

HAZMAT Identification, Control, and Emergency Response: The Fundamental Weakness in the System

The Security and Public Health Risks

Today we see more and more catastrophic accidents involving hazardous materials, most recently rail accidents. One of the major factors involved in these types of accidents is the identity of the chemical involved. Is it explosive, toxic, or worse? What is the government doing to minimize these events? What are the chemical manufacturers, shippers, and carriers doing? The reality is that they are doing very little considering the available technology to help reduce these dangerous vulnerabilities. One such technology is the *chain-of-custody* process involved in global supply chain control and the use of smart conveyances whether they are trailers, containers, tankers, or rail cars.

A Fix to the Risks: A Chain of Custody

In jurisprudence and law enforcement, "chain of custody" refers to the integrity of evidence and requires a documented process showing the seizure, custody, control, transfer, analysis, and disposition of physical and electronic evidence. Documentation should include the conditions under which the evidence is gathered, the identity of all evidence handlers, duration of evidence custody, security conditions while handling or storing the evidence, and the manner in which evidence is transferred to subsequent custodians each time such a transfer occurs. This *Off-the-Shelf* (OTS) chain-of-custody technology can now be applied and used in the world of HAZMAT movements with the use and deployment of "smart" containers, trailers and railcars using container security devices (CSDs).

1. Smart HAZMAT containers and conveyances provide the electronic equivalent of a receipt showing evidence of contents and evidence of shipping. The evidence is provided by a simple smart phone App or comparable electronic device

usable only by an authorized and identified individual at the point of origin and at destination. Similar to the law enforcement officer collecting evidence, that person must be identified as the authorized person supervising the loading of the trailer, container, rail car, or tanker and verifying its contents and applicable identification code of the cargo or contents. At the time the electronic data or biometric information is inserted into the smart container system, there is a data transfer of logistics and hazmat data such as shipper and consignee, the identity of the hazardous material, and its Placard Number displayed by the carrier on the conveyance of the hazardous material. Within seconds of the arming of the CSD, the activation of the system takes place. The identity of the accountable person verifying the cargo's accuracy, and any data agreed upon will automatically be electronically transferred from the conveyance by satellite or cellular communications. Additionally, the electronic data contain the emergency response guidelines which include the name of the hazardous material, the emergency response to the flammable, explosive, toxic, corrosive, infectious or radioactive cargo. The CSD can also automatically provide the first responders with the proper isolation and protective actions and safe distances necessary in the case of a spill or accident. It can even provide the location of an accident occur in a remote location.

2. Depending on the robust nature of the hardware, the smart container provides a unique identifier for tracking and communication, which allows the consignee or consignor to "query" the container while it is in transit and also allows the container itself to report independently any movement off its intended journey. Satellite and/or cellular-monitored and tracked smart containers automatically offer through the use of a worldwide call centers third-party record of any break in the chain-of-custody. Essentially, the hazmat movement is monitored from origin to destination, reporting any anomaly in the movement, including any breach into the conveyance.

3. A smart container employing the chain-of-custody process can provide an electronic receipt of delivery, generated by the opening of the container at destination by a person approved and authorized to open the container or trailer. Its opening is accomplished by the specialized smart phone App or biometric reading directly linked to

an authorized individual at the point of destination.

The only real difference with the chain-of-custody described in other legal circles is that the smart containers can do all of this electronically. Smart containers not only meet the challenges of providing good control similar to a registered and certified letter in the postal system, but also provide the electronic management not available in documentary chains, thus exceeding the demands of jurisprudence.

Worldwide Monitoring

These smart container security devices are able to provide electronic signals to monitor movement of containers internationally and domestically from origin to destination. However, there is much more that CSDs can do than just report location. The user or their national and international control center (“platforms”) can communicate with these CSDs, depending on the programming, sensors, and technology used in real-time or close to real-time. The very smart containers can tell you electronically

1. the contents of the container;
2. who supervised loading the cargo and who is accountable for the accuracy of the contents at origin;
3. the time the container was sealed;
4. when it left origin;
5. its route;
6. its internal environment;
7. its progress;
8. whether it deviated from its course;
9. its arrival at port of embarkation;
10. when it was loaded aboard the vessel;
11. whether it was breached;
12. when it arrived at the destination port; and

13. who opened it and verified the cargo.

In addition, the use of CSDs with HAZMAT carriage, can also provide a means to safeguard those areas through which the HAZMAT travels, by the detection and transmission of any spill and the immediate proper response to that spill as required by the *North American Emergency Response Guidebook*, the official nation guidelines for first responders during the initial phase of a dangerous goods/hazardous materials incident.

Control and Emergency Response: The Solution

The action of government regulatory agencies and competent hazmat producers and transporters are the solution. Additionally, the proper identification of hazardous materials especially hazardous cargo as it moves throughout a State is a *sine qua non*, or mandatory requirement. Present regulations only require the international UN hazardous materials numbers be used on the carrier's bill of lading or shipping documents. Should a highway accident result in spills of hazardous materials release hazardous fumes, public safety depends on the knowledge of first responders. The first responders must immediately know the identity of the hazardous material in order to determine the proper emergency procedures to execute and to know how far to isolate the public from the hazardous material. This knowledge is contained in the hard copy of the *North American Emergency Response Guidebook* and is published by the U.S. Department of Transportation. Every known hazardous material is numbered and links to a unique set of procedures. However, access to this guidebook is limited and may not be physically present in the equipment and vehicles used by first responders. In practice it is often somewhere in the trunk of a police car or somewhere in an emergency vehicle. Specifically, access to “what to do” is a real threat for first responders if the guidebook cannot be immediately found and utilized. Even its use requires knowledge of how to use it and the time it takes find and read how to implement procedures recommended in the guidebook.

The solution includes the development and use of electronic standards and methods for automatically identifying hazardous materials and waste and concomitantly to provide emergency response information in the case of an accident. The essential element of solving the hazmat problem is the modification of the *North American Emergency Response Guidebook* into electronic data unique to each hazmat movement. These data are then available for inclusion into the CSC and the servers of the control centers which monitor movement on a 24/7 schedule. Specifically, the CSD will automatically alert the appropriate state agencies of the identity, emergency procedures and isolation procedures through current software used by a state's law enforcement and emergency responders should a spill occur. The CSD clearly supports HAZMAT control and proper response should any spill occur by providing the following:

- Identification of the hazardous materials;
- Detection and reporting of any deviation in planned route of movement of conveyance;
- Detection and reporting of any breach into the conveyance;
- Satellite and/or Cellular location monitoring of origin to destination movement;
- Automatic reporting of HAZMAT arrival at destination; and
- Automatic detection and reporting of spill, its location, and all emergency response information contained in the hard copy of the *North American Emergency Response Guidebook* linked that the subject HAZMAT.

CSD usage clearly allows for quicker determination of a spill and the appropriate emergency response procedure especially if a driver is incapacitated or otherwise unable to report a spill, especially in a remote location. Given the cost savings resulting in not having to equip all State Police cars with the Guidebook, this proposal should amount to a net savings for the State agencies. It is time that State and Federal requirements demand the use of this *chain-of-custody* technology. What's taking so long?