



## Tank Overfill Protection System – Project Highlights

### Global Energy Group, UK

#### THE BACKGROUND

Our client operates fuel storage terminals throughout the UK. A catastrophic fire and explosion at the Buncefield storage terminal in Hertfordshire, UK, identified a requirement to mitigate the risk of fire and explosion caused by overfilling storage tanks used for extremely inflammable products, such as gasoline.

Tank overfill protection systems with a verified safety integrity level (SIL) in accordance with IEC 61508 and IEC 61511 were installed on all UK operating terminals (hot cross-over). GSE Systems provided comprehensive project management, engineering and safety instrumented system (SIS) support.

#### Storage Terminal Operation

- The incoming fuel is usually imported into the terminal storage tanks from pipelines or ships and is then exported from the storage tanks into road tankers via tanker loading gantries.
- The filling of tanks and tankers must be done in a controlled manner in order to prevent an overspill situation with the potential of fire and explosion.

#### Services provided by GSE Systems:

- Project management
- Specification and procurement of materials
- Detail of design
- Calculations to verify that installed system meets SIL requirements
- Specification of high-integrity logic solver (Emerson Delta V System) together with associated acceptance tests
- Specification of installation, test and commissioning
- Site supervision
- Operator training
- Independent third party review

#### THE CHALLENGE

GSE Systems were asked to significantly reduce the risk of fire and explosion by the phased installation of complex, high-integrity systems onto operating sites, including integration with existing systems. As an augmented service, full asset lifecycle support, documentation and associated services were supplied by GSE.

## THE SOLUTION

GSE Systems operated as a fully-integrated element of the client project team and adopted a collaborative, partnering approach to deliver maximum value.

### Typical Overfill Protection Project

- The design must fulfil the SIL requirement derived from the SIL determination process, typically layer of protection analysis (LOPA) studies.
- Ensure that provisions are made for all future and existing interfaces within the SIS logic solver and all of the data for immediate and future requirements is collated into a cause and effect matrix which forms the main part of the specification for the SIS logic solver.
- Gasoline and distillate tank high-high level switches are replaced by new, more reliable and accurate gauges, (typically radar) hard-wired to the SIS logic solver and remotely operated shut off valve (ROSOV) installed in the tank inlet and outlet nozzles.
- The SIS logic solver to close the tank inlet ROSOV in the event of a tank high-high level.
- The outlet ROSOV to close in the event of a high level of pressure from the loading bay gantries.
- Discrepancy alarms to be provided in order to identify if the outputs from the various level gauging systems are greater than a set parameter.

### Bespoke Solution

- Prioritized approach to dealing with the assets posing the greatest risk
- Project management – program, quality, cost, control
- Detailed site survey
- Detailed design phase delivered equipment specifications and installation requirements
- Logic solver specification including cause and effect matrix
- Calculations using GSE's qualified personnel and TUV-accredited Exida software to verify SIL

- Equipment procurement, competitive equipment tenders, purchase recommendations based on technical and commercial assessment considerations
- Appointment and management of installation contractors
- Site support and supervision provided to address any technical queries raised on site
- Rigorous test and commissioning program to ensure that the system meets the required performance levels
- Comprehensive client operations staff training
- Full lifecycle support processes and documentation
- Full technical support post commissioning
- Comprehensive training for client employees

## THE BENEFITS

A significant and verifiable reduction in the risk of fire and explosion from tank overfill has been delivered in a flexible, collaborative and cost-effective manner.

The interface with emergency shut down and fire systems now meets UK Buncefield regulation recommendations.

*//GSE had the right combination of project management and functional management skills to successfully bring together the various elements of the project in accordance with relevant standards.*

### PROJECT MANAGER

Tank Overfill Protection Scheme  
Global Energy Group

## THE FEEDBACK

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Project Manager, Tank Overfill Protection Scheme,  
Global Energy Group

## References

Report on the Buncefield incident:  
<http://www.hse.gov.uk/comah/investigation-reports.htm>

International Electro-technical Commission standard  
IEC-61511 Functional Safety – Safety Instrumented  
Systems (SIS) for the process industry as recommended  
by the HSE

Achieving Competitiveness through Innovation  
and Value Enhancement (ACTIVE):  
<http://www.eci-online.org/taskforces/active>



## About GSE Systems

We are a next-generation simulation, training, and engineering services provider applying a world of experience to help you achieve the performance you imagine. GSE is a world leader in real-time high-fidelity simulation, providing a wide range of simulation, training and engineering solutions to the energy and process industries. Our comprehensive and modular solutions help customers achieve performance excellence in design, training and operations. GSE's products and services are tailored to meet specific client requirements such as scope, budget and timeline.

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