"Open Ground Flare systems – Hystorical review of a recent project from the concept to the commissioning, passing through R&D activities

Presentation and Discussion of the Results of R&D activities as a basis for design and execution stage.”

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1. Foreword

The more and more restrictive environmental laws and regulation applied in most of the projects all over the world led in the last years to the need to increase on one hand smokeless performances of assisted flares, to guarantee smokeless combustion up to Ringelmann 0, and, on the other hand to install staged enclosed ground flares or staged opened ground flare with totally hidden flames to avoid visible flames.

Hamworthy was awarded from Petrobras – Brasil for the Design of the biggest ground flare of South America, disposing 750 Tons/Hr of hydrocarbon.

This presentation will show, as a key study, the development of the project, the highly successfully results achieved and the synergies shared between the involved disciplines like CFD analysis and modelisation, tests and test rig preparation, design and prototype fabrication, radiation software prediction and validation against data acquired, post-processing site testing and site acceptance test.

The full presentation shall detail all the following shortened subjects of this technical paper, with exposure of pictures and short videos.

2. Presentation Content

- System description
- Mechanical & Structural Design vs. Process and Thermal Design
- 3D Modelling
- Flare/Burners Prototype Testing
- CFD Simulation
- Commissioning
- Lesson learnt
2. System description

The designed ground flare consists mainly in the following parts

a. A staged Wet Flare disposing 750 Tons/Hr of hydrocarbons at max. rate.
b. A smaller staged Cold Flare disposing 149 Tons/Hr of hydrocarbons at max. rate.
c. A Fence with perimeter of 68x62 mt. and 18 mt. Height, enough to totally hide the flames.
d. 307 “Spider” burners (300+7 wet+cold flare), shared on 6+2 stages (wet + cold flare)
e. Staging System
f. Automatic FFG/HE Pilot ignition system with Fuel Skid & PLC for ignition control

3. 3D Modelling

System was designed 100% with aid of 3D modelling to harmonise all involved disciplines
4. Simulating to scale test rig

To finalise process design:

a. Burner Type and Drilling was first selected with single burners firing tests

![Burner Type Image]

b. Selected burner/drilling was again tested with different type of fuels from methane to heavy unsaturated hydrocarbons (Propylene)

![Flare Testing Image]

c. A to scale Ground Flare was built to perform flaring testing under different conditions

![Flare Test Images]

The flame length - Propane – Test#1
5. CFD

CFD of Ground Flare emission has been simulated on large scale

![CFD Simulation](image)

6. Commissioning

Ground Flare has been tested at 90% of its Design capacity

![Commissioning Picture](image)

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