Improved understanding of the major-hazard potential of large fuel depots

The project seeks to improve the understanding of the major-hazard potential of large fuel depots. The topic is of considerable importance to society because real estate developments (upscale residential, schools, institutions etc.) are moving closer to harbours and other areas, where fuel depots typically are located.

Before 2005, the storage of petroleum products in large tanks was thought to present rather limited risks to its neighbours. For land-use planning purposes, the dimensioning scenario was a pool fire resulting from an ignited release of product. Although flames can be very large and intense, heat radiation levels have limited reach. Calculations predicted that the distance at which a pool fire could cause harmful burns could not exceed 200 m.

A very large explosion of petrol/gasoline (in Danish*: benzin*) vapours at a UK fuel depot in 2005 led the international safety community to re-think the major hazard potential of such storage facilities. A petrol tank overflowed and the vapours exploded with tremendous force, destroying many nearby office buildings. Property damage was estimated at 1 billion £. Internationally, much attention has since been given to improved overfill protection and larger recommended separation distances to neighbours.

In recent risk consultancy work however, COWI has identified that another scenario, import pipeline puncture, under certain circumstances, might produce even larger vapour cloud explosions. The work indicates, that in a risk-based land-use planning context, the dimensioning scenario might be a punctured import pipeline rather than an overfill scenario. If true, the finding may trigger a new round of re-assessment of the major hazard potential of fuel depots and the need for better safety measures. Internationally, this finding has novelty and relevance.

Petrol consists of various petroleum fractions blended to meet detailed quality specifications. The main constituents are in the C6-C12 range, with C4-C5 fractions added to meet vapour pressure specs. DTU will model the physical properties of petrol and its behavior if released as a spray.

The purpose of the project is to examine critically the possibility that the preliminary earlier findings, while defensible and technically correct, could be an artefact of simplifying assumptions elsewhere in the analysis procedure.

The project will provide novel insights into the major-hazard potential of large fuel depots and give advice on how to determine proper separation distances to neighbours (land-use planning guidance).

Project team: COWI and DTU (CAPEC PROCESS research center).