

Title	Offshore Technology Report 1999 043: Explosions in full scale offshore module geometries
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Executive Summary	<p>In May 1990, a joint industry project, the 'Blast and Fire Engineering Project for Topside Structures', was initiated to study the special hazards facing offshore operators. Phase 1 of this project was completed in 1992 and established interim guidelines [1] for the design of topside structures against the loading from fires and explosions. It also identified that there were areas of major uncertainty in this design process, especially in determining the loading that might be generated by a fire or explosion within a topside structure. This led to Phase 2 of the project, which included, for the first time, the study of explosions in a test rig (up to 28m long by 12m by 8m high) representing an offshore process module at a realistic scale. This project was sponsored by BG, BP, Elf Enterprise Caledonia, Enterprise Oil, the Health & Safety Executive (HSE), Mobil North Sea, Norsk Hydro, Saga Petroleum, Shell UK, Statoil, and Texaco Britain and included 27 experiments in all [2].</p> <p>In 1997, Phase 2 of the project was completed and the results showed that high explosion overpressures could be generated for certain configurations and that water sprays activated prior to ignition could significantly reduce these overpressures. This led to an initiative by the HSE to obtain further data which explored the mechanisms which led to high overpressures and ways of mitigating them, for example, by reducing perimeter wall confinement and by the use of water deluge. The overall objectives of the HSE programme of work were to:</p> <ul style="list-style-type: none"> • Provide information on the reduction of explosion overpressures in the design of new and modified offshore installations. • Identify mitigation measures to reduce explosion overpressures on existing installations. • Provide test data for use in the validation of explosion models. <p>The HSE funded project, known as Phase 3a, commenced in May 1997 and comprised of 45 experiments. During each experiment the test rig was filled with a gas/air mixture and ignited by a single spark at a specified location. The programme commenced with the first series of experiments (comprising seven tests) with confinement only present at the floor and roof. This series included both 'dry' tests and those with full area deluge. The next series of experiments (comprising eight tests) involved confinement on one long wall as well as the floor and roof. Again, both 'dry' tests and those with deluge were included, in the form of full area deluge and deluge curtains. The remaining thirty experiments were conducted with no wall confinement and with part of the roof removed. During these tests, various deluge systems including full area deluge, water curtains and vessel specific deluge, were studied. The equipment layout inside the module was also modified to include a greater equipment density and the inclusion of scaffolding. This final test series also incorporated eleven experiments (a set of five and a set of six) which were designed to study the repeatability of the results. The results of these tests are included in this report but the assessment of the repeatability is reported elsewhere [3].</p> <p>The test programme was conducted between May 1997 and March 1998.</p>
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