

A Global Perspective on Compliance with Process Safety Regs

presented by Bob Andrew



Presentation Outline

- Regulations & project examples from CIS, "down-under", Middle East, US, UK
- Prescriptive versus the performance-based approach: which is better & why?
- Embedding process safety at the design stage, and impact on manning levels

Background on Bob Andrew

Over forty years of professional activity. He is now Technical Editor at Gulf Publishing for "Hydrocarbon Processing" magazine and "Gas Processing News".

Recently he was Subject Matter Expert supporting development of operations manuals, procedures training for a mega-LNG project. Prior to that Bob worked in "Integrity Assurance" for gas processing projects in Shetland and Turkmenistan, and led HSE teams for Sakhalin and Abu Dhabi.

Bob's career timeline includes Corporate HSSE, EPC, consulting, teaching of Chemical & Materials Engineering in New Zealand, and was also Mobil rep to API for MACT-II rules.

Example Projects from Bob's Career

- Projects with PHA or PSM
 - Mega-LNG Australia
 - Gas Plant in Scotland
 - Sour Gas Turkmenistan
 - Benzene in Gasoline US
 - Arctic Oil & Gas Russia
 - Offshore Platform UAE
 - Sulfur in Gasoline US

Regulations in the CIS

- The “**Commonwealth of Independent States**” was formerly USSR. For many years projects in CIS faced a rigid, Soviet-style, compliance
- The GOST family of standards still exist: for Russia only are GOST R, SNiP for buildings, NPB for Fire. *Ukraine scrapped GOST standards.*
- Example of difference was requirement for duplicate columns/drums: Why? Were not used to corrosion-resistant alloys, just carbon steels, so equipment would rust out. Required internal wash/filter systems
- Another difference was worry about fighting fires in frozen climate, would require two * 100% of all systems, including for FW storage: were able to persuade them to move to “N+1” approach for reliability
- Cold climates also mandated wind-chill charts for any outside work: in really cold windy weather this could be limited to just 30 minutes

Regulations Down-Under

- Australian & New Zealand process safety regulations are similar
- Getting away from fixed-leg platforms, instead to sub-sea with long multi-phase lines to shore, or floating platforms, or FPSO
- Bringing oil & gas processing onshore changes the risk envelope: onshore facilities use spacing and layout to reduce consequences
- They now follow a “Safety Case” approach pioneered in the UK: although developed for offshore, adapted principles for onshore
- Good emphasis on Operational Excellence, learn from incidents
- Not yet developed as much guidance material as HSE in the UK
Note “HSE” is the Health and Safety Executive, www.hse.gov.uk
- “Major Accident Hazard” is an approach in common with the UK
- AS & NZ standards can differ from US standards, e.g. electrical

Regulations in the Middle East

- Middle East countries tend to follow oil companies they start out with: e.g. **Saudi Aramco**, now 100% Saudi owned, still uses American codes
- Whereas **the UAE** still uses e.g. PSM standards they inherited from BP, even though BP no longer have any operating ventures within the UAE
- In many countries, national oil company standards become their law: UAE is not alone in that, see this in Asia-Pacific, Africa and Americas
- Certain codes became universal, as seen by them becoming ISO stds. e.g. **API RP 521** became **STD 521**, twice as big, and under **ISO/TC 85**
- **NFPA** standards dominate for non-building fire protection in O&G: Buildings a “turf war” between **NFPA** & **International Building Code**

Regulations in the UK

- Oil & Gas license to operate is through the UK Gov't [Oil & Gas Authority](#)
- Oil Safety Directorate [Safety Case](#) regulations of 2005 were updated in 2015
- [HSE](#) are responsible for off-shore regulation, and “life extension” onshore
- Onshore is DECC, Dept. of Energy & Climate Change www.gov.uk/decc
- Both have a strong emphasis on risk assessment www.hse.gov.uk/risk/
- And many other acronyms that might not be familiar to American audiences
 - [COMAH](#) (Control of Major Accident Hazards)
 - [COSHH](#) (Control of Substances Hazardous to Health)
 - [CDM](#) (Construction and Design Management) just updated in 2015, places professional responsibility on the lead design engineer. May face jail time?
 - Manufacturers/fabricators have to confirm with European [CE standards](#)



Regulation Development in Europe

- ISO recognizes both Regional and National Standards e.g. GOST-R
- In Europe, a handful of countries have led standards development: in many cases, national standard gets put forward to be EU region
- One good example is “explosion overpressure” from the Dutch TNO; Germany has its organizations like TUV doing mechanical integrity
- Some well-known standards e.g. BS5500 for pressure vessels, were withdrawn, because they were not harmonized with [EU Directive](#)
- See [REACH](#) (chemicals) and [RoHS](#) (hazardous substance) Directives also [Low Voltage](#) Directive: this is up to 1,000 volts, so it can be lethal
- [Industrial Emissions Directive](#) no intentional emissions, replaced IPPC

Regulations in the USA

- Tend to differ by upstream vs downstream, offshore vs. onshore
- US “hazardous area class” differs from international IP, now EI
- Some aspects of PSM compliance starting to align more closely: increased monitoring and reporting, also violation self-reports
- Company culture can drive whether “near-misses” are tracked, or simply “letter of the law”. Chemical companies used to lead
- The speaker who preceded me covered well all the onshore rules OSHA, EPA, DoT..... I replaced a speaker who was going to cover BSEE, USCG, OSHA, DoT and more. But I’m a downstream guy!
- *I will point out we’re seeing potential issues for Gulf of Mexico for projects in fields that straddle US and Mexican waters. For more details, consult with UH’s “Center for US and Mexican Law”*

Prescriptive vs. Performance-based

- Prescriptive approaches can lull designers into a false sense of security e.g. if I complete the check-list, then the plant is safe, we can move on
- Some firms favor using **IV&V** (Independent Verification & Validation) usually by a firm who does not itself do design, but specializes in IV&V
- Risk Assessment approach is fairly well standardized across the globe: Screening HAZAN, EPC-phase HAZOP, handoff to Operations (tricky)
- Risk matrix can vary across companies on Consequence “break points” Tend to agree on ALARP criteria at one in 10,000, and one in a million
- Lesser known is Electrical discipline use of SAFAN, SAFOP, OPTAN
- My preference is performance-based over prescriptive, if done properly

Embed Process Safety at Design Stage

- Real challenge to get people with the right experience, also at the right time
- Also see lack of cross-disciplinary skills e.g. “complex loop control narratives”
- See delays getting post-HAZOP critical drawings, e.g. P&IDs, Cause & Effects

- Ideally, risk designed out by EPC e.g. relief system handle control valve failure
- Also recommend formal alarm rationalization approach, systematically done.

- Increased modularization is making oversight tricky to ensure full compliance
- Significant effort required in HAZOP closure to validate fabrication is correct: this can be at supplier factory, module fabrication yard, or on-site verification

Impact of PSM on Manning Levels

- To protect site staff from fire, explosion or toxics, have central control rooms
- Control rooms may have panels for Process, Fire & Gas, and common trouble
- To minimise chance of operator error, have automated Emergency Shutdown
- There may be times when a simple intervention would save a total shut-down
- Where is the authority person in the middle of the night to do any over-rides?
- Clarifying exactly what an operator should do is procedurally very important
- This applies to normal operations, as well as emergency triage and stabilize
- **Pre-startup** normal & emergency procedures training should be **mandated**
- **Competence assessment** should be part of the training – verify all learning
- *Rotational staff during commissioning and startup makes “continuity” tricky*

Web-Links and Contact Info

Here are the full URLs which were hyperlinked in the previous slides

- www.api.org/~media/Files/Publications/Whats%20New/521%20e6%20PA.pdf
- www.energyinst.org/technical/safety/ei-15-hazardous-area-classification
- “Safety Case” guidance <http://www.hse.gov.uk/pubns/books/l154.htm>
- O&G UK <https://www.gov.uk/government/organisations/oil-and-gas-authority>
- CDM rule www.hse.gov.uk/construction/cdm/2015/
- COSHH www.hse.gov.uk/coshh/
- CE Stds. http://ec.europa.eu/growth/single-market/ce-marking/index_en.htm
- PMI https://en.wikipedia.org/wiki/Project_Management_Body_of_Knowledge
- EU https://en.wikipedia.org/wiki/List_of_European_Union_directives

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