# Objective

Prevent fire and explosions in the offshore oil and gas industry by controlling ignition sources and developing effective regulations, compliance and training

# Diesel Engine Protection In The Offshore Industry

# What Happened?

***Extract BP Report:***

***Sequence of events from RT link*** *April 20th*

***9.48-***Main power generation engines started to go into overspeed (#3 & #6 Engines online)*

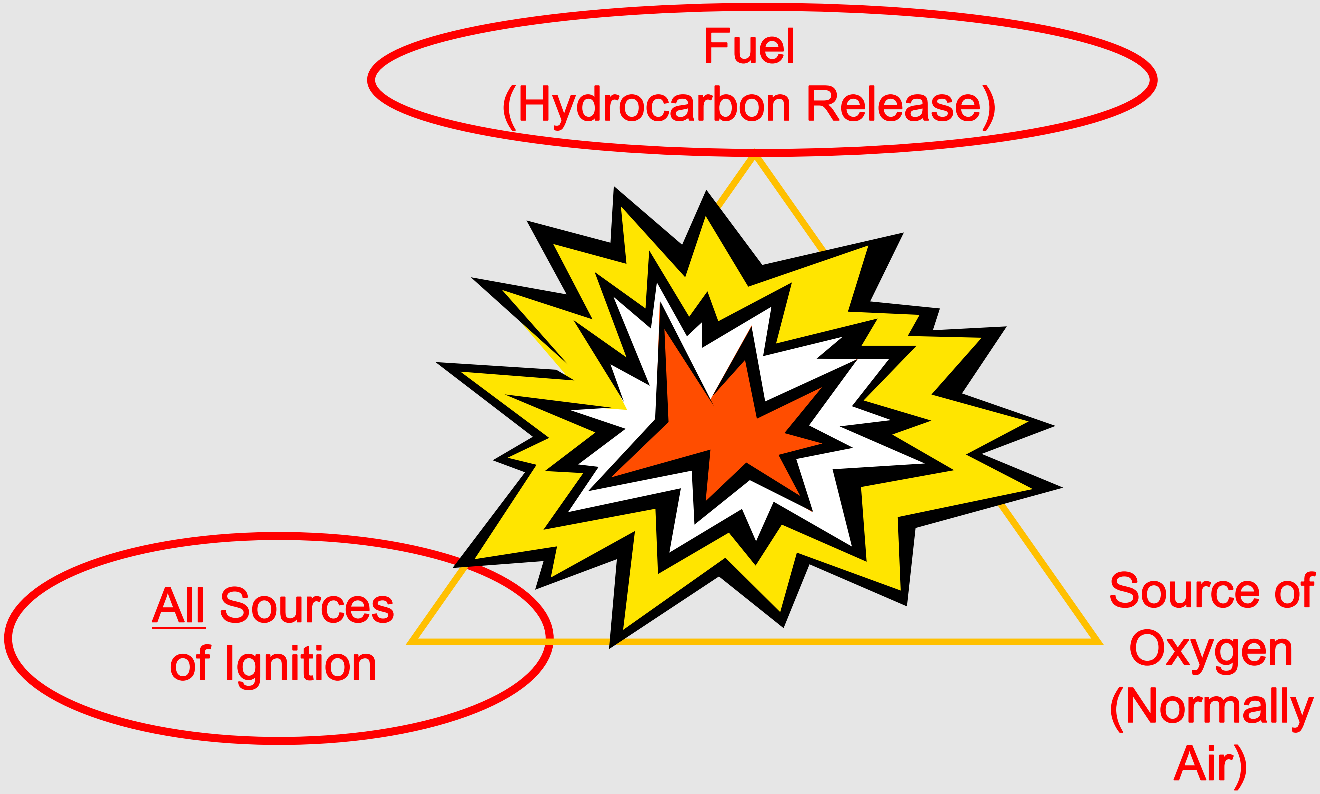
***9.49-***Rig lost Sperry Sun real time data transmission link*

***9.49-***First explosion occurred approximately 5 seconds after power lost*

***9.49-***Second Explosion occurred approximately 10 seconds after first explosion*

***Overspeeding engine was most likely the ignition source that caused the detonation***

# The Explosion Triangle

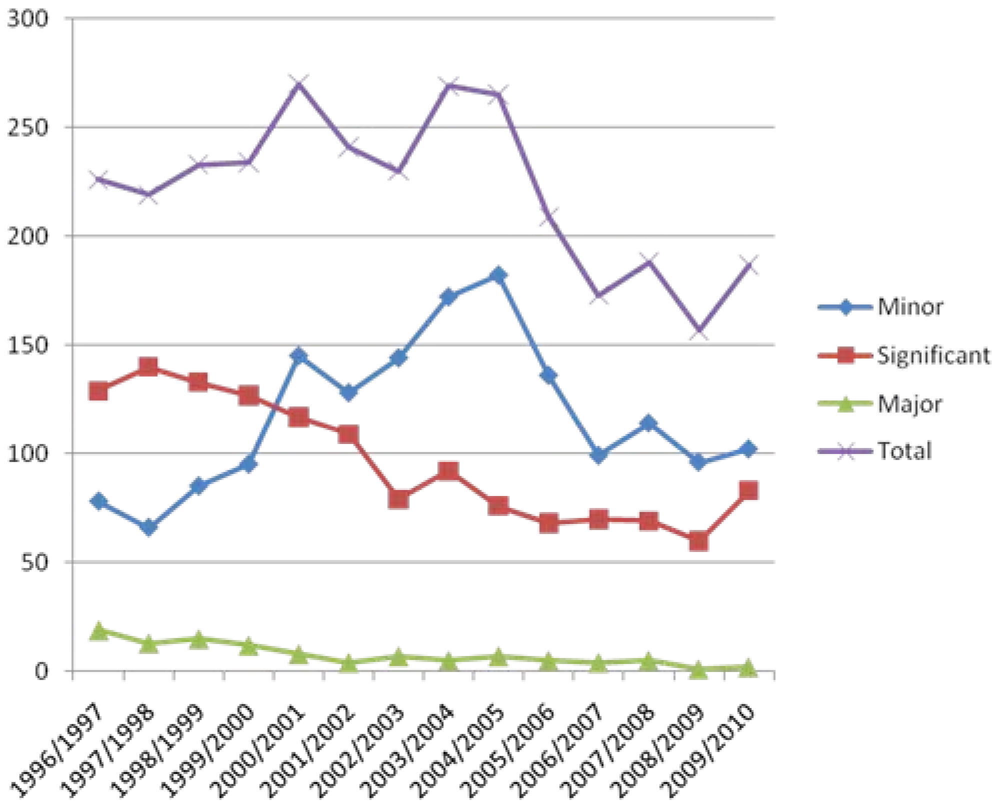


# Hydrocarbon Releases (HCR's) Offshore

Hydrocarbon reduction strategies have been applied by UK regulatory bodies for many years through:

- Legal requirement (UK RIDDOR) to report HCR's
- Investigations (primarily loss of containment of hydrocarbons) mandatory for Major & Significant releases
- Inspections ( Focus asset integrity particularly associated  with ageing installations)
- Safety Case Assessment (legal requirement  UK SCR05)
- Giving technical advice and producing guidance on offshore process safety issues
- Promoting inherent safety in new designs
- Input to relevant codes, standards and industry guidance.

# UK Reported Offshore Hydrocarbon Releases (HCR's) (1996-2010)

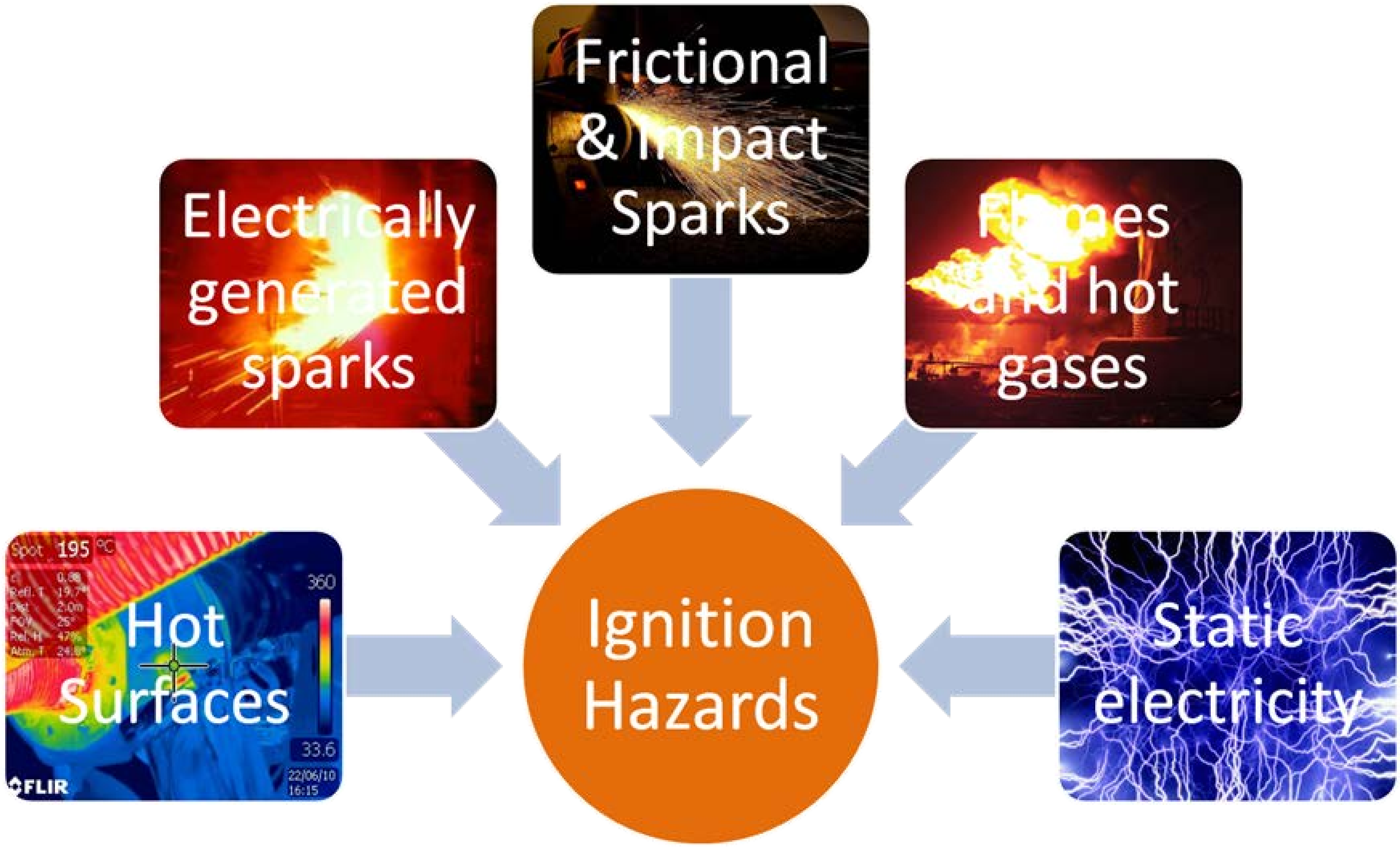



https://www.hse.gov.uk/hcr3/help/help_public.asp#Severity

Strategies have been effective in reducing HCR's but reality is **<u>they still occur</u>**

Hydrocarbon releases within the oil and gas industry are an inevitable consequence of the nature of the business.

**Emphasising the importance of Ignition Protection as the last means of defence for explosion prevention**




**A large proportion of ignition hazards are from non–electrical equipment sources**

# How Current US Federal Regulations and Offshore Standards may Deal with Diesel Engine Ignition Protection

OCS lands Act-brings drilling & OS production until federal jurisdiction

30 CFR Pt 250(code of Federal Regulation) covers Oil , Gas and Sulphur Ops

30 CFR 250.1911 call for SEMS incorporating Hazard analysis with all facilities by Nov 2011

30 CFR 250.1911 – hazard analyses must cover previous incidents (Deepwater Horizon)

BP report indicates diesel engine as a potential source of ignition

30 CFR 250.510 diesel Engines must be fitted with shutdown device to prevent runaway

30 CFR 250.510 Manual Remote or automatic shutdown depending on attendance

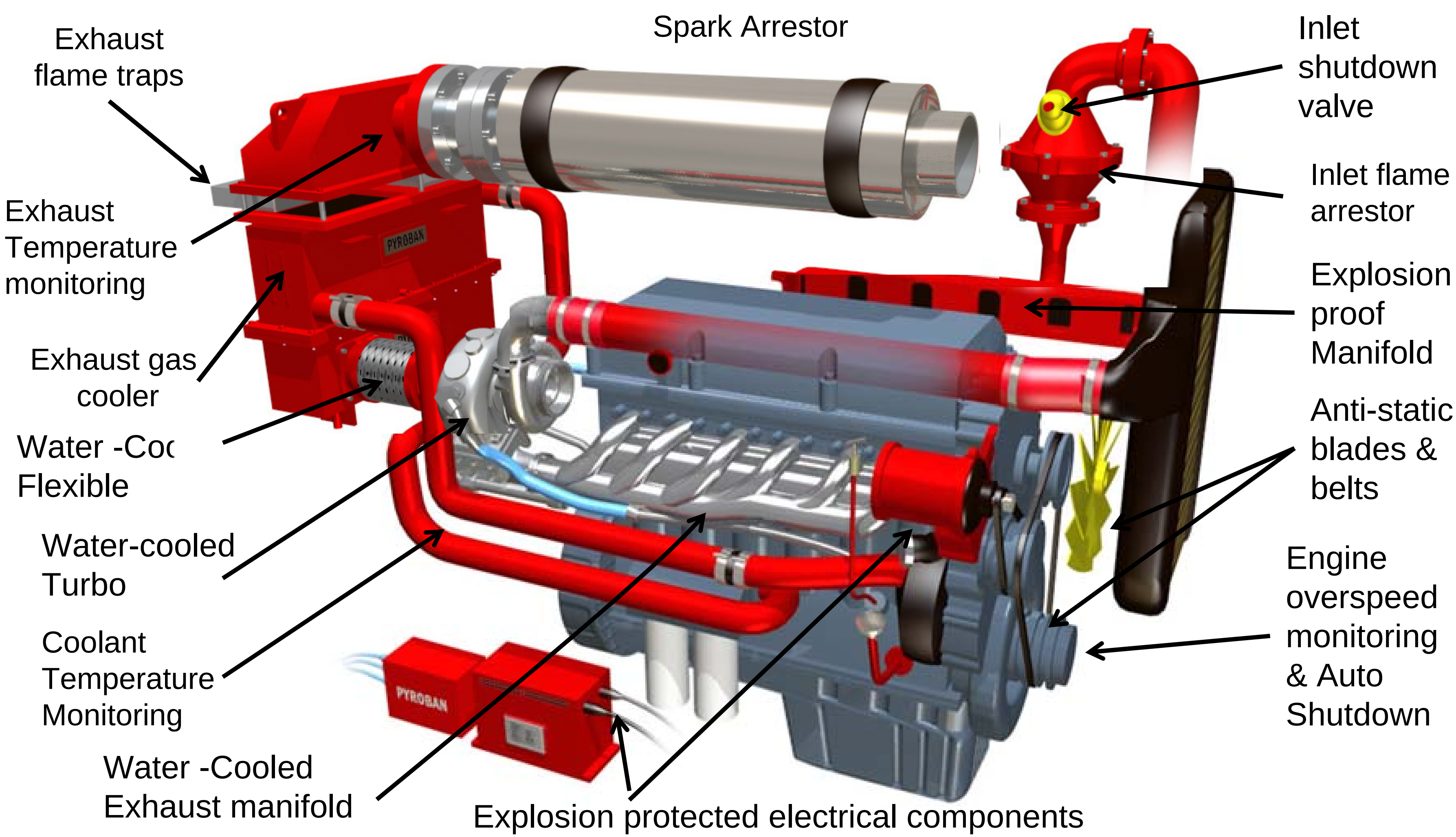
Does 30 CFR Pt 250 go far enough with respect to diesel engine ignition protection offshore?

1.US guidance from other industries

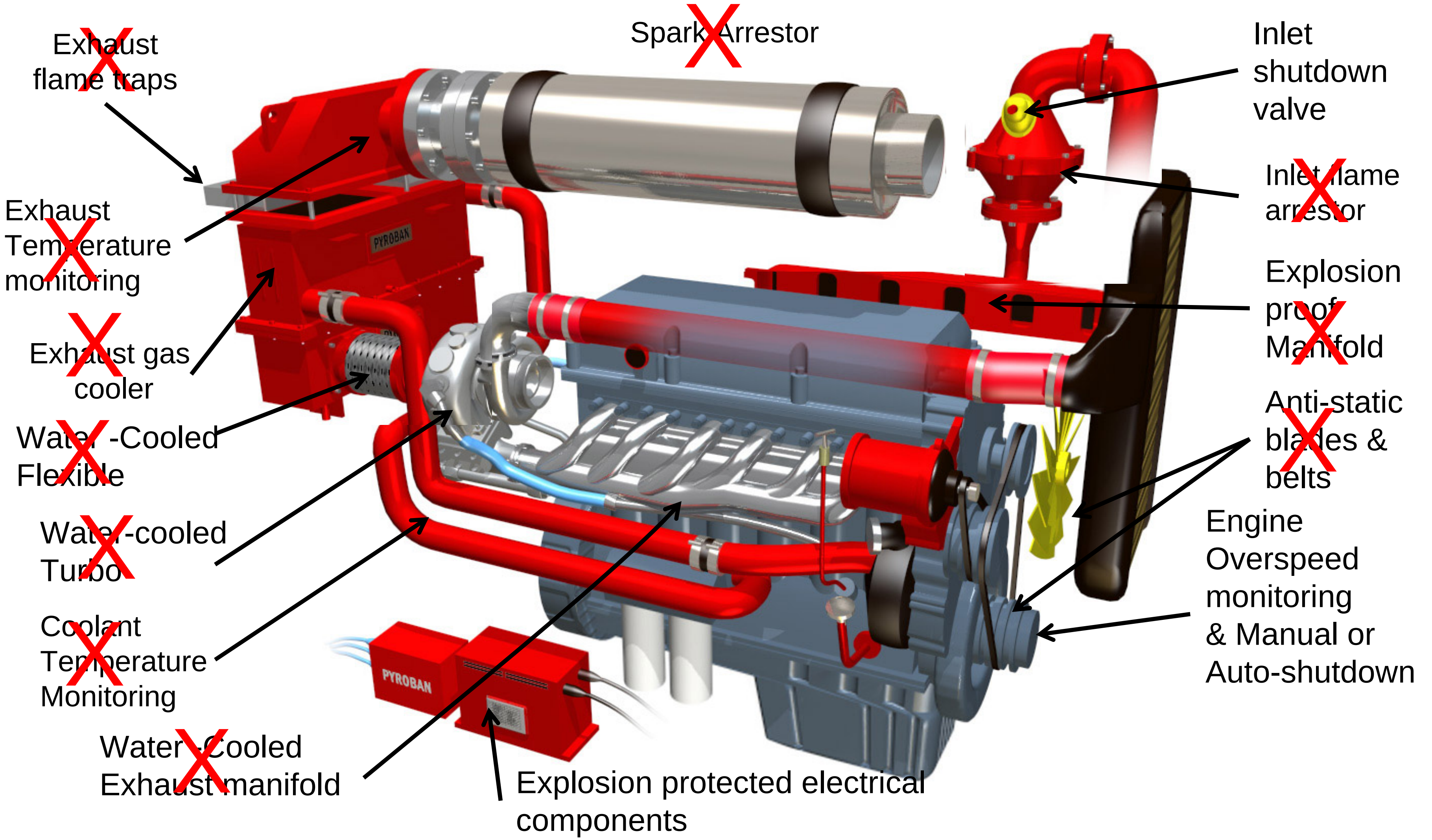
2.RoW guidance

| Status of Explosion Protection legislation & Standards US, UK & RoW | | | |
|---|---|---|---|
| **Explosion Protection Requirements** | **US** | **UK** | **RoW** |
| **Legislation to control fire and explosion hazards offshore** | OCS/CFR 250 | PFEER/SCR05/PUWER | Regional Legislation |
| **Electrical Explosion Protection Concepts & Standards** | NEC 500 | EN 60079 series | IEC 60079 series or NEC 500 |
| **Non-Electrical Protection Concept Standards** | No | EN 13463 series | China Adopting EN 13463 series through GB 3836 series |
| **Product specific-mining engines** | 30 CFR § 7.98 | EN 1834-2 | China MT 990-(2006), comparable to EN 1834-2 Europe EN 1834-2 |
| **Product specific IC engines forklift trucks** | UL 558 | EN 1755<br>EN 1834-1 (IC Engine) | China GB 19854<br>GB20800(IC Engine) |
| **Product specific IC engines offshore (all ignition risks)** | 30 CFR §250. 510 (partial Ignition protection) | EN1834-1<br>EI guidance | Various (EEMUA 107, BP 200 & EN 1834-1) |

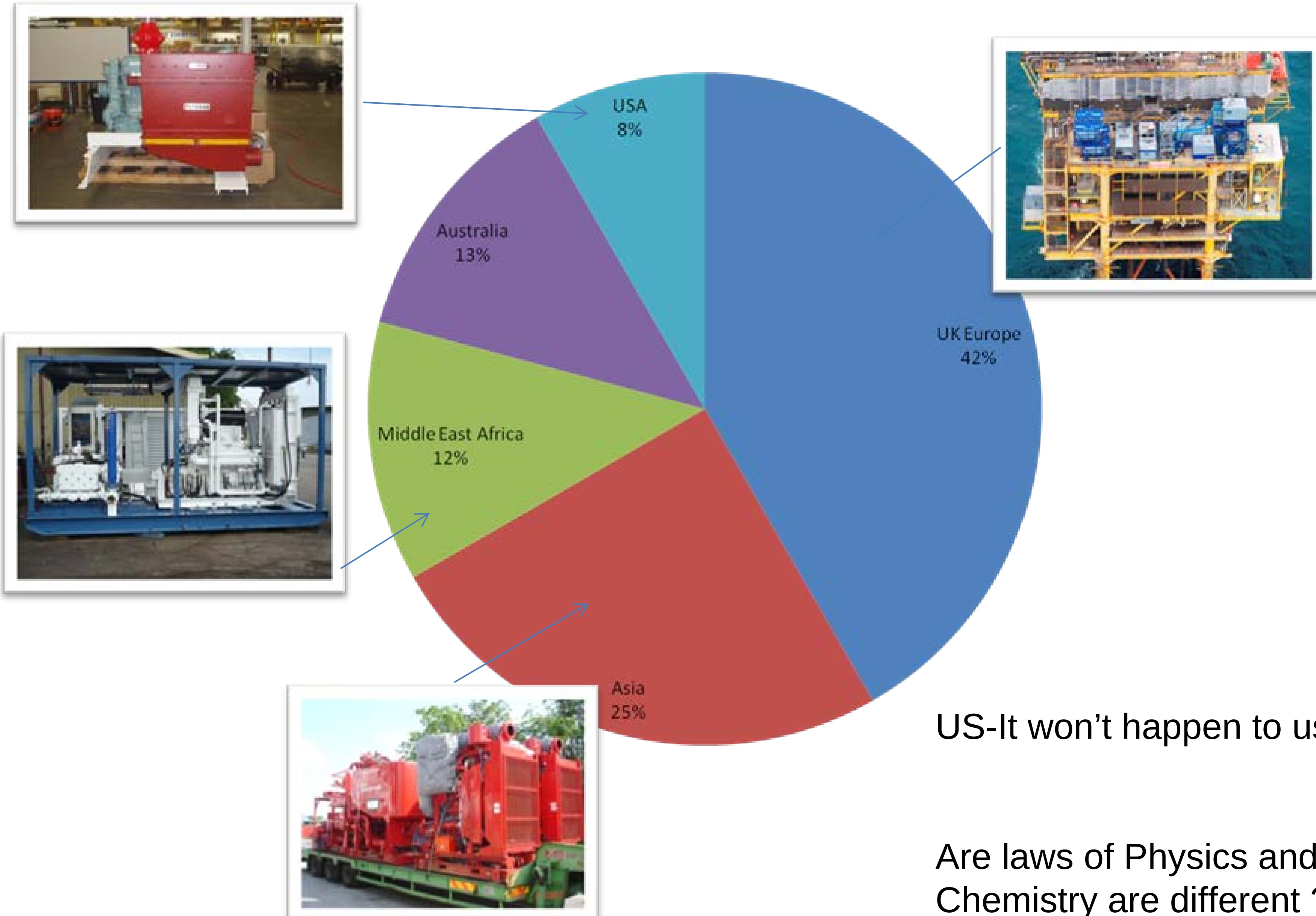
# Typical RoW Installation For Offshore Engines



# Typical US Installation (CFR 250.510)



# Proportion of Zone 2 Units Sold by Area




US-It won’t happen to us..

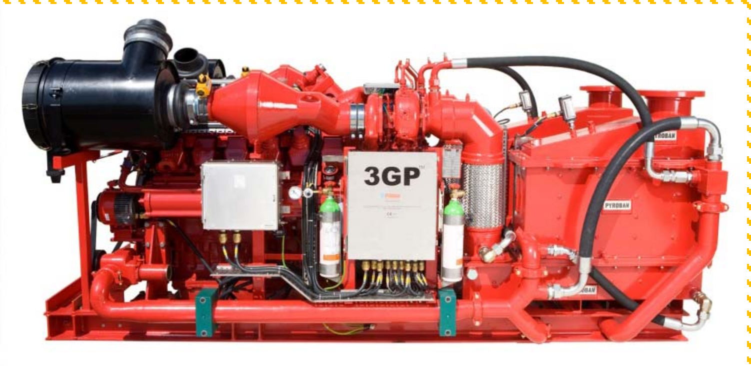
Are laws of Physics and Chemistry are different ?

# Ignition protection of engines in Non-hazardous areas

Non-hazardous area

Ignition Protected?

Hazardous area




EI 15 Chapter 8 (2005)

*'A situation where a fixed source of ignition is located just outside a hazardous area leads to a much higher probability of ignition than suitably classified equipment located just inside'*

# Ignition protection of engines in emergency situations

**In the event of a Major HCR as occurred on the Deepwater Horizon can any area be classified as safe in terms of an explosive atmosphere?**

**BP Report:** ***The fire and gas system did not prevent ignition*** *hydrocarbons migrated beyond areas that were* ***electrically*** *classified to areas where the potential for ignition was higher. The HVAC system probably transferred a gas rich mixture into the engine rooms causing at least one engine to overspeed creating a potential source of ignition*

**Equipment required to either support or maintain essential services should be ignition protected with automatic executive management functionality**

# Why Protect Diesel Engine-Offshore and Onshore?

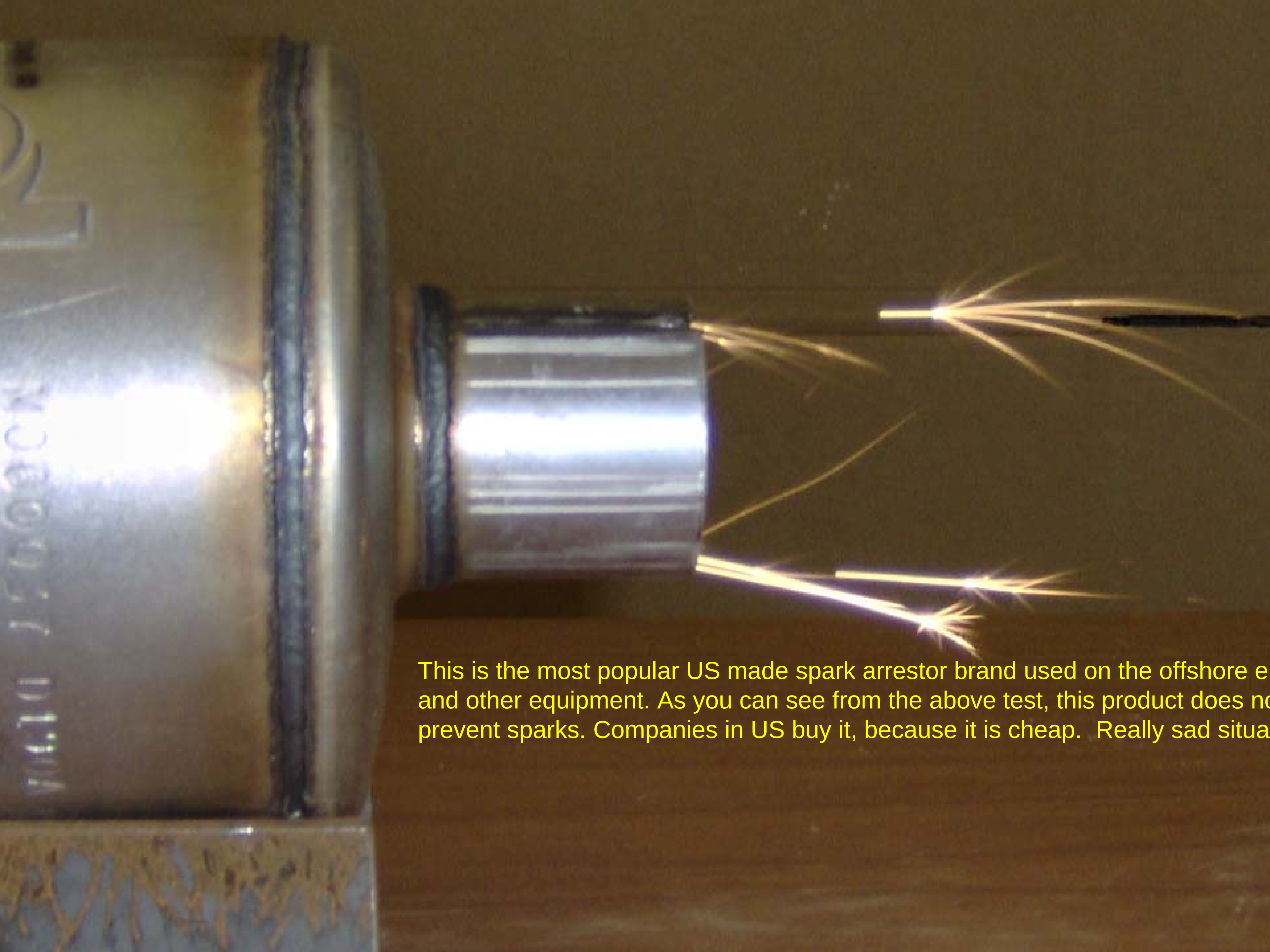
1. Diesel engines often running very close to the potential release of flammables, which: (1) makes them more likely to ingest a mixture in the flammable range and (2) minimizes the time to take any manual preventive action

2. Other ignition sources such as fired heaters, boilers, and flares are: (1) typically significantly farther away, increasing the likelihood that the flammable cloud will dilute below the flammable range before it reaches them and (2) can have design features (e.g., remote/elevated air intakes for fired equipment, height of flares) which make them less likely to ignite a release

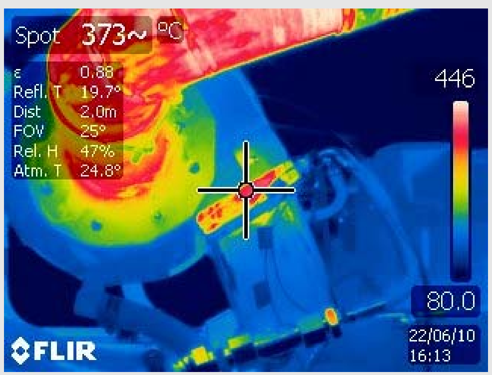
3. And most importantly, unprotected, running diesel engines can be easily and inexpensively eliminated, thereby significantly reducing the risk of an explosion by eliminating one of the most likely sources of an ignition (based on the logic above as well as actual industry experience)

***A runaway diesel can explode within seconds –a detonation source***

RV Toilet valve made of PVC for $15 installed on a offshore diesel engine for
shutoff. Manual valves Should not be allowed  as a runaway engine can explode within secon
Please note the shutdown lever that some one has to push in from below to shutdown the engi


This is the most popular US made spark arrestor brand used on the offshore
and other equipment. As you can see from the above test, this product does
prevent sparks. Companies in US buy it, because it is cheap. Really sad

# Our Recommendations


- Update US offshore standards to close the gap with other world standards on diesel engines-Refer EN 1834 standard
- Don’t ignore non-electrical equipment protection
- Train BOEMRE inspectors on diesel engine safety, inspection and compliance
- Do not allow manual shutdown air intake valves on diesel engines
- Follow ATEX and UK standards on spark arrestors-Cyclone principal