DYNAMIC BEHAVIOR - RELIABILITY

This paragraph describes the most important dynamic behavior issues throughout the complete logistics chain. These issues are: water hammer, reliability, metallurgic behavior, cool down and heat up effects and ship wave interaction. The reliability of the chain influences the requirement for venting or purging, which could pose extra health and environmental effects on the surroundings. The dynamic behavior issues could pose a negative effect on the integrity of (part of) the logistics chain, which may result in unwanted release of CO_2.

Reliability

The importance of an optimal chain reliability is not just economical, but is also of interest regarding safety health and environment (SHE). If unplanned maintenance has to be performed, equipment has to be vented before any actions can be taken. A storage vessel could be emptied on beforehand for the larger part, but other equipment may be filled with CO_2. Consequently, the whole volume of the equipment will have to be vented to the air. Venting of the equipment/chain segments should be done carefully to prevent damage due to embrittlement, which will be discussed in the next paragraph.

The extent of the effect of the venting on the environment depends on the volume of the equipment/piping/pipeline. Inspections also require the system to be purged, therefore minimizing the necessity for inspection will be highly beneficial. When segments have to be vented, high CO_2concentrations may arise which could affect the local environment and pose health risks on persons working in the proximity. Therefore the reliability of the complete logistic chain should be as high as possible to minimize the necessity of frequent inspections on equipment and piping and unplanned maintenance or repairs due to failures.

If possible pipelines and piping can be sectionalized by means of valves. When maintenance or repair of the pipeline/piping has to be performed, it will not be required to vent the whole pipeline/piping system, but only the particular segment. This will result in less CO_2 emissions and thus lower risks. Besides piping there will be several storage tanks at the hub. The use of stainless steel storage tanks for CO_2 would prevent the necessity of frequent inspections. The storage tanks on the ship will have to be checked every 4 year regardless of the applied material.

Parts of seagoing ship, which are exposed to seawater, require more maintenance than parts of the ship that have no contact with seawater. More maintenance has obviously a negative effect on the reliability.

By minimizing the exposure of equipment and piping to the environment the maintenance requirement could be minimized. The current design, performed by USOS, provides for a walkway and ship systems duct in the void on starboard and a cargo piping duct in the void on portside. This arrangement removes the piping from the main deck compared to existing designs. Also, the small superstructures above the tank domes make connections with pipes in the duct possible without pipe penetration through bulkheads.

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