

Services Performed

IRC completed a computational fluid dynamics (CFD) analysis for the OceanWay Secure Energy deepwater port development offshore southern California to assess the impact of cold air recirculation and condensation.

Objectives

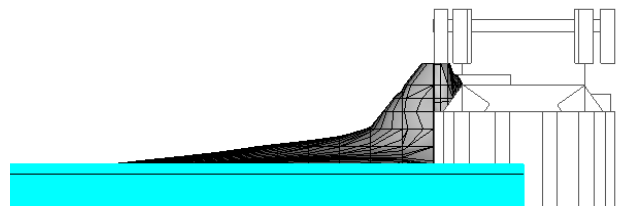
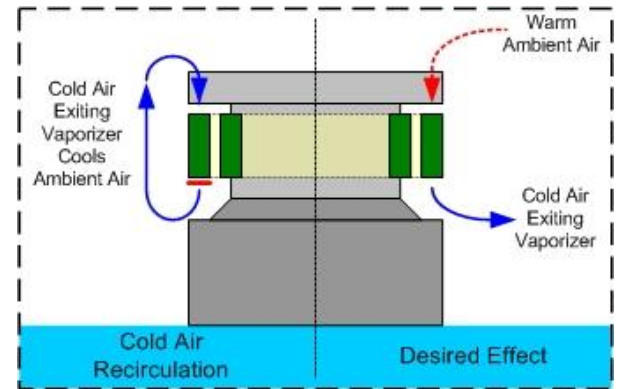
- Evaluate the sensitivity to humidity, wind speed, wind direction, vaporizer air outlet temperature, and vaporizer air flow rate of water vapor cloud formation (fog) that is restricting visibility in the area
- Investigate the potential for cold air recirculation and define operational and environmental scenarios where this may occur
- Evaluate air temperature near the hull to determine any adverse affect of cold temperature on the metallurgy

Project Description

This deepwater port project in southern California was proposed for revaporizing liquefied natural gas (LNG) using a proprietary process whereby ambient air is used to trim-heat natural gas and regasify LNG. When cold air exits the vaporizer and contacts moist, ambient air, the ensuing cloud formation might impact the vaporizer efficiency and restrict visibility of approaching vessels and helicopters.

The client provided key input data and assumptions (such as meteorological, cloud generation, and Woodside Hybrid Air Vaporization [WHAV] parameters) for the site. IRC used the industry-standard PHOENICS (parabolic, hyperbolic, or elliptical numerical integration code series) model to perform the CFD analysis and considered blockages (such as ship hull and superstructure) and boundary conditions.

Conclusions from the analysis were that the extent of cloud formation is localized and does not constitute a hazard to navigation. Variations in humidity, wind speed, wind direction, and vaporizer air flow rate have a minimal impact on the efficiency of the vaporizers. Variations of vaporizer air outlet temperature have an impact on air temperatures along the hull and waterline and, contingent upon the material selection for the hull, steel embrittlement can occur.



Key Benefits to Client

- Demonstrated to California authorities that fog formation was not a significant issue or threat to nearby shipping
- Demonstrated that the vaporizers functioned for a full range of environmental conditions
- Determined that the outlet temperature of the vaporizers impacts the material selection for the hull