



**The Impact of Subsea Gas Releases and Resulting Gas Plumes Using  
techniques in Computational Fluid Dynamics**

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1. **OBJECTIVES/SCOPE:** Please list the objectives and scope of the proposed paper. (25-75 words)

Vessels and platforms that operate in offshore fields are at risk of subsea gas releases that result from accidental loss of containment caused by well blowouts or ruptured pipelines. The objective of this paper is to understand the various phenomena that can occur when a gas plume reaches the sea surface potentially leading to surface boiling and strong outward surface flow.

2. **METHODS PROCEDURES, PROCESS:** Briefly explain your overall approach, including your methods, procedures and process. (75-100 words)

The methodology involved dividing the subsea gas plume into three main zones. The first is the zone of establishment located near the release source where the plume is dominated by very high speed flow caused by the momentum gained through the high gas well pressure. Above the zone of establishment is the zone of established flow where the gas plume is dominated by buoyancy and the turbulent dispersion force. The last zone is the surface zone where the significance of the water surface should be considered. In order to assess these zones, a Computational Fluid Dynamics (CFD) model was developed that was validated against experimental data to predict the properties of subsea gas plumes for various release rates and release depths.

3. **RESULTS, OBSERVATIONS, CONCLUSIONS:** Please describe the results, observations and conclusions of the proposed paper. (100-200 words)

In conclusion, the random wondering behavior of the subsea gas plume was well captured by the CFD model. Very good agreement between the CFD results and the experimental data were obtained in terms of all the important plume parameters including velocity profile, void fraction profile, plume rise time, fountain height at the surface, and the surface flow. The study demonstrated the importance of understanding subsea gas releases and the implications to safety and risk in the offshore oil and gas industry.

4. Please explain how this paper will present novel (new) or additive information to the existing body of literature that can be of benefit to a practicing engineer. (25-75 words)

The impact of subsea gas releases and resulting gas plumes is an unknown in the Offshore Oil & Gas Industry. This novel analysis analyzed the various phenomena that could occur and potentially have detrimental effect on platforms and rescue vessels at the surface above the plume. There could be adverse effects on propeller efficiency of rescue vessels used during emergency response, and the accumulation of hydrocarbon gas above the surface is also a potential explosion or fire risk. Therefore, the prediction of the dimension of the boiling zone, surface water density, surface flow and gas flux across the water surface are of vital importance in safety considerations for the offshore oil and gas industry.

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