

Case story | SEM-SAFE® low-pressure CO<sub>2</sub> system

# CMA CGM Benjamin Franklin

Ultra large container protected with SEM-SAFE® low-pressure CO<sub>2</sub> for fire fighting

Danfoss Fire Safety A/S



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Benjamin Franklin is the third vessel in a series of ultra large container ships for CMA CGM. It is the largest vessel ever to call port in the USA.

CMA CGM decided to build three 16,000 TEU vessels in Shanghai Jiangnan Changxing Heavy Industry, making them the first ship owner to look to China for this size vessel. The vessels were later upgraded to 18,000 TEU.

Due to the volume of the engine room and cargo holds, it was decided early on to go with a low-pressure CO<sub>2</sub> fire fighting system, as the amount of cylinders in a high-pressure system would be 600, which would take up a large space and result in tedious maintenance for the crew. The SEM-SAFE® low-pressure CO<sub>2</sub> system from Danfoss was chosen because of the technical know-how of the Marine Division and extensive reference list for low-pressure CO<sub>2</sub> systems.

The weight saving obtained by using the SEM-SAFE® low-pressure CO<sub>2</sub> system means the vessel can carry 6 containers extra, giving a significant increase in the revenue over the life time of the vessel.

Significant space  
saving with  
**SEM-SAFE®**  
for fire  
fighting

## SEM-SAFE® low-pressure CO<sub>2</sub> system

### System description

The system used on board CMA CGM Benjamin Franklin is a low-pressure CO<sub>2</sub> system containing 27.8 tons of liquid CO<sub>2</sub>, which is kept at a temperature of -18°C and a pressure of 20 bar by the 2 completely independent cooling units. (According to IMO SOLAS, the cooling system must be fully redundant).

Due to the high quality in design and manufacturing, these units run only an average of three hours per day. Furthermore the special insulation of the tank will maintain a stable temperature for approx. 48 hours without cooling.

As the first company in the world, Danfoss overcame the technical challenges involved with designing a low-pressure CO<sub>2</sub> system complying with class requirements to supply 85% of the calculated CO<sub>2</sub> concentration within 2 minutes for engine rooms of this size (38,000 m<sup>3</sup>). Danfoss designed the system with three diptubes compared to the standard one. This posed another issue – what will happen to the internal pressure in the tank if three large valves were to be opened at the same time. Based on the many years' of experience of working with low-pressure CO<sub>2</sub> fire fighting, Danfoss found the solution in the form of the N2 booster unit, which was developed in cooperation with Force Institute.

As the keel laying of CMA CGM Benjamin Franklin was done after July 1, 2014, it was necessary to take MSC 339 (91) into consideration. The main challenges in this resolution is the time limit for release to cargo holds and the fact that it must be possible to make 1/3, 2/3 and full release based on the degree of filling in cargo hold. Taking security measures seriously and in order to live up to the time limit for release, Danfoss designed the system with larger distribution pipes, and therefore it was no longer possible to use the same pipes for smoke detection and release of CO<sub>2</sub>.

CMA CGM had a desire to keep all release functions at the same location to avoid any excessive risks for the crew. As Danfoss values crew safety above all, a solution was found to design the system, with separate lines to all cargo holds, which results in a rather large manifold encompassing 12 distribution valves.

To simplify installation work, Danfoss included all these features on the same single frame, This greatly reduces any risk of making mistakes, as all components are pre-installed/wired and tested in the Danfoss workshop prior to shipment.



*The high quality single skid mounted SEM-SAFE® low-pressure CO<sub>2</sub> system from Danfoss.*

**SEM-SAFE®**

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