Fire and Gas Detection – *A Safeguarding System Worth Investing*

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Offshore platforms contain hydrocarbon inventory at the process areas. It is a hazardous workplace. When there is a liquid or gas leak, it can harm the people working on the platform. It will also spoil the equipment and damage the environment.

A fire and gas detection system is required on a platform to protect the personnel, equipment and the fishes or natural wildlife in the sea. When a catastrophic event occurs, it will be reported in the media. It will cost the operator a lot of money to rectify the problem. It is worthwhile investing in a fire and gas solution due to the aforementioned reason.

A fire and gas detection system consists of field devices that detect a gas leak or a fire when it develops. It will then send a signal to a control system which will then sound the alarm and isolate the supply of hydrocarbon inventory flowing into the platform. When this happens, the platform should be safe from a catastrophic event because the source of the hydrocarbon has been stopped. The power supply is also isolated to these areas.

The danger is when the safeguarding system fails to work, i.e. when it is supposed to activate the alarm, isolate the power supply and shutdown the platform. To mitigate this from happening, two gas detectors or flame detectors are required. When one fails to work, the other is able to step in.

When a detection system is in place, a lot of money can be saved. People can work safely on a platform. Equipment will be protected and will not be severely damaged. The harm to the environment is minimised.

However, ensuring the safety of personnel on a platform is not easy. The idea of prevention is important because if there is a leak, it must be stopped. Hence, a fire and gas detection system is required to prevent this from happening, thus people working on a platform are able to avoid the danger.

What are the chances of a leak occurring at the same time when a person is working at a hazardous area? As such, a model to predict such an occurrence is required. In the later section, it is suggested that the fire and gas detection system need to be reliable and safe. A quantitative approach is also suggested, based on two equations, to avoid a catastrophic occurrence.

RELIABLE AND SAFE DETECTORS – WHAT DOES IT MEAN?

Fire and gas detection in the oil and gas industry requires reliable and safe detectors. Some of the elements that constitute a reliable and safe detector are built-in quality (which includes product assurance), high operation performance (minimum faults or failure; if possible, zero breakdown) and best possible components – source from prominent suppliers.

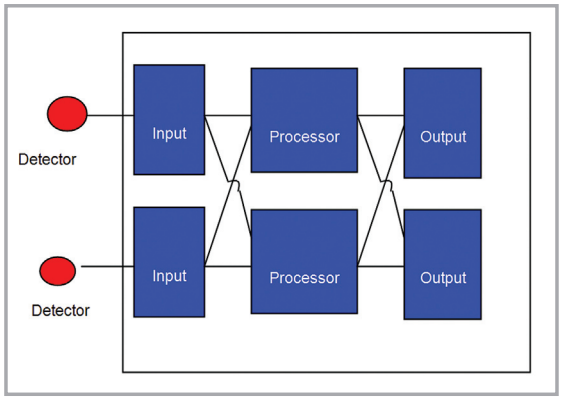

Figure 1: Diagram of a redundant processor

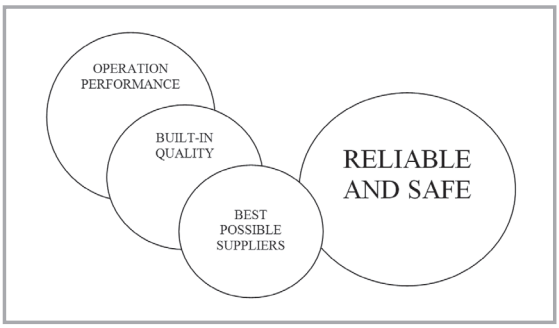

Figure 2: The challenge to achieve a reliable and safe detector

OPERATION PERFORMANCE

The detectors must function all the time to transmit signal to the detection system when there is a fire or leak, e.g. gas, flame or smoke. Failure will result in poor performance. Fault alarms must be generated in the system when detectors in the field fail to operate. Performance is rated by identifying the number of failures.

BUILT-IN QUALITY

A manufacturer has to realise that quality is important. Built-in quality is regarded as an organisation with a quality system in place, a group of resourceful people, etc. Quality is free, according to top quality gurus. Achieving this is a challenge.

BEST POSSIBLE SUPPLIERS

Component suppliers must supply good components that will last a long time. The electronic devices must be sourced from a good electronics maker, in order to produce a reliable and safe detector required by customers. Suppliers need to look out for the best component supplier which will contribute indirectly to the performance of the detectors.

FAILURE RATE AND MEAN TIME BETWEEN FAILURE – A QUANTITATIVE MEASURE OF SAFE OPERATIONS

The failure rate is an equation to calculate the number of failures sent out to customers over the total number of production output. This is an equation to know how well is the device being manufactured.

Mean time between failures is another equation that is used to calculate the actual number of failures in use by the customers over a period of time. It is

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an equation to determine the duration between failures collected throughout the use of the device. Statistically, this number will depict an estimate time of an actual failure that is going to happen.

$$\text{Failure Rate} = \frac{\text{Number of Failures}}{\text{Total Number of Products Tested}} \times 100$$

Mean Time Between Failure (MTBF)

$$= \frac{\text{Operating Hours}}{\text{Number of Failures}}$$

T = Operation Duration

F = Repair Duration

|------T1----||---F1----||-------T2------||----F2---|...|---TN---||---FN---|

Mean or Average Time Between Failures

$$= \frac{T1 + T2 + ...TN}{N}$$

In the case of gas and flame detectors, this number is dependent on the fire and gas suppliers. And for every supplier, it is different in every case.

In fire and gas detection, the time of an actual failure taking place in a field device is unknown. Only an estimate can be determined. The number of the detectors' failure rate is important because if this figure is high, it means that the quality is bad. Inversely, if the failure rate is low, this means that the quality of the product is good.

The quantitative calculation is to determine whether there is a repeat case of failure. If it does not recur, then the incident could be sporadic. In which case, an analysis is required on the collected data. Limits might then be applied.

As an additional point, the platform needs to be well maintained to avoid an incident from occurring. Proper predictive tools to monitor the performance of pumps or compressors are required. Regular visual checks on the condition of a platform are also required to ensure that the machinery and equipment are well maintained. ■

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