

# INTEGRATED SAFETY CONTROL SYSTEMS



The size and complexity of modern process facilities means that minor fires and gas leaks can escalate quickly and undetected with potentially catastrophic human and financial consequences. Angus Fire Engineering (AFE) integrated safety control systems are designed to provide complete coverage and monitoring of all spaces and areas and to provide fast and reliable protection for plant and personnel.

## Engineered Systems

AFE offers a comprehensive range of systems which covers all requirements for integrated control and safety systems including:

- Hardwired solid state fire and gas systems.
- Conventional and Hardwired Fire and Gas Systems with Programmable Logic Controller (PLC) logic solver.
- Dual (GMR) and Triple Modular Redundant (TMR) high integrity Fire and Gas Detection and Emergency Shut Down (ESD) systems.
- Fully Distributed or Centralised Analogue Addressable fire detection and alarm systems.
- Intelligent fire detectors and addressable manual alarm call stations, addressable IR and UV based optical fire detection systems, and a range of addressable gas detection systems.
- A complete range of fire and gas detectors, and other field devices.
- PC based graphic display and annunciation systems.
- High speed SOE software.
- Secure dual gateways to plant wide DCS systems using OPC or MODBUS links.
- Evacuation Management and PA Systems.



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### Solid State Systems

For small facilities and extensions, hardwired systems are a reliable and cost-effective approach to fire and gas detection. AFE can provide small and medium sized fire and gas detection systems based on 19 inch rack mounting modular hardware using CMOS-based logic as the prime logic solver. This hardware can also be used as the front-end processor to a traditional PLC-based logic solver system. The modules comply with the requirements of modern fire and gas detection codes to provide full field supervision of plant wiring and field devices. They can be designed to control and monitor a full range of fixed fire protection systems and act as the main plant alarm controller.



### Field Devices

AFE offers a complete range of field devices sourced from sister companies in the Kidde plc group as well as world class manufacturers with whom it has exclusive distribution agreements:

- Conventional and addressable smoke and heat detectors, sounders and call points.
- Hazardous area certified point and linear heat detectors, and HSSD detectors.
- Catalytic and IR-based catalytic combustible gas detectors.
- Semiconductor (MOS) and electrochemical cell based toxic gas detectors.
- Oil Mist Detectors.
- Hazardous area certified sounders, beacons, and PA system components.



### Approvals

Systems and components supplied by AFE are certified by the leading fire protection and marine safety authorities including:

- ISO 9001
- NFPA
- EN54 compliance
- TuV
- BASEEFA/CENELEC



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#### Addressable Systems

Addressable fire and gas detection systems offer several benefits including greater design flexibility, reduced wiring and lower installation costs, and monitoring and retrieval of significant system performance information. AFE offers a unique combined addressable fire and gas detection system with dual or triplicated PLC logic solver. Such addressable systems can provide full compliance with NFPA 72. AFE has supplied systems that demonstrate compliance with IEC61508 SIL2 and SIL3. The AFE detection system design is based on the latest analogue addressable technology using intelligent or conventional field devices and interfaces linked to fire panel-based control and monitoring systems.

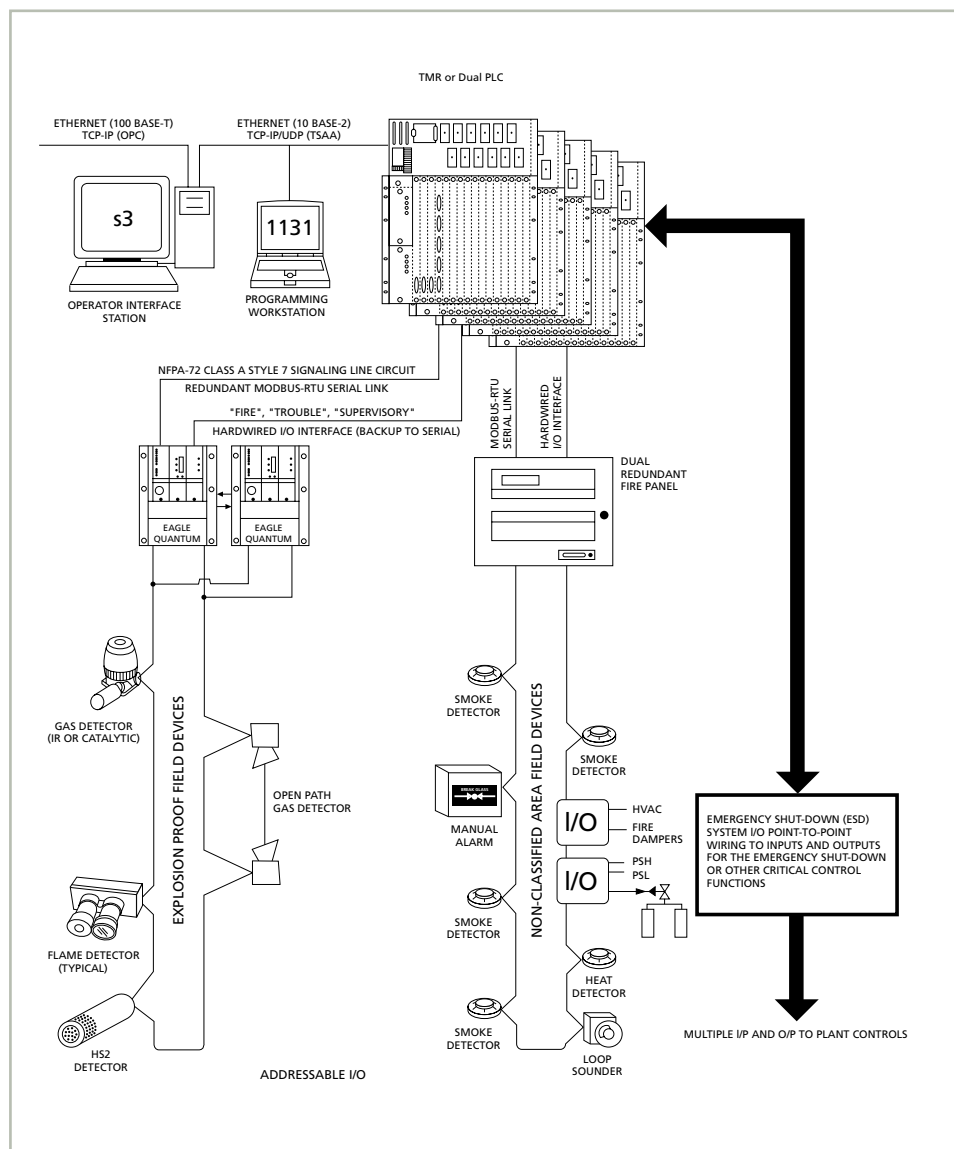
Addressable systems are built up in sets of analogue addressable loops. Each loop monitors up to a maximum of 126 intelligent devices or I/O points. The status of every address and its connected detector or I/O is constantly monitored and displayed. Critical command and control signals can be hardwired for additional security. These hardwired signals are fully monitored for open and short circuit faults. Field devices in hazardous areas can be wired on to the addressable loops via IS spurs using individually certified Intrinsically Safe devices. These panels can be distributed throughout the facility in individual fire zones or at a central location. Fully distributed systems are built to communicate with each other via dual or single dedicated fire detection data

highways. Each highway is configured as a bi-directional ring such that a single cable fault will not effect system operation.

Each single sub-system is fully independent such that in the event of

loss of the communication network the sub-systems continue to operate.

The system can be built and configured as a duplex system if the highest level of system availability is required.



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### Emergency Shut Down Systems

AFE offers ESD systems predicated on the well proven GMR (Dual Redundant) and TMR (Triple Modular Redundant) technology. AFE is an approved integrator for both GE FANUC and Triconex PLCs. Each system is custom designed and the system configuration software can be changed with a PC based IEC 1131 programming tool. This minimises commissioning and maintenance time. Communication to other plant control and monitoring systems is by single or dual RS485 serial ports using MODBUS – RTU serial protocol.



The fire and gas alarm systems can form part of an overall plant safety control system in conjunction with the ESD system based on shared CPUs with separately dedicated I/O or as two complete stand-alone systems linked by high integrity peer-to-peer communications. For maximum availability a Triconex developed Triple Modular Redundant (TMR) solution will ensure that no single point of failure will cause a nuisance trip or unwanted shut down. These can be configured as centrally based triplicated I/O chassis or distributed I/O with triplicated I/O - CPU communications. Alternatively, a GMR-based ESD system would comprise a series of remote (field or panel) mounted I/O blocks with dual communications to dual redundant CPUs running in full duplex mode. These field I/Os will collect status, alarm and fault information from various sub systems and process monitoring transducers.



### Applications

No matter what your application, you can count on AFE for safe, reliable, and cost-effective plant protection. We have the technologies, products, people, and facilities world wide to get the job done efficiently and cost-effectively:

- Oil Refineries
- Offshore Platforms
- Gas
- LNG terminals
- Petrochemical Plants
- FPSOs
- Pipelines
- Drilling rigs
- Compressor Stations
- Spray Paint Booths
- Electronics
- Pulp/Paper
- Automotive
- Fuel Loading Racks
- Aircraft Hangars
- Rocket Launch Facilities
- Semiconductor Fabrication
- Chemical
- Electric Power
- Food & Beverage
- Water & Sewage Treatment

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### Clients

AFE is a leading single source supplier of integrated safety control systems. The company has a long established track record of providing special risk integrated safety control systems for many prestigious projects worldwide.

#### Oil, Gas & Petrochemical

Abu Dhabi Company for Onshore Oil Operations (ADCO)  
Abu Dhabi Gas Industries Company (GASCO)  
Abu Dhabi Marine and Operating Company (ADMA-OPCO)  
Abu Dhabi National Oil Company (ADNOC)  
AGIP  
Aramco  
Atlantic Richfield Company (ARCO British)  
Badger Catalytic  
Bahrain Petroleum Company (BAPCO)  
British Gas  
BP Amoco  
Caltex  
Ciba-Geigy  
Conoco  
Chevron  
Dow Chemicals  
Exxon Mobil  
KALA  
Marathon Oil  
Mossgas  
National Iranian Oil Company (NIOC)  
National Iranian Gas Company (NIGC)  
Pemex  
Petronas  
Qatar General Petroleum Company

#### (QGPC)

Saga Petroleum  
Saudi Arabian Basic Industries Company (SABIC)  
Single Buoy Mooring (SBM)  
Shell  
Sonatrach  
Sudanese Pipeline  
Suez Oil Company (SUCO)  
Total/Elf/Fina  
Transco  
Vietsovetro

#### Contractors and Consultants

Aker Engineering  
AMEC  
Bechtel  
Brown & Root  
ENPPI  
FELS  
Fluor Daniel  
Foster Wheeler  
M W Kellogg  
Kvaerner  
McDermotts  
Mott MacDonald  
Roche  
Stone & Webster  
Technip  
Tecnomare  
Trenegy, Malaysia

### Customer Case Studies

#### LNG Production, Loading, Storing

Algeria's state-owned oil and gas company Sonatrach recently upgraded its GL2-Z LNG complex in Arzew/Bethioua. Fire protection for the project, believed to be among the largest LNG renovations ever undertaken anywhere in the world, was provided by the AFE Dual Redundant PLC-based integrated fire and gas and ESD system.

This integrated safety control system monitors and manages the site-wide fire and gas detectors, and has direct process shut down control. In addition, it controls and monitors the Angus Fire LNG Fixed Turbex System which controls LNG spill fires and disperses vapours safely.



#### Equipment supplied by AFE:

- Dual PLC based fire and gas detection and ESD systems to SIL3/AK6.
- Combustible gas detectors.
- UV/IR flame detectors.
- Heat detectors.
- LNG temperature spillage detectors.
- General plant alarms and MACs.
- LNG Fixed Turbex System.

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### Customer Case Studies (continued)

#### High Pressure Gas Pipeline

AFE was responsible for the provision of integrated safety control systems and fixed fire protection systems for the compressor stations on the Esfahan-Rez gas pipeline operated by NIGC in Iran.

The system comprises hardwired conventional gas, flame and fire detection systems with automatic control over the compressor station automatic fire extinguishing systems and direct interface into the compressor station system shut down.

AFE was responsible for the project management, design and fabrication, and commissioning of the complete system.

#### Equipment supplied by AFE:

- Integrated modular fire and gas detection system and fire protection control.
- Overall compressor station alarms and mimics.
- Combustible gas detectors.
- UV/IR flame detectors.
- Heat detectors.
- LNG temperature spillage detectors.
- General plant alarms and MACs.

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