

The Dow Chemical Company

Based on an interview with Henry Ward, Global Supply Chain Director, Security, Sustainability & Public Policy, Dow Chemical
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Dow Chemical: Strategies for Supply Chain Security and Sustainability

The Changing Landscape for Supply Chain Risk Management

Historically, the issues that cause the greatest impact on the supply chain included natural disasters, severe weather, labor disputes and work stoppages, and social and political unrest. Since The Dow Chemical Company operates on a global scale, these conventional risks continue to have the greatest enterprise-wide impact. But, the risk landscape has changed dramatically since 9/11. Increased terrorism risks, coupled with pandemics, cargo theft, chemical diversion, growing public concerns about hazardous material incidents, product counterfeiting, and smuggling and maritime piracy convinced the company to develop a long-term strategy for supply chain sustainability and risk management that included:

- A supply chain redesign to reduce the number of shipments and container miles;
- Risk-based global supply chain security measures and regional service event management centers;
- Chain of custody controls implemented through asset visibility, vendor/service provider risk assessments and continuing technological innovation; and
- Enhanced collaboration with industry coalitions and the government to share best practices and promote the adoption of practical, proven industry best practices as the basis for government policy.

Supply Chain Redesign

Dow operates an extensive, integrated global supply chain. The company procures more than 100 billion pounds of raw material and hydrocarbon feedstock from more than 1,000 suppliers worldwide, and manages about three million product shipments to external customers and other Dow locations each year. Dow's products are staged in 300 warehouses and 100 terminals around the world, and shipped via highway, rail, marine, pipeline and air. About 20 percent of those shipments involve international border crossings where custom's clearance is required.

Dow believes that a sustainable supply chain is a key enabler and an ongoing necessity for sustainable business growth. The company's vision for a sustainable supply chain goes well beyond the boundaries of "greening" the supply chain. It addresses the fundamental attributes of sustainability, including safety and security, profitability, reliability and resilience, and social and environmental responsibility.

In order to achieve its vision of a sustainable supply chain, Dow has continued to evaluate and implement new ways to improve the efficiency and effectiveness of its supply chain. The greatest gains have been accomplished through supply chain redesign. For example,

during the past three years, Dow completed more than 300 supply chain sustainability projects that contributed \$85 million to the company's bottom line. The drivers for those projects were primarily economic, but they also yielded significant service, safety, security, energy and environmental benefits. As a result of the company's efforts to reduce transportation distances, improve asset utilization, optimize distribution networks and improve productivity, Dow was able to achieve energy savings equivalent to 2.5 million gallons of diesel fuel per year, greenhouse gas reductions of nearly 400,000 metric tons per year, and relative transportation safety risk reductions of about five percent.

300 projects between 2009-2011

+ **\$85 M** to Dow's bottom line

energy **\$** savings **= 2.5 M** gallons of diesel / year

greenhouse gas **↓** nearly **400,000** metric tons per year

relative transportation safety risk **↓** about **5%**

The supply chain was an important area of focus for Dow after 9/11. Dow sought to reduce chemical product transportation risks by reducing highly hazardous chemical shipments, while still meeting the needs of the marketplace. Its supply chain redesign efforts had two major components:

- Reduce the number of existing shipments through alternative sourcing, alternate modes of delivery and greater producer/user process integration; and
- Avoid new long-term shipments of highly hazardous materials.

Those supply chain redesign efforts reduced Dow's global footprint for highly hazardous materials by 40 percent and lowered its inventory handling and shipping costs.

Risk-Based Global Supply Chain Security Measures

Dow has developed a comprehensive risk management system for the safe and secure distribution of raw materials, intermediates and products worldwide. The program includes an assessment of potential safety and security risks across its chemical supply chain, including an evaluation of the safety and security practices of its raw material suppliers, the hazards of the materials shipped, the safety and security practices of its logistics service providers, the downstream uses of its products and the qualifications of customers to whom the products are shipped. This supply chain risk assessment and management program enables Dow to identify and implement appropriate, consistent, minimum safety and security measures for product, intermediate and raw material shipments worldwide.

Dow has prepared and implemented a supply chain security plan, which establishes a tiered system of risk-based security measures that increase with rising threat levels. Dow also has established transportation safety and security standards in those areas where additional risk reduction measures are desired above and beyond those required by government regulations. And, in those areas representing the greatest safety and security concern, Dow is pursuing industry-leading state-of-the-art security initiatives.

Regional Service Event Management Centers

Within the last two years, Dow has created regional supply chain service event management centers to proactively monitor events that could adversely impact its global supply chain — from adverse weather conditions to anticipated labor disputes to social and political unrest, cargo theft and piracy — and manage those events to minimize any potential disruptions for customers. Covering the Americas, Asia, Europe/Middle East, Latin America and Africa, the regional centers draw on multiple intelligence streams to gather information and assess the potential impact of events on Dow shipments. For example, in a recent month, Dow's regional centers have managed potential disruptions associated with rail and port strikes in Europe and North America, typhoons in the South China Sea, hurricanes and tropical storms in the Gulf Coast, Houston ship channel closures due to a barge accident, political unrest in the Middle East, maritime piracy in the Gulf of Aden, and dangerous goods routing restrictions in China and other world areas associated with high-profile public events. The regional centers are building a strong library of lessons learned — i.e. what worked, what did not, and how the company could approach the problem differently in the future.

Once it becomes clear that an event could affect the company's product shipments or customers, the regional centers become the focus for risk management efforts. Depending on the potential severity of the event, the regional teams can put together a "war room" to monitor the situation, assess the potential impact, develop options and work directly with the affected business units, which in turn engage customers to determine ways to mitigate the impact of the disruption. The goal is to anticipate and adjust before a disruption can cascade into a major crisis for the company and its customers.

Chain of Custody Controls

Dow's supply chain security is rooted in chain of custody controls. For high valuable, highly regulated or highly hazardous products, the company has established the capability for 24-7 monitoring of the cargo's location — e.g. who has responsibility for its handling and whether there has been unauthorized entry into the containers in transit or at the points of hand-off from one party to another.

Three areas of focus include:

- Asset Visibility
- Supplier/Service Provider Evaluations
- Technology Innovation

Asset Visibility: Dow began implementing a strategy for asset visibility through a combination of RFID tagging, GPS and sensor technologies about six years ago. Although RFID had long been used to track chemical shipments by rail, the communication was one way — the container had to pass an RFID reader to signal its location — and did not cover other modes of transportation. By combining RFID and GPS technology, the company got real-time location information. Today, Dow's web-based "DowTrak" container tracking portal gives the company and customers the ability to track shipments no matter what mode of transportation or area of the world.

GPS and RFID technologies are coupled with sensors which allow supply chain managers to monitor the condition of the material and the integrity of the container. Electronic seals can monitor whether the door has been opened; whether the sensors detect light. There are shock detectors, which also can enable the company to detect where rough handling may be damaging the transportation equipment or products in the container, and humidity sensors to monitor for the presence of water vapor, previously detectable only after drums deteriorated as a result of adverse conditions during ocean transits. These types of asset visibility measures serve both product quality as well as security needs.

Given the volume of shipments, it is not practical to track every shipment. Dow's focus is on cargo that is:

- **High value:** for example, catalyst materials and agriculture chemicals which could bring a high price on the black market;
- **High hazard:** for example, materials that are toxic to inhale which could be used as weapons of mass effect by terrorists; and
- **Highly regulated:** for example, chemicals that could be repurposed to manufacture illegal drugs or chemical weapons, or products sold into sensitive end-use markets such as direct food and pharmaceutical applications.

As the need is determined by risk assessments on products in these categories, Dow has the ability to maintain 100 percent visibility on a shipment from the time it leaves the shipping location until it arrives at its destination.

Risk Assessments of Raw Material Suppliers & Logistics Service Providers: Dow's suppliers are evaluated initially and periodically thereafter, based on the potential risks they present to the company. All suppliers are screened against specific criteria in eight risk areas, including safety and security, product stewardship, social and environmental responsibility, product quality, trade compliance, business continuity, financial stability and information protection. The criteria include attributes related to the supplier, industry sector, commodity, geographic area and markets served. Based on the screening results, all suppliers are ranked in one of three risk tiers — high, medium or low.

Suppliers that are ranked in a medium or high-risk tier are further assessed using industry-developed protocols and internationally recognized certification standards, where available. Examples include marine and terminal assessment protocols developed and administered by the Chemical Distribution Institute; CEFIC SQAS assessment protocols for road and rail carriers and warehouse operators; international border security program certifications under the C-TPAT (USA), AEO (Europe) and PIP (Canada) government programs; ISO 9000 quality standards; and ISO, ASIS and NFPA business continuity standards. Where industry protocols or government programs are not available, Dow-specific assessment protocols are used. Further, for suppliers ranked in a high-risk tier, Dow puts boots on the ground to validate that minimum risk management requirements are being implemented.

Most Effective Technology: Technology solutions are driven by Dow's MET (most effective technology) programs which provide a range of solutions for supply chain safety and security, including the integrity of the shipment container, tracking devices and anti-counterfeiting technologies.

One of Dow's emerging challenges is counterfeit products — either counterfeit Dow labels or real Dow labels with counterfeit product. For several high-risk businesses operating in high-risk geographies, Dow has implemented anti-counterfeiting approaches. For example, Dow places tamper-evidence seals on containers to lower the probability of undetected entry. Second, the company has employed the use of holographs and 3D bar codes linked to a database of shipments, so distributors and customers can scan and verify the bar code through a link to Dow's secure database that the label is a legitimate Dow label and a legitimate Dow shipment. The link also provides information on when the product was manufactured and shipped.

Cyber Security: IT has become an emerging supply chain risk for Dow. Criminal elements around the world are beginning to use shipping information to target specific cargoes. For example, criminals in Mexico recently gained access to a logistics company's shipping records and used that information to target specific shipments in transit. In another example, there is evidence that Somali pirates have gained insider information from ports in Europe about container ship cargoes, which they have used for targeting purposes when those vessels pass through the Gulf of Aden. The challenge is to prevent the basic information that shippers, customs authorities, carriers and customers need from falling into the wrong hands. Cyber security is the responsibility of Dow's information security professionals. They use standard industry protocols to assess the IT security of high-risk suppliers and service providers.

Collaboration for Improved Security & Resilience

Dow partners with both the public and private sectors for information sharing about best practices. It partners with a wide range of industry consortia and associations to develop best practices and is proactive in proposing practical, proven industry standards for adoption by policy-makers and regulators.

For example, Dow and the eight highway carriers that account for about 90 percent of Dow's North American truck shipments formed a highway security network to share security intelligence information, discuss best practices and develop common security programs. When the Transportation Security Administration (TSA) was looking for guidelines to secure hazardous materials, the highway security network shared their practices for safe and secure transportation of toxic inhalation materials. These became the basis for TSA's voluntary Highway Security-Sensitive Materials Security Action Items for hazardous materials transportation for the entire industry.

Dow's position is that, rather than wait for the government to propose a security standard, a proactive approach ensures that practical and proven industry best practices are built into the national strategy for homeland security and resilience. For public-private collaboration, Dow emphasizes two principles:

1. **Holistic Approaches:** Supply chain security strategies need to be based on the selection of those risk mitigation techniques and approaches that achieve the desired result in the most cost-effective way. The strategies also need to balance commercial and security needs.
2. **Collaboration Imperative:** Neither the public nor private sector can secure supply chain systems without the support and partnership of the other. The level of complexity is increased by the fact that, for manufacturers, supply chain security requires the engagement of suppliers, customers and carriers. Traditional, punitive regulatory frameworks do not represent the best approach for securing the supply chain.

The Business Case for Supply Chain Security

In the final analysis, Dow can document that supply chain security investments have saved the company millions in annual operating costs from reduced inventory requirements and shipping costs, greater efficiency, minimized losses from theft and greater resilience. Estimates of savings for the supply chains where those investments have been made include:

- More than 20 percent cost reductions in excess inventory and container fleet requirements;
- 100 percent reduction in theft/loss/pilferage;
- 100 percent reduction in tampering;
- Up to 90 percent reduction in transit time;
- 25-50 percent improvements in on-time delivery; and
- 50 percent reduction in response time to identify and resolve in-transit problems.