



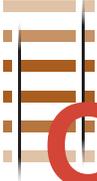
Dow-UP MOC  
PROGRESS REPORT



# ONTrack

to Increase Rail Safety and Security





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“Nothing is more important than the safety of our employees and the communities where we live and work,” said Bob Grimaila, Union Pacific vice president – Safety, Security and Environment. “We are proud to be collaborating with Dow, a leader in the chemical industry with a long history of innovation.”

Combining technology and innovation, Dow Chemical and Union Pacific Railroad joined forces with Union Tank Car Company to lead a group of more than 60 engineers, researchers and logistics specialists to develop new ways to make rail tank cars safer and more secure.

Developing a Next Generation Rail Tank Car was one of eight goals outlined in a voluntary Memorandum of Cooperation (MOC), signed by Dow and Union Pacific in 2007, to increase rail safety and security. The first of those cars came off the assembly line in 2Q2012, with a design that will provide 2-1/2 to 3 times better safety and security performance than cars in the existing fleet. The continued collaboration between Dow and Union Pacific reflects both companies’ commitment to Responsible Care®, which drives continuous improvement in the safe and secure manufacture, distribution and use of chemical products.

“As we approach the mid-point of our 10-year commitment to improve rail safety and security, the collaborative effort between Dow and Union Pacific continues to be both positive and productive,” said David Kepler, Dow’s chief Sustainability officer. “Our efforts are further enhanced by the contributions of stakeholders in the transportation and chemical industries and government – as we all work together to ensure that rail remains the safest way to transport essential chemical products throughout the U.S. and Canada.”



## Tracking our Progress

The MOC agreement outlined goals in eight critical areas of the chemical supply chain, with key innovations for event prevention and response planning, railcar designs and tracking. These next few pages outline progress made to-date against each goal.



## Expand the TRANSCAER® Program

GOAL 1

**Provide improved community awareness and emergency preparedness along highly hazardous material\* transportation routes by providing communities with a significantly enhanced outreach, education and training initiative in coordination with national, regional and state TRANSCAER® programs.**

### Progress:

- Dow joined the Fire Fighters Education & Training Foundation and Union Tank Car Company to build a six car, high-tech Hazmat Safety Train, dedicated in memory of Chicago Fire Chief John Eversole to provide hands-on emergency training for first responders nationwide.
- From 2007 to 2011, the Hazmat Safety Train brought training to more than 5,500 first responders from over 900 emergency response agencies and departments in 68 cities, while also supporting regional hazmat safety conferences in California, Texas, Illinois and Louisiana.
- In 2011, Dow and Union Pacific joined other TRANSCAER® supporters to create and deliver the National TRANSCAER® Anhydrous Ammonia program to more than 800 audiences in 37 states – and the companies continue to support many TRANSCAER®-related programs with equipment, personnel and resources.
- In recognition of their initiative's extraordinary and sustained results, Dow and Union Pacific have earned the TRANSCAER® National Achievement Award every year since its creation in 2007.
- In addition to the joint Dow and Union Pacific initiative, the companies work with other shippers and railroads to train thousands of additional local community emergency responders each year.



## Improve Shipment Visibility

GOAL 2

**Provide for improved safety, security and emergency response through continuous surveillance of highly hazardous material shipments by installing GPS units and appropriate sensor technologies on all highly hazardous material tank cars, supporting a reduction in the time these cars are unattended in transit.**

### Progress:

- In 2006, Dow began installing GPS transceivers and dome open sensors in all tank cars that ship Toxic Inhalation Hazard (TIH) materials as part of a larger focus on TIH transportation safety and security. Through this industry-leading practice, Dow has helped advance hardware and software development for the demanding rail environment.
- In late 2011, Dow began fleet-wide installation of 4th generation GPS units in all of its TIH tank cars, enabling onboard geo-fencing that automatically adjusts reporting frequencies when crossing into TSA HTUAs (High Threat Urban Areas). While in transit, these units capture a “bread crumb” trail for transmission at scheduled reporting intervals. The small, fully integrated units can sense tilt to detect dome condition (open vs. closed).
- Dow is collaborating with CHEMTREC® and the U.S. Transportation Security Administration to maximize the value of GPS tracking information. Through a service provider, Dow voluntarily provides all GPS location reports to the TSA, allowing them to track individual units. CHEMTREC also has full access to Dow's tracking data to help support emergency responders in case of an accident or security incident.

\*As used in this document, the term “highly hazardous material” refers to chemicals that are classified as Toxic Inhalation Hazard (TIH) materials or flammable gases.



## Develop the Next Generation Rail Tank Car

GOAL **3**

**Develop and implement a new rail tank car design for the transportation of highly hazardous materials, achieving a step-change improvement in safety and security performance over existing fleets.**

### Progress:

- In 2006, Dow and Union Pacific joined Union Tank Car Company to collaborate with the Federal Railroad Administration, Transport Canada and the U.S. Transportation Security Administration on the Next Generation Rail Tank Car Project – an aggressive, three-year research initiative to design a new tank car to transport TIH materials with greater safety and security. The interdisciplinary approach included more than 60 experts in design, engineering, corporate R&D, university research, logistics, rail operations and maintenance, and emergency response.
- The project team identified and tested new design concepts and technologies for improvements of 200 to 300 percent in crashworthiness for head and side impacts over today's standard designs that provide only 70 to 75 percent improvement. Plus, the project team transferred the technology, making the advanced scientific knowledge, modeling and analytical tools available to tank car builders, further driving adoption and enhancement of advanced tank car protection systems.



- Through additional collaboration with Midland Manufacturing and Chlorine Tank Car Development Panel members, the project team developed low-profile valve assemblies with fail-safe internal closures to prevent chemical releases if valves and fittings are sheared off in a rollover – and the new assemblies have been proven effective in a recently completed two-year service trial.
- After the Next Generation Rail Tank Car Project concluded in 2009, Dow requested bids from major tank car builders in North America to design and construct a next generation chlorine tank car based on the advanced concepts and technologies developed during the project. Union Tank Car Company won the contract and submitted a detailed design/construction package to the U.S. Department of Transportation and Transport Canada in 2010. Approval was granted in 2011, and construction of the first 11 next generation chlorine tank cars began in early 2012.
- The next generation chlorine tank car will provide a 310 percent improvement in crashworthiness for head impacts and a 240 percent improvement for side impacts, compared to the current chlorine fleet tank car. And, the next generation car will provide a 170% improvement for both head and side impacts, when compared to the next best available car as defined in the 2009 Interim Standard for TIH Tank Cars (79 FR 1770).
- Concurrent with their efforts to introduce and deploy the next generation chlorine tank car, Dow and Union Pacific continue to support ongoing research to further improve TIH tank cars. In 2010, both companies formed a broad research initiative – the Advanced Tank Car Cooperative Research Program – to continue the Next Generation Rail Tank Car Project. Supported by a formal Memoranda of Cooperation between the Association of American Railroads, the Chlorine Institute, The Fertilizer Institute, American Chemistry Council, Railway Supply Institute, U.S. Departments of Transportation and Homeland Security and Transport Canada, this initiative will continue to drive economically viable rail tank car safety and security improvements.

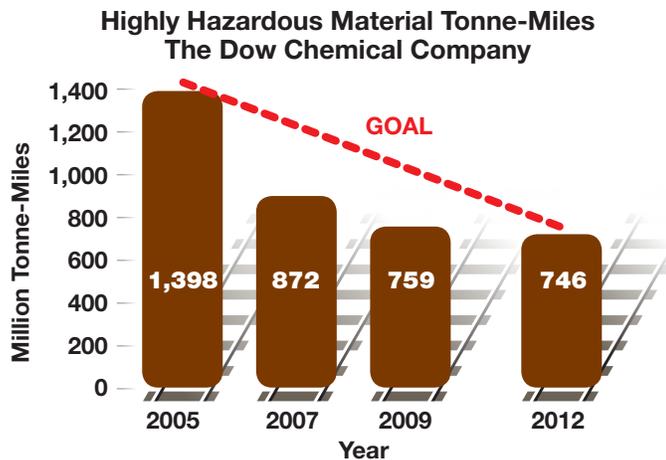




## Improve Supply Chain Design

GOAL 4

Reduce the shipment of highly hazardous materials by 50 percent, while continuing to meet the needs of the marketplace and reducing overall risk.



### Progress:

- Dow's businesses are implementing long-term sustainable business strategies to further reduce the shipment of highly hazardous materials. These measures include:
  - Avoiding new, long-term shipments
  - Alternate sourcing to reduce transportation distances through exchanges, swaps, contract manufacturing and purchases
  - Using alternate modes of delivery (e.g. pipeline vs. rail or highway)
  - Rationalizing and optimizing producer-user operations facilities
  - Business rationalization and higher thresholds for customer selection / qualification
  - Converting to less hazardous derivatives before shipment
- In 2012, Dow reduced the tonne-miles of highly hazardous materials by 47 percent compared to the 2005 baseline, staying on track to achieve its 50% reduction target by 2015.
- Toward that goal, Dow continues to eliminate significant TIH shipments by optimizing producer-user operations. For example, in September 2011, Dow and K2 Pure Solutions announced the successful start-up of a new chlor-alkali plant at Dow's Pittsburg, California site, producing bleach for municipal water treatment while also providing Dow with a secure, local, reliable and competitive source of chlorine via pipeline to manufacture crop protection chemicals. This new plant eliminates the need to ship chlorine from the Gulf Coast to California.



## Eliminate Non-Accident Releases

GOAL 5

Reduce non-accident releases by 75 percent.

**Note:** A non-accident release (NAR) is defined as an unintentional release of hazardous material during transportation not caused by an accident or derailment. NARs consist of leaks, splashes and other releases from improperly secured or defective valves, fittings and tank shells, and also include venting from safety relief devices.

### Progress:

- Dow shipping locations have developed and implemented a number of new measures to further reduce NARs, including:
  - Enhanced NAR reduction training programs for operators
  - Instructor-led training for all new personnel at each loading/unloading facility
  - Annual, self-paced refresher training
  - Post-load leak detection/pressure testing for all hazardous material rail cars prior to releasing for transport
  - Root Cause Investigation for all reported NARs, with corrective actions tracked to completion through Dow's Event & Action Tool
- As a result, Dow shipping locations have been able to reduce NARs by 47 percent since 2005. That means 99.98 percent of Dow's hazardous material shipments reach their destination without an NAR.
- With a continuing emphasis on operating discipline and accountability, Dow remains firmly committed to its "Drive to Zero" campaign, where each employee makes a personal commitment to zero incidents, zero injuries and zero excuses.
- As part of the railroad industry's continuing effort to eliminate chemical releases from rail tank cars, many of the railroads have established award programs to further increase shipper awareness and recognize those shippers who have taken measures to prevent NAR incidents. Dow has earned the following recognition awards from the nation's Class 1 railroads since 2006:
  - Union Pacific Pinnacle Award (2011)
  - Norfolk Southern Thoroughbred Chemical Safety Award (2006, 2007 and 2009)
  - CSX Chemical Safety Excellence Award (2006, 2007, 2008, 2009, 2010, 2011 and 2012)
  - Canadian Pacific Chemical Shipper Safety Award (2005, 2006, 2007, 2008, 2009, 2010 and 2011)
  - Canadian National Safe Handling Award (2005, 2006 and 2011)
  - BNSF Stewardship Award (2006 and 2008)
  - Kansas City Southern HARP Award (2010)



## Deploy Communications-Based Train Control and Anti-Collision Systems)

GOAL 6

**Deploy technology that will help us eliminate collisions on mainline track, pending government approvals and the success of two pilot projects.**

**Note:** Positive Train Control (PTC) will be a predictive avoidance technology designed to prevent train-to-train collisions, derailments caused by excessive train speed and unauthorized train incursions onto sections of track where work is being done. PTC is a highly complex technology still being developed and tested as railroads work to implement it by the end of 2015 as mandated by federal law.

### Progress:

- Union Pacific plans to begin testing the Interoperable - Electronic Train Management System (I-ETMS) in the Los Angeles basin in the fourth quarter 2012 to further validate PTC hardware and software technology. Upon testing completion, UP will submit a safety plan to the Federal Railroad Administration for approval of system-wide deployment.
- UP continues partial installation for the wayside, telecom and locomotive onboard requirements. The back office system (BOS), most critical to proper completion, is still under development. Meteor Comm developed the prototype 220 MHz radios that are being field tested. Class I railroads are working together closely to ensure standards are established for interoperability from one railroad to another.



## Reduce Movement of Highly Hazardous Chemicals through High-Threat Urban Areas

GOAL 7

**Reduce the non-essential dwell time of highly hazardous material shipments in-transit in high threat urban areas (HTUAs) by 50 percent.**

**Note:** Simultaneously with the MOC goal, Union Pacific and other railroads, in collaboration with the U.S. Transportation Security Administration, embarked on a program to reduce risk associated with TIH shipments in HTUAs by 50 percent by year-end 2008.

### Progress:

- Through improved tracking and handling practices, Union Pacific achieved a 98 percent reduction in dwell time in HTUAs as reported to the TSA compared to the 2006 baseline.
  - Implemented site-specific procedures for positive and secure handoff of TIH cars at points of origin, destination and interchange.
- Other major initiative components include:
  - Reducing the number of hours (dwell time) TIH cars are held in HTUAs.
  - Minimizing the occurrence of unattended TIH cars in HTUAs.
  - Identifying secure storage areas for TIH cars.
  - Limiting TIH car movement near public venues during National Special Security events.





## Improve Accident Prevention

GOAL 8

### Achieve a 50 percent improvement in hazardous material rail operations safety.

**Note:** The nation's railroads transport 1.7 million carloads of hazardous material each year, with 99.998 percent of those shipments reaching their destination without incident.

#### Progress:

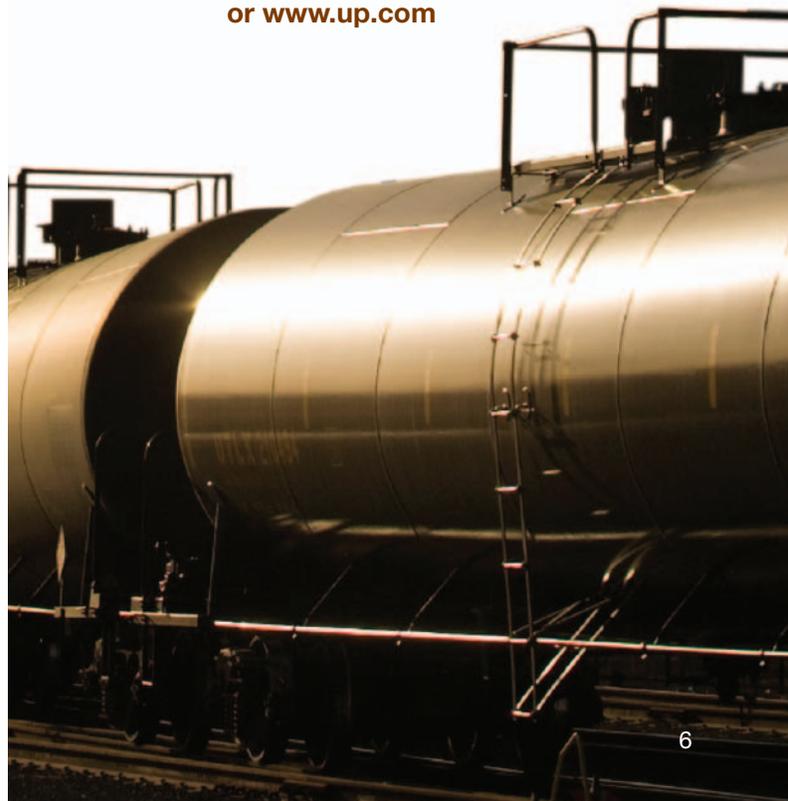
- Union Pacific's accident performance is better than the industry average and the company remains committed to further continuous improvement, driven by specific initiatives in the following areas:
  - Risk-based maintenance and operating improvements
  - Targeted employee training, including use of simulators
  - Human-factor incident reduction, including the use of alertness management principles
  - Significantly reducing the percentage of highly hazardous material shipments moving in dark territory (i.e., on track that is not protected by signal technology)
  - Quality System Process - QSP 1010 Since 1989
  - Our safety process, which includes, employee, public and rail equipment
  - Continuous Improvement Process - 8 Step Problems Solving Process
  - Capital Investment
  - Front line management of the safety process
  - Continued emphasis on improving grade crossing safety
- As a result of measures and initiatives like those described above, in 2011 Union Pacific was able to achieve a 3 percent improvement in train accidents from 2010, and has had an overall improvement of 43 percent from 2006. Union Pacific remains on track to achieve its 2015 goal.
- Implementation of Total Safety Culture (TSC), an employee-led safety program focused on enhancing safety practices while encouraging a culture of concern for not just personal safety but also coworkers' safety.



### Collaborating for Safer Communities

Union Pacific's railway system transports Dow products everyday – products that are critical to the U.S. economy. Both Dow and Union Pacific are committed to doing our part to ensure that rail remains the safest way to transport these essential chemical products.

For more information, please visit [www.dow.com/security](http://www.dow.com/security) or [www.up.com](http://www.up.com)





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Dow (NYSE: DOW) combines the power of science and technology to passionately innovate what is essential to human progress. The Company connects chemistry and innovation with the principles of sustainability to help address many of the world's most challenging problems such as the need for clean water, renewable energy generation and conservation, and increasing agricultural productivity. Dow's diversified industry-leading portfolio of specialty chemical, advanced materials, agrosociences and plastics businesses delivers a broad range of technology-based products and solutions to customers in approximately 160 countries and in high growth sectors such as electronics, water, energy, coatings and agriculture. In 2012, Dow had annual sales of \$57 billion and employed approximately 54,000 people worldwide. The Company's more than 5,000 products are manufactured at 188 sites in 36 countries across the globe. References to "Dow" or the "Company" mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. More information about Dow can be found at [www.dow.com](http://www.dow.com)

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