

## Reefer Explosion, Route 295 NJ

July 2022



On June 2, 2012, I received a call from the Burlington County Fire Marshal's Office seeking my advice. He told me that on May 31, 2012 on US Route 295 in Burlington County, NJ there was a reefer containing tangerines that caught fire pulled to the side of the road. Florence FD responded and as they approached the trailer it exploded blowing out the doors. Seven firefighters were injured, including one critically when the firefighter was struck in the head when the doors blew open.

This baffled me for months as to what could have caused the explosion. I had many theories which all proved to be incorrect. It was not until a few months later when I was a keynote speaker at a conference in Taiwan along with the DuPont ER manager for Asia who was also presenting that I was able to determine what happened. After I explained this baffling case he immediately told me about the reefer problems in the Pacific.



It appears that a number of reefers were refurbished in Vietnam and rather than using R-134A they substituted the cheaper R-40 methyl chloride. The boiling point of R-40 is similar to that of R-134a, hence it is very difficult to detect R-40 when they are mixed in the refrigerant system.

Thermodynamically this works fine however the refrigeration systems today use a lot of aluminum rather than copper or carbon steel previously used. Methyl chloride reacts with aluminum forming trimethylaluminum (TMAI), a pyrophoric liquid. It slowly corrodes the aluminum until it leaks. Methyl chloride is also a flammable gas that coupled with the pyrophoric liquid TMAI being released into air completes the fire triangle. The TMAI being pyrophoric ignited the flammable mixture.

As shown in the following picture, the ignition and deflagration were initiated in the front of the reefer as evident in the bulging of the roof and sides. This reaction proceeded toward the rear of the trailer blowing out the doors.

On 18 October 2011, Maersk Line informed the World Shipping Council's Safe Transport of Containers Working Group that it had recently experienced three cases in which refrigeration units had exploded for no apparent reason. The explosions occurred on three separate occasions in 2011 in Itajai, Brazil and Cat Lai, Vietnam. Two men died in Vietnam and one in Brazil as a result of the explosions. CMA CGM also reported that explosion occurred in one of their refrigerated containers in Qingdao, China, in October.

US reefer technology provider Carrier Transicold has identified the port where the four reefer machines that experienced compressor ruptures received refrigeration system service work at Cat Lai in Vietnam. Maersk Line identified the malfunctioning containers underwent gas system repairs and maintenance at the same repair yard in Vietnam between 30 March 2011 and 25 April 2011.

Various actions were undertaken by various stakeholders to address safety issue: – Maersk Line grounded 844 refrigerated containers that might contain contaminated coolant fluid, while CMA CGM grounded 332 and Singapore-based-APL grounded around 103 as precaution measures. – Maersk also issued guidelines that any suspect boxes be cross-stuffed, the machinery unplugged and the containers be stored in an isolated position with the machinery facing away from people or traffic. – Saigon New Port (SNP), operator of Cat Lai container terminal, appointed one direct supplier of refrigerant “for all the items of M & R requiring the refrigerant serving for the reefer containers at SNP's facilities”<sup>7</sup>.

Furthermore, fluorocarbon producers have warned customers to only purchase refrigerants from authorized suppliers. They adopted measures to address counterfeit refrigerants: – Honeywell started using a new security measures to detect counterfeit refrigerants. The new anti-counterfeit technology allows for the identification of non-authentic products much faster and more easily than was previously possible. – DuPont Refrigerants initiated DuPont Brand Assurance Program. The Brand Assurance Program uses a proprietary DuPont technology which involves 3D holographic label.

31 October 2011

## Exploding boxes spark alarm

Exploding refrigerated containers have prompted worldwide enquiries.



The investigation was set in motion by Maersk Line, which alerted the World Shipping Council's Safe Transport of Containers Working Group to a problem.

The container line has recently experienced unexplained explosions in three refrigeration units. Such incidents have so far resulted in three fatalities.

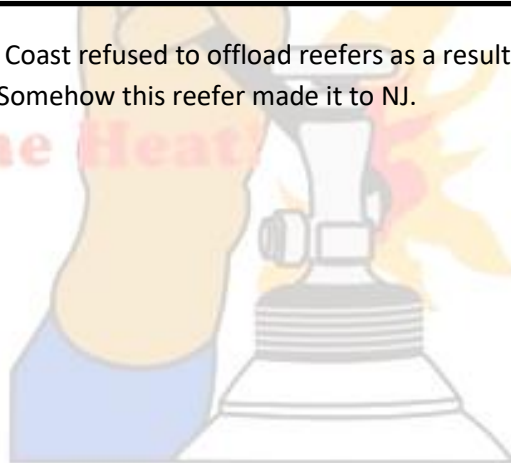
Maersk's own investigation uncovered the fact that all three boxes had undergone gas repairs in Vietnam between late March and late April.

It urged other companies which had similar repairs to investigate these units.

Major brands of reefer boxes, such as Thermo-King, Star Cool, Carrier and Dalkin are all under suspicion.

Longshoremen on the West Coast refused to offload reefers as a result. We never heard about this problem on the East Coast. Somehow this reefer made it to NJ.

Feel the Heat



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