

# Alarms The hidden menace



## ABB uncover a serious safety issue that had been deteriorating for 10 years.

Our client operates a Floating Production, Storage and Offloading Facility (FPSO) in the North Sea. Their alarm control system was poorly designed and they realised they had a problem with nuisance alarms. They asked ABB Consulting to carry out an alarm management health check. The health check confirmed that they had a number of issues and in particular suffered from an overload of alarms.

To help the client solve their alarm problems ABB began an alarm rationalisation programme.

### Benefits

- A hidden danger to safety was discovered that had been deteriorating for 10 years
- Improvements to the alarm system
- Gas and HVAC alarms down from 1 every 2 seconds to a manageable rate (4/5 a day)
- Assurance that operational risk assessment was valid
- Closer compliance to ISA 18.2 and adherence to the EEMUA 191 guidelines
- Operators have more confidence in the alarm system
- Learning passed on to other assets where similar design issues were identified

### Solution

ABB Consulting began the project by carrying out an alarm analysis. Using the data sent from the alarm system offshore, all the alarms were identified and ranked in order of frequency to highlight the worst nuisance alarms.

With the worst offenders identified, the process of rationalising the top 20 alarms began. This involved investigations to see if the alarms were genuine i.e. if it should be an alarm, or not. If an alarm was genuine and required, the occurrences were analysed to find out what could be done to minimise its nuisance behaviour.

A little way into the project, data was sent from a different alarm system console offshore. As the alarms had been considered a nuisance, the sounder on the console had been switched off so they did not sound and had been so for almost 10 years. The alarms from this console had originally been excluded from the rationalisation process by the client.

After some investigation, ABB found that that they were in fact genuine alarms mostly caused by failing gas detectors. In 1 month over 412,000 gas detector alarms were generated. The personnel on the asset believed the detector alarm only indicated a calibration (drift) error. In fact, the alarm also indicated a complete failure of the detector. Figure 1 below shows the extent of gas detector faults and results of the first remediation visit carried out by the F&G vender.

Figure 1.

January 2012							412,740 Total alarms		
Gas detector alarms							395,727 Removed alarms		
							17,013 Alarms remaining		
							96% %age cleared		
Num	Tag	Description	Alarm	Priority	Count	%age	14-20 Feb 2012		
1	xxx_715GD:GD7126	GASDETECTOR FIREAREA 51	RANGE LOW	1	142,452	36.29%	Many faults - Replaced		
2	xxx_715GD:GD6211	PAINT STORE VENT AR 42 AIR INL	RANGE LOW	1	81,059	23.62%	Many faults - Replaced		
3	xxx_715GD:GD7124	GASDETECTOR FIREAREA 51	RANGE LOW	1	63,685	15.72%	Many faults - Replaced		
4	xxx_715GD:GD6832	AIR INLET AREA 48	RANGE LOW	1	52,143	18.81%	Many faults - Replaced		
5	xxx_715GD:GD7502	TURRET 2ND DECK FIRE AREA 55	RANGE LOW	1	46,929	18.63%	Many faults - Replaced		
6	xxx_715GD:GD4435	TANK TOP PMP ROOM FIRE AREA 24	RANGE LOW	1	13,639	4.21%	To be checked		
7	xxx_715GD:GD6624	USB PMPHOUSE FIRE AREA 46	RANGE LOW	1	5,020	1.34%	Maintained, cleaned & calibrated		
8	xxx_715GD:GD7211	LP GAS COMPR FIRE AREA 52	BEAM BLOCK	2	1,182	0.41%	To be checked		
9	xxx_715GD:GD6322	UIR HVAC FIRE AR 43 AIR INL	RANGE LOW	1	1,107	0.39%	Many faults - Replaced		
10	xxx_715GD:GD7128	GASDETECTOR FIREAREA 51	RANGE LOW	1	943	0.30%	Many faults - Replaced		
11	xxx_715GD:GD7407	1ST DK FLARE SYS FIRE AREA 54	RANGE LOW	1	937	0.27%	To be checked		
12	xxx_715GD:GD7305	1ST DECK HP COMP FIRE AREA 53	RANGE LOW	1	785	0.34%	Many faults - Replaced		
13	xxx_715GD:GD8229	HVAC DUCT	RANGE LOW	1	319	0.17%	Cleaned & calibrated		
14	xxx_715GD:GD7127	GASDETECTOR FIREAREA 51	RANGE LOW	1	307	0.08%	Many faults - Replaced		
15	xxx_715GD:GD7409	1ST DK FLARE SYS FIRE AREA 54	RANGE LOW	1	291	0.11%	Maintained, cleaned & calibrated		
16	xxx_715GD:GD8230	HVAC DUCT	RANGE LOW	1	269	0.12%	Many faults - Replaced		
17	xxx_715GD:GD6920	2ND DECK CSU PS FIRE AREA 49	RANGE LOW	1	267	0.08%	To be checked		
18	xxx_715GD:GD5704	TURNTABLE FIRE AREA 37	RANGE LOW	1	239	0.06%	Maintained/cleaned & calibrated		
19	xxx_715GD:GD6122	HAZ STORE VENT AR 41 AIR INL	RANGE LOW	1	222	0.08%	To be checked		
20	xxx_715GD:GD5925	FIRE AREA 39	RANGE LOW	1	199	0.06%	To be checked		
21	xxx_715GD:GD7408	1ST DK FLARE SYS FIRE AREA 54	RANGE LOW	1	174	0.06%	Unit in fault - Replaced		
22	xxx_715GD:GD7313	1ST DECK HP COMP FIRE AREA 53	RANGE LOW	1	126	0.03%	To be checked		
23	xxx_715GD:GD5921	L.O.S. ABOVE PUMP ROOM	BEAM BLOCK	2	123	0.06%	To be checked		
24	xxx_715GD:GD7205	GLYCOL REGENERATN FIRE AREA 52	RANGE LOW	1	101	0.04%	To be checked		
25	xxx_715GD:GD7018	2ND DECK CSU SB FIRE AREA 50	RANGE LOW	1	101	0.03%	To be checked		

The fire and gas vendor was called out to investigate the situation and found that the detectors causing the nuisance alarms had multiple faults, and worryingly, almost 20% of the detectors checked out were totally dead. All faulty and dead detectors were replaced to bring the system back to full functionality.

As the gas detector alarms were being ignored (and in some cases there was a 2oo2 voting system), in the event of a genuine gas release where one detector in a 2oo2 voting configuration was dead, the GPA would not have been activated. In one zone, both detectors in a 2oo2 configuration were found to be dead. This could have led to a serious incident and possible loss of life. An internal safety notice detailing the findings was sent to the operator's other assets. This revealed that another asset had the same problem.

As well as the 412,000 silent gas detector alarms; in the same month, 78,000 HVAC alarms had also gone unheard. Investigations instigated by ABB found these to be caused by pressure control dampers being set to manual, (alarms were generated through pressure differentials when doors were opened), meaning the HVAC system was not operating as per design to provide the required positive pressure to the protected areas.

At its peak; not counting process alarms, the combined average gas detector and HVAC alarm rate was 1 every 2 seconds. Once all the remediation work had been carried out; the gas detector and HVAC alarm rate dropped significantly to 4 or 5 a day, as shown below, and the console was returned to normal operation, annunciating alarms to the Control Room Operators.

Figure 2 - Before.

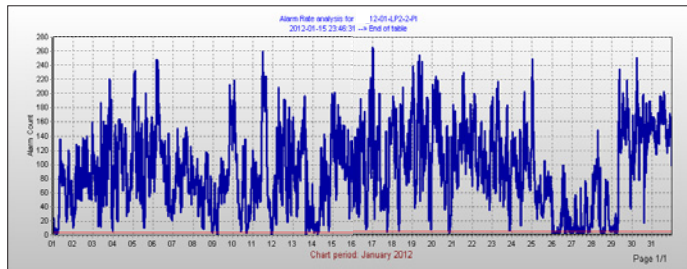


Figure 3 - After.

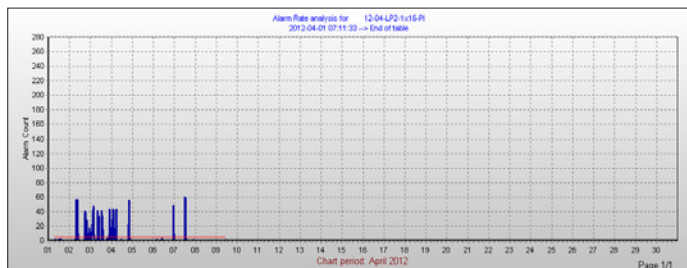
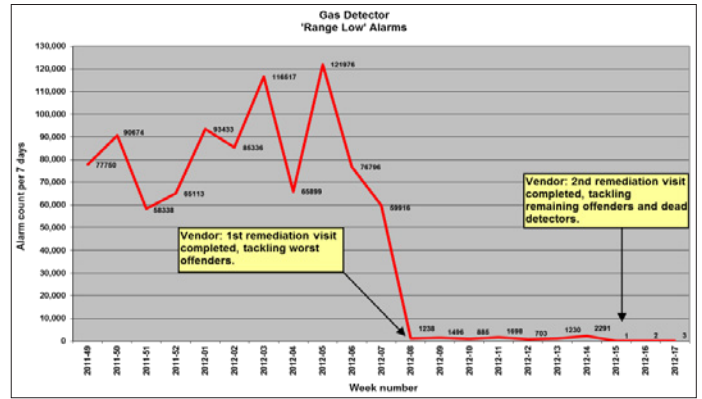


Figure 4.



This serious problem had been misunderstood and ignored for almost 10 years, and if not for the work of ABB, would have remained a hidden risk.

The gas detector and HVAC alarms were a key layer of protection. When holes in the temporary refuge on the asset had been discovered, an Operational Risk Assessment (ORA) had been carried out. This erroneously concluded that it was safe to carry on production due to the protection afforded by the gas detection and HVAC systems. Had this situation gone unnoticed and the HSE had uncovered the problem, (and they had already expressed concern over the asset's process alarm rate), there is a distinct possibility that the HSE may have served notification to cease production due to the safety risk to personnel.

During ABB's work the HSE were due to inspect the asset. ABB were asked to present their findings on the gas detector and HVAC system problems and explain the solution. Following ABB's short presentation, the HSE agreed that the problem would be resolved and no further action was necessary at that time.

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