shipper and forwarder requires a high degree of transparency and a continuous supply of required information.

In order to improve communication between the involved parties and to optimize delivery processes it is required to standardize the processes. Modern cloud-based IT solutions can support here as they allow for central access to transport-relevant data for all participants and thus create a consistent level of information. By mapping a cross-company process in the cloud, which is valid for everyone, individual and local isolated solutions can be avoided or removed. In addition cloud solutions ensure that logistical processes run in automated ways: They are documented in detail and the system alarms when processes or pre-alerted delivery times run out of hand.

“We wanted to standardize communication with our forwarders instead of using multiple communication forms.”

Holger Eiffert
Head of SCM & Sales Services, Kuraray Europe
The typical logistical distribution process in the chemical industry mostly looks as follows: The chemical producer distributes goods from various locations to a large number of customers. Depending on the company’s diverse transport requirements different forwarders are being used. Shipments consist of general cargo, partial or full loads or – in case of samples – of small parcel shipments. In addition there are dangerous goods for which special service providers are being used. At the same time – especially in international distribution – various ways of transport are used such as air, sea, rail and road. The processes for cooperation and for the exchange of information can be organized in different ways depending on location and forwarder. Many departments in the company are affected by logistical processes, therefore the requirements for an IT system are comprehensive:

- **The company’s central logistics** needs central overviews, continuous transparency of all locations and clear measurability of performance as well as meaningful reports. In addition, processes which are standardized across locations are desirable instead of many individual solutions, also integration with the own data warehouse system. In addition to that, central availability of validated shipment count would be helpful, e.g. for tenders.

- **The purchasing department** needs solutions which can quickly and easily be rolled out to new forwarders and an updated data basis which delivers all the required information on shipment structures for tenders at the push of a button.

- **The individual locations** require easy and automated communication with forwarders, i.e. quick and cost-effective integration of new forwarders, automated exchange of all required data, quick ability to provide information in case of problems and on the shipment’s progress. They also need a system which can flexibly map the locations’ special requirements.

- **The customer service center** requires easily accessible and timely information on the shipment status and proactive notifications in case of problems.

- **The IT** needs a system which can be implemented at reasonable cost, which can be easily integrated with the existing system landscape and is easy to maintain.
2. REQUIREMENTS TO IT-BASED SUPPLY CHAIN MANAGEMENT IN THE CHEMICAL INDUSTRY

Besides that, also external partners make requirements to companies:

- The company’s customers expect transparency and an easy way to access their shipment information. They want a modern and innovative set of features.

- The forwarders require early information on planned transports and an easy way for the driver to report status information.

“We transmit all shipment data centrally from our SAP system to AX4, from where it is being forwarded to the various forwarders. These, in turn, report tracking data which is returned to SAP in a harmonized structure.”

Michael Kuschnerus
Logistics Manager, Brunsbüttel factory, Sasol
A cloud-based logistics platform like AX4 offers the chemical producer a central solution for communication with various forwarders and transport service providers. The flow of information in shipment management is mapped continuously and the solution can be flexibly adapted to the locations’ varying requirements. It thereby replaces numerous individual solutions by a single standard.

The typical components of a digital distribution process are subsequently described using the example of the logistics platform AX4:

a. Initial creation of shipment data by chemical factories

From the different locations’ and factories’ ERP system pre-dispatched shipment data is transmitted to AX4 (one interface per each different ERP system). By accessing master data such as packaging or transit times, additional shipment data can be added automatically. Automated shipment consolidation can be done according to pre-defined criteria (e.g. same day, same consignee). AX4 also considers requirements based on dangerous goods data. An integrated dangerous goods database (ADR 2015) with an interactive dangerous goods entry screen supports the classification.

Necessary documents like loading lists, shipment documents or barcode labels can be generated and printed at the push of a button. Dangerous goods information can also be displayed on the loading list of the forwarding order. Through pre-defined routing rules AX4 finally transmits the shipments to the various forwarders.

There are some special features here: The ERP system’s dataset includes data which cannot be imported into a forwarding program but which is important anyway and must not simply be “cut off”. Therefore AX4 saves this kind of data for the forwarders, easily accessible in their AX4 web account. As a consequence only data which can be processed will be transmitted to the forwarding program.

Also, not every forwarding program is able to process shipment updates. The solution: AX4 saves shipment pre-alert data in the user’s web interface; here it is available for the user by logging in. Only shipment data marked “final” will then be transmitted to the forwarding program by AX4.
b. Transmission of shipment data to a large number of forwarders

The forwarders receive a service offer with a variety of connectivity variants from which they can flexibly choose the option suitable for them, e.g. individual interface, standard interface, web account, e-mail notification in case of new shipment or download function for shipment data.

The cooperation between chemical producer and forwarders is thus optimally supported as the next partner in the chain is being sent the best-possible data by AX4 which ideally supports his processes. Examples can be: automatic calculation of volume, loading meters, chargeable weight based in stored material profiles.

The earlier the forwarder can view the chemical producer’s shipment data the better he can plan his resources. For example, the logistics platform as a collaborative IT system allows for the forwarder to gain insight into planned or pre-alerted orders early on, so-called forecasts. This way he can see whether possible synergies exist. Early insight in the upstream or downstream partner’s processes offers valuable optimization approaches.

“The better organized the value chain is the more competitive a company is. As a 4PL service provider the flexible cross-company integration of our customers and transport partners at any time is absolutely essential.”

Alexander Bauer
Chairman, 4PL Central Station Group
3. FROM SHIPMENT CREATION TO DELIVERY: A CONTINUOUS IT-SUPPORTED PROCESS FOR DISTRIBUTION LOGISTICS

c. Monitoring of shipment progress & reporting

Also here it is about facilitating the work of the participants, in this case the forwarders, in the best possible way: Tracking data can be reported via existing interfaces which are the forwarder's standard and therefore do not require any further programming efforts. At the same time the platform ensures that the various forwarders' tracking vocabulary is translated into a harmonized vocabulary. This can be automated and does not have to be a burden for any of the participants. Feedback on tracking data can also be given by the driver. The driver uses his smartphone to scan a QR code on the forwarding order and can then use a dedicated screen to enter the required information.

Through a defined interface tracking information then flows back into the ERP system. Monitoring of tracking data and of the flow of transport is taken over by the platform. Comprehensive notification functions in case of certain events like late pick up or missing package support here. For the participants this means: They receive information on discrepancies automatically and do not need to invest time to actively do a research.

Also the shipment's consignee can be permanently informed on the current status. An automatic shipment pre-alert sent to the consignee by e-mail includes a tracking link which displays the shipment's tracking data.

On top of that, the chemical producer's central logistics department is provided the Control Tower function, a useful monitoring instrument with cross-location search functions and overviews, e.g. on shipments with delays or risking delay. A reporting module also provides information about the forwarders' performance and delivers reports on shipment structures, e.g. as a basis for tenders.

The logistics platform AX4 as an enabler of collaboration relieves the participants from manual tasks, automates those and thus makes the participants' work easier. Moreover, AX4 harmonizes heterogeneous wordings into a central vocabulary.
d. Special Case: handling of samples

For a chemical company handling of samples has great significance as they are the tickets to new business. Fast and secure delivery of samples to the respective customers is therefore essential.

A company’s sample warehouse sends numerous packages per year to the customers. Shipping is usually done through a parcel service provider, while complexity increases with numbers. Not only order entry but especially tracking of shipments becomes rather tedious and often does not deliver the requested information in the desired quality and time.

The logistics platform AX4 offers a central way of communication to the CEP providers. An order – no matter to which one of the connected CEP providers – can be entered through the system, which then also provides the respective labels. Furthermore, through the small parcel solution it is possible to view status reports of all parcel shipments through a central platform. Besides, AX4 calculates due dates based on stored transit times and uses them to monitor the shipment’s progress.

In this way the complexity in the samples shipping process can be clearly reduced. It reduces the error risk and allows for time savings and reduced efforts. However, much more important is the increase in transparency: The option to be able to view tracking information on the samples easily and centrally for all parcel shipments increases security.

“The platform gives us the possibility to integrate new partners with our network at any time at the push of a button and to be able to transparently manage the complex network of our cooperation partners.”

Thomas Förster
Vice President Regional Supply Chain Services Europe, BASF
4. SPECIAL: SUPPLY MANAGEMENT FOR CHEMICAL PARKS

Application areas for the use of IT

Chemical parks and large production locations are often logistical hot spots close to the city with their own infrastructure. Transport volumes in these locations are high which especially burdens road traffic: Around the chemical site traffic jams may occur, severely affecting supply processes in the factories. But even on the premises the traffic situation is complex: Trucks need to be parked in the right spots, routed to the right unloading or loading stations or be weighed.

For chemical parks it is therefore important to be able to coordinate transport and logistical processes both within and outside the location. For one, this requires a high degree of transparency and also a cross-location IT solution which prevents traffic jams and at the same time ensures the best possible supply and disposal for the companies in the chemical park. Only a central IT solution which maps processes both within and outside the premises can perform this management task. Important components of these integrated IT solutions are:

A IT on management of supply chains outside the chemical park’s premises
   • Cross-company transport management

B IT on management of logistical processes within the chemical park’s premises
   • Check-in / time slot management
   • Integrated Truck Guidance
   • Dock and Yard Management

An IT solution which integrates all four application areas creates the option of continuous supply management for shipment transports up to unloading in the chemical park as well as for trucks for the distribution of chemical products. When this is offered in combination with the central IT platform AX4 this results in a very comprehensive collaboration process through which the participants can exchange shipment- resp. transport-relevant data and information.

Together with Siemens Postal, Parcel & Airport Logistics and Siemens Mobility AXIT offers a comprehensive software package which allows for continuous data and process transparency in supply management.
The management of incoming transports

**Collect transport data centrally and make it available**

Information on incoming transports are transmitted by the shippers or forwarders to AX4. This data already contains all important information for the chemical park, including details on the kind of shipment, volume and weight, probable arrival date, optionally enhanced by prioritization marks for especially urgent materials and much more.

In order to make it as easy as possible for the participants to transmit data to AX4 the IT solution offers flexible connectivity options: Easy and straightforward access is possible via web, individual interface or upload function. For the chemical park the platform offers a central view on all incoming transports – across forwarders and reachable with a single click.

Even the estimated arrival dates can be gathered from the data or they are calculated by AX4 from stored transit time tables. AX4 not only provides the forwarders' or carriers' shipment pre-alerts for the participants but also transmits them to other IT systems of the chemical park through a central interface. Complex manual entry is eliminated, the data can be further processed immediately.

**Access tracking information at any time**

And the same way forwarders can transmit tracking information on their transports. Initially roughly calculated arrival dates become more and more precise in the process. The chemical park's logistics managers access the transport status any time at the push of a button and plan for the arrival exactly and reliably.

Alternatively they can search for a specific transport. A control tower overview marks delayed transports with a “red traffic light” and thus visualizes problem cases at a glance. In case of irregularities in a transport’s progress the persons in charge are informed via e-mail through the integrated supply chain event management system.
4. SPECIAL: SUPPLY MANAGEMENT FOR CHEMICAL PARKS

The system monitors, checks and documents previously calculated deadlines on the transit time and automatically sounds an alarm in case of irregularities.

Advantages:
- Transparency in the supply chain and proactive information in case of delays
- Utilization optimization for the chemical park
- Early determination of expected system load at loading points due to forecast on incoming transports
- Reliable and quick transshipment processes even in case of tightly clocked time slots
- Status access on incoming transports at the push of a button, in connection with reduced research efforts

Check-in and time slot management

Through AX4’s time slot management the chemical park and its forwarders can define a convenient delivery time resp. arrival time. The forwarder views, reserves and books free time slots through his web access.

The chemical park, in turn, confirms bookings through the system. This way inconvenient traffic congestions caused by unplanned deliveries can be avoided for both sides. Besides, through exact time slot management the chemical park can assign its staff in incoming goods more efficiently. Forwarders have the advantage of not having to wait. Even peak times can be managed more easily due to increased transparency and common exchange of information.

By linking time slot, truck and, where applicable, the number of shipments on the truck it is possible to extend or reduce the allocation of a loading point depending on the number of shipments per truck.
Alternative:
For some companies and locations a leaner alternative on time slot management is sufficient. Based on pre-alerted transports it can be planned how many vehicles are to be expected.

To achieve this, the forwarder or shipper enters basic information on the transport into AX4, plus possibly the type of vehicle, plate registration, driver’s name and the planned arrival time. This information is immediately available for the chemical park and can thus be used for resource planning.

Upon arrival at the chemical park the driver can now do a self-check-in based on the transport pre-alert’s details. To do this he identifies himself either by manually entering a reference number or with a barcode scan. The system consults stored master data to verify the transport and, if necessary, requests additional information.

Advantages:
- Better utilization of resources and increased planning security on the use of staff in incoming goods
- Idle and waiting times are reduced by up to 40 per cent while shipper’s productivity increases by more than 20 per cent at the same time
- Efficient automated communication between chemical park and shipper
- Transparency allows all participants to manage their processes in a more active, targeted and reliable way.
- Time slot management is fully integrated with AX4’s shipment management so that shipment and manifest data is automatically taken over into time slot booking

“Collaboration means to us, to share transport information with all involved participants via one central platform. This is necessary to cooperate smoothly.”

Ivonne Stange
Logistics Manager Europe, Almatis GmbH
Integrated Truck Guidance - to increase efficiency of chemical parks’ performance

Guest article by Dr. Padideh Moini Gützkow, Siemens Mobility

Many chemical parks ask how growing flows of goods can be smoothly handled in the future and how truck traffic can flow without disruptions on the access routes. Even today the access roads to chemical parks can experience bottlenecks at certain times of the day with the acute lack of public truck parking spots playing a central role. Challenges which already exist today are delays in the transshipment process, long transit times for trucks and a lack of information on incoming trucks. The most severe consequence of these factors is a backlog of trucks along with increased waiting times at the gates and ramps for loading and unloading. Unproductive trucks not only cause immense cost in incoming traffic (for routes shorter than 300 km up to 25 per cent of total cost) but they also have negative external effects on the environment, the local flow of traffic and traffic safety in general.

Integrated Truck Guidance has the goal to create logistical processes in chemical parks in a more efficient way in the future. When a truck driver is on the way to the chemical park he signs into the system through a smartphone app. The coordination center then retrieves his position via GPS, the system gathers relevant truck data, anonymizes it and bundles it with current regional traffic data such as travel times, traffic situation, disruptions etc. All this data is then analyzed in real time and the results are sent to mobile devices on the truck and the system’s installed LED signposts. The result: chemical park, forwarder and driver can see at a glance whether the planned and expected arrival time match. If that is the case the driver can continue his journey. But if delays are to be expected it is possible to react swiftly and to make arrangements. So instead of directing the truck only upon arrival the data is already coordinated when on approach and arriving trucks are directed to the next available loading point as quickly as possible.

Without intelligent logistics it will hardly be possible to remain in the flow in a world of globalized flows of goods. This is where Siemens already uses the new system today to remove tomorrow’s bottlenecks. The intelligent truck approach control increases the performance of chemical parks and at the same time ensures that traffic flows. It will use the capacities on the premises and outside the gates which are already limited today as efficiently as possible. A future-oriented result of the fruitful cooperation of the operator of Central Europe's leading logistics hub, duisport, and the expertise and know-how of automation, digitalization and well-proven hardware solutions by Siemens.
The Dock and Yard Management (DYM) facilitates the management of all transport processes within a chemical park. With DYM all transports on the premises are coordinated transparently so that processes from a truck's arrival to departure run smoothly. This way the throughput times at the entry gates are minimized and utilization of valuable resources at the loading docks is maximized. Bottlenecks are avoided due to intelligent management of transports.

Upon entry into the chemical park the individual vehicles are identified via RFID, automatic plate recognition or via Smart Card. Based on the transport plans and available data on the vehicle and its load subsequent processes on the premises can be coordinated without problems. The driver is given relevant information on the stations he has to call at on the premises, such as parking position and ramp for unloading and loading through a ticket printer at the entry gate, via a mobile device or on large display boards. An integrated task management takes care of automated management of shunting vehicles. Like this their utilization and timely allocation of staff for unloading can be optimized.

DYM offers an exact overview of the chemical park's entrance and exit gates, driveways and parking zones as well as loading and unloading docks resp. zones and the trucks and swap bodies situated there. A web surface displays the premises' condition, i.e. the current positions of all vehicles and containers including their processing status. Interfaces transfer the data from the IT-controlled systems within the chemical park to DYM. For better management of operations on the premises the software can be supplemented by adequate hardware solutions (sensors, actuators). This way, additional displays, utilization and/or RFID sensors, printers or handhelds can be integrated through the IT solution.

Thereby DYM increases effectiveness and efficiency in a chemical area with the following performance features:

- Optimization and automation of transport processes from arrival to departure
- Reduction of throughput times due to automated transport handling
- Avoidance of bottlenecks like traffic jams and unplanned waiting times
- Standardized management of transport movements
- Optimized and targeted use of all resources on the chemical park's premises
- Reduction of personnel cost and required resources
The digitalization of management and information processes in logistics opens up groundbreaking opportunities for companies of the chemical industry. Even complex tasks in delivery networks can be flexibly realized. Cloud-based IT solutions make complex logistical processes easier to manage. They allow for the integration of all participants along the supply chain at the push of a button. Processes are automated, availability of data increases and the quality of information grows.

Due to central availability of transport-relevant information for all participants it is easier to make decisions, to avoid costly wrong decisions and to reduce cost for research and information procurement. In practice this leads to the following results:

**Reduced logistics cost:**
- The early recognition of synergies, e.g. in utilization of transport vehicles due to improved planning capability and transparency leads to reduced transport cost and even the number of special transports reduces significantly.
- Savings in freight cost can also be achieved by way of tenders as detailed and reliable data on shipment structures and volumes is available for the tender documentation.
- Administration cost is reduced as fewer research is required and duplicate entry of data is eliminated.
- In a central cloud solution data which is gathered due to common processes and the use of a common IT is collected. Based on this new key figures or key figures with more valid values can be created.

**Quicker and more reliable supply chain:**
- Smooth interacting processes replace breaking points between the companies and harmonize heterogeneous IT landscapes in a common process for the participants.
- A central logistics platform allows for more efficient planning of transports as well as of resources in the chemical park.
- Reliability in distribution increases due to more stable processes, transparency and meaningful KPIs, timely information in case of irregularities.
- Complexity is reduced, which also reduces risks along the supply chain. Also the error rate caused by intransparent processes or lack of access to information is significantly reduced.
- Due to the integration with the flow of information also satisfaction among the company’s customers increases.

Due to central availability of transport-relevant information wrong decisions can be avoided.

The early recognition of synergies leads to reduced transport cost.

A central logistics platform allows for more efficient planning of transports as well as of resources in the chemical park.
5. BENEFITS OF DIGITALIZATION

Efficiency by collaboration:

- Cloud solutions allow for close cross-company cooperation in the sense of collaboration – a key factor for increasing margins: More efficient management and the reduction of various cost factors lead to higher margins for all participants.
- Internally many companies are already highly optimized. However, the area of cross-company cooperation still leaves a lot of leeway for innovative ideas. Collaboration intensifies cooperation between companies. The close and partner-like cooperation results in an innovation-friendly climate and new ideas can be looked at in a more holistic way. In addition, those new ideas have fewer obstacles to overcome as the various parties already cooperate closely. Thereby the conditions are perfect for driving and implementing innovations.

Savings through modern IT:

- Connecting the cloud solution to the ERP system allows for reduced efforts of 50 per cent when integrating new forwarders that used to have a direct and dedicated connection to the ERP system.
- Compared to a locally implemented software time savings in rolling out a cloud solution to a new location amounts to 70 per cent since the solution can simply be copied.
- Internal maintenance efforts for the system are eliminated and the internal IT is further relieved by outsourcing forwarder integration.
- The logistics platform AX4 also offers customers another advantage: By using the administration environment AX4 Open solutions can be adapted independently. This leaves companies with a high degree of agility and freedom of design. Like this innovative ideas can be realized independently from the software manufacturer with the available tools. And that is probably the biggest benefit for many: Future reliability.
You can order further information about the use of the logistics platform AX4 as well as examples of best practices at the following contacts:

Germany:  
e-mail: info.germany@axit.de  
phone: +49 (0) 62 33-4 59 43 - 0

US:  
e-mail: info.us@axit.de  
phone: +1 972 - 947 - 7270

China:  
e-mail: info.china@axit.de  
phone: +86 10 64 767 579