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Rating vaporisation systems: Dr. Yang, director of LNG technology for Foster Wheeler in Houston

Photo: ANTHONY GUEGEL

Counting environmental cost of vaporisation

THE PRIMARY methods used for heating LNG to turn it back into a gas at a receiving terminal are alarming some US environmentalists, concerned about the impact on marine life as well as air emissions.

Open rack vaporisers (ORVs), which feature a seawater-based heat exchanger, are the most common system chosen by terminal operators.

ORVs are relatively inexpensive, easy to operate and maintain, and have relatively few air emissions, according to Dr. CC Yang, director of LNG technology for engineering group Foster Wheeler in Houston. However, they do use tremendous amounts of seawater, anywhere from 18,000 metres to 65,000 cubic metres per hour.

Fishery groups have expressed concern about the impact on overall fish populations as tiny fish species and eggs that may slip past safety screens are destroyed inside the ORV.

In addition, the seawater loses heat in the process. The temperature of the water when it is returned to the sea is five to 12 degrees Celsius cooler, another potential environmental impact.

The chief alternative to ORVs is to use warm water bath heat exchangers, called submerged combustion vaporisers (SCVs).

Instead of relying on warm, plentiful seawater, SCVs consume gas as a fuel to heat the water surrounding pipes carrying the LNG. That process can burn up as much as 1.5% of the LNG cargo being offloaded.

While the fish are safe, the air is not immune. SCVs produce nitrogen oxides, about 30 to 80 parts per million, in addition to carbons, according to Yang.

A third alternative is a combined heat and power (CHP) heat exchanger system. According to Yang, it is a very efficient process that uses flue gas heat. It has some air emissions but not as much as SCV systems. However, reliability is enough of an issue to warrant a 100% back-up vaporisation system, Dr. Yang noted.

A possible mitigating solution is to capture as much waste heat as possible from power generation or other activities and use it to warm the LNG.

Up to 20% of the heat needed for the vaporisation process can come from waste heat, Yang calculated.

Shell and tube-type vaporisers are other options that have been developed but are not in widespread use. Corrosion from exposure to seawater is an issue, Yang said.