IECEx System: *A User's perspective* : TOTAL

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TOTAL

Who is TOTAL?

- A global oil and gas company
- 5th ranked international oil Major (IOC)
- 3 business segments (Upstream-Downstream-Chemicals)
- 93.000 employees in over 130 countries
- Stock market capitalization = € *100* billion
- Turnover 2011= € 184 billion – US$ 257 billion
- Adjusted net income 2011= US $ 16 billion
- Capital expenditures 2011 =US $ 22 billion

UPSTREAM

Oil & gas exploration, development and production,LNG

- **Production in 30 countries**
- **Production : 2.35 million barrels of oil equivalent**
- **Proved reserves :10.7 billion of barrels of oil equivalent per day (12 years)**
- **Middle East area represents 24.3% of production**

DOWNSTREAM

Refining,marketing,and trading &shipping

Refining capacity :2.6 million barrels per day
Station services :17500

CHEMICALS

- Base chemicals :petrochemicals & fertilizers
- Speciality chemicals : rubber processing , adhesives ,resins, electro-plating

Other Activities

- Interests in coal mines,power generation ,etc
  - Bang Bo (Thaïland)
  - Taweelah (UAE)

- Solar , biomass
  - Sunpower : world third –ranked solar energy operator
  - Shams : one of the largest concentrated Solar Power Plant in Abu Dhabi (rated capacity of 100 MW)

A few projects in non conventional fields

Deep offshore

- Long history of deep offshore projects since 2001
  - Girassol FPSO in Angola (WD 1400 m)
  - Akpo (Nigeria - 2009) first all electric FPSO
  - Pazflor (Angola 2011) FPSO with first subsea separation and subsea multiphase pumping
  - Clov (Angola) with VSD for all main process equipment

Heavy oil

Oil sand mining and processing in Canada (Alberta)
Joslyn North Mine

Surmont

Shale gas

Barnett Shale with Chesapeake In USA (Texas)

A few projects in non conventional fields

Artic area

On-going development of LNG plants in Artic conditions.

Power From Shore

Hild Project in Norway (studies started in 2011)

- Offshore platform and FSO at 160 km from shore fed from Norvegian 300kV Grid
- 170 km of AC subsea cable
- 50MW load

Future major projects

Synthetic image of the future GLNG plant in Gladstone, **Australia.**

Production is scheduled to start in 2015 and eventually reach 7.2 million metric tons per year

Ichtys offshore and onshore LNG,

The full-conversion **Jubail refinery** in **Saudi Arabia** will process heavy crude. It is scheduled to come on stream in 2013.

Total in the UAE

- Presence since 1939

- Long-term partnerships in the **UAE** with ADNOC in several operating companies of ADNOC group:

ADCO	1939	5 major onshore fields
ADMA	1953	2 offshore fields
ADGAS	1973	LNG ,LPG , condensates
GASCO	1978	LPG + condensates (4 plants)
FERTIL	1980	Urea production

Total is also a partner with MUBADALA in the **Dolphin** company (marketing of gas produced in Qatar)
and with ADWEA in **TAWEELAH A1** (power & desalination plant)

Total is also operator of **Abu Al Bukhoosh** (ABK) oil & gas field (offshore)

Shams **:**concentrated Solar Power Plant in Abu Dhabi-rated capacity of 100 MW

Total in the Middle East

- **Qatar**: presence since 1936 with interests in

  - Al Khalij field (offshore)
  - North Field
  - Qatargas 1(LNG plant)
  - Dolphin project (Ras Lafan plant)
  - Qatargas 2 (train 5)
  - Laffan Refinery

- **Yemen**

  - Masila basin –East Shabwa (operator)
  - Marib basin –Jannah (interests)
  - Yemen LNG –Balhaf liquefaction plant

- **Syria**

  - Deir Ez Zor
  - Tabiyeh

Total in the Middle East

➢ Oman

- Block 6-53
- OMAN LNG
- Qalhat LNG

➢ Iran

- Production under buyback agreements

➢ Irak

- First discovery Baba Gurgur oil field north of Kirkurk (1927)
- Halfaya field

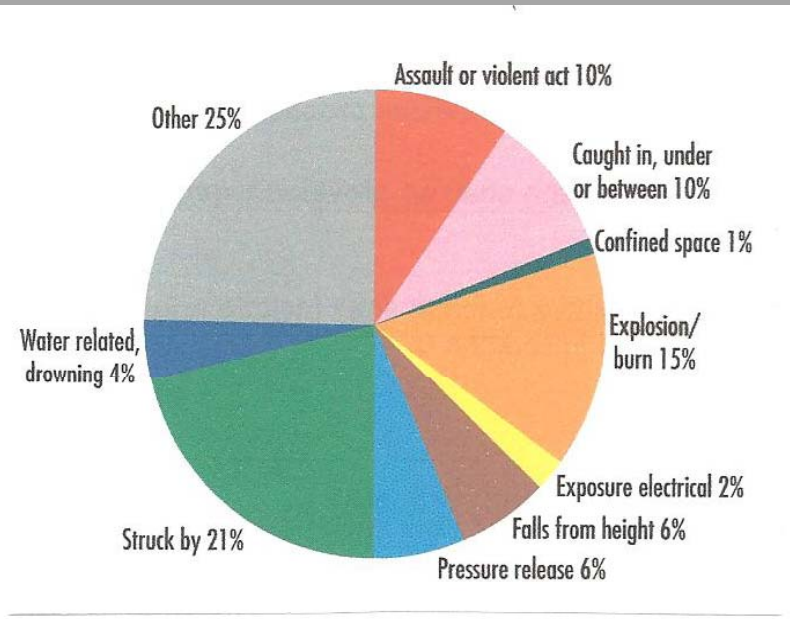
Safety, a core strategic Issue for the O&G industry

- Safety has been for years a key issue within the Oil & Gas Industry, and particularly in Upstream operations
- Handling of oil & gas products is a potentially dangerous business
- The O&G companies have funded an organization : the International association of Oil & Gas Producers, **OGP**, with companies such as IOCs (Shell, BP, Chevron, Total, …) and NOCs (CNOOC, QP, PTTEP. Petrobras, …).
- OGP edit each year the “OGP Safety Performance Indicators”, which gives the performance of the Upstream Industry

UPSTREAM statistics OGP extract

Safety performance indicators 2010 data report 455 (publication May+June 2011)

Since 1985 collect data ……OGP safety database
53 members (Exploration & Production)
42 reported data in 2010,covering 102 countries



Explosion/burns =15 %

Fatalities =94 occuring in 58 separate accidents
blow out in US Gulf of Mexico =11 fatalities

INJURIES = 1336 reported (at least 1 day off work)

Offshore injuries result in a 33% higher number of lost work days than onshore !

Explosive atmospheres : Which rules ?

- In term of **explosive atmospheres** the world is basically divided into two parts :

  - The **European Union** (E.U) gathering 27 countries where the **ATEX directives** must be applied (law).
  - A few other European countries outside the EU (Norway, Switzerland,…) have also decided to use at least the “Product” ATEX directive

  - **North America** (USA/Canada), where the **NEC & CEC** and **API & NFPA** are applied.

  - Outside these 2 major zones , other systems exist (Russia ,China ,…)but many countries in the world do not have strict regulations/rules or simply have adopted either European rules or North American ones.

Explosive Atmospheres , ATEX in EUROPE

EUROPE : ATEX directives (Law in Europe ,applicable to 27 countries) are mandatory :

- ATEX 94/9/EC ("Product" directive) -2003
- ATEX 1999/92/EC ("User" directive) 2006

Implementation of these directives have used a lot of time and efforts from Industry !

Difficulties encountered with application of ATEX directives :

- **New approach concept :**
  Requirements are no longer based on mandatory application of standards **(CENELEC *ones very close of IEC standards for Ex matters)** but on Essential & Health Safety Requirements) .
  Any standard can be applied ,provided it can be demonstrated that EHSR's have been met ……***Risk of interpretation !!***
- **Self certification** by the manufacturer is authorized for equipment in zone 2 (no third party involvement)
- **Too many Ex Notified Bodies** (test houses) have been appointed by Governmental Organizations without control of their effective competence

CENELEC standards = European electrical standards

Explosive atmospheres : Which rules at Total ?

- TOTAL when acting as an **OPERATOR** in the Upstream Industry does apply :

o Local regulations, & national or international standards as well as the Corporate rules and specifications.
o The same level of requirements worldwide.

- TOTAL E&P requirements for Ex-equipment is as follows :

o Application of IEC and/or CENELEC standards
(current trend is going towards identical standards (cf. CENELEC 60 079 series often identical or with minor deviations to the IEC 60079 series)
o Other standards may be accepted but on a derogatory basis *(with OPERATOR formal approval).*
o Electrical equipment must be certified by an official Recognised Body.

Explosive Atmospheres , Total rules in EUROPE

- The 2 ATEX DIRECTIVES have been applied but with a few additional requirements defined by Total in its Corporate specification (GS ELE 079)

- Equipment for zone 2 (category 3 ,as per ATEX) :

  "Self certification" (by internal control of production) by the manufacturer is not accepted by TOTAL

  A type examination certificate (equivalent to CoC of IECEx) shall be delivered to the client (as it is claimed for an equipment for zone 1, category 2- although not requested by ATEX)

- Ex Notified Bodies : they are all equivalent in theory, as per ATEX , but there are substantial differences between Ex NBs.

- All Ex NB are not entitled to deliver all type examination certificates against all schemes defined in the ATEX directives

- The ExNB proposed by the manufacturer with its products is taken into consideration during equipment evaluation stage

Explosive Atmospheres ,Total rules outside EUROPE

- Since a vast majorities of countries had no strict rules ,Total decided as from 2003 (when ATEX directives became in force) to apply also the ATEX directives in these countries (outside the European Union & North America)

- The reasons for this decision can be summarized as follows :

- Until recently nothing did exist in the world but only regional systems (eg ATEX) or local systems.

- This is why Total decided until recently to apply the ATEX directives worldwide (except for countries with an « American content ») because ATEX, although not part of the local regulations, was accepted by many countries (e.g. : most of countries in Africa, Indonesia , Gulf ,etc ..)

Explosive Atmospheres ,Total rules outside EUROPE

- ATEX directives have led most manufacturers to review completely their range of Ex products, recertify them, create a new range of products, all being certified to ATEX.
- This has created a climate of confidence with ATEX products and explain the reasons of Total choice to adopt the ATEX directives worlwide .
- At last it must be reminded that 7- 8 years ago IECEx was still a baby (!) and very few IECEx certified products were available on the market .

What should be done to have a safe installation in explosive atmosphere ?

- Equipment must be manufactured in conformity with a recognized standard by a reputable manufacturer .
- Equipment must be certified by a recognized third party
- Equipment must be installed and maintained by competent persons
- Equipment must be repaired in « qualified » workshops

- The ATEX directive does not have any provision to maintain the certification of repaired equipment to evaluate the repair shop ability to enforce the requirements of IEC/EN 60079-17 & -19 while IECEx has developed the “Service facilities scheme “

- In O&G Industry, the Company personnel skills are normally evaluated using internal procedures but personal competence of contractors (installation ,operation , maintenance) cannot be easily assessed and this is a weak point .

- No sound provisions have been included in the ATEX directive while IECEx has developed the “Personnel competence scheme”

IECEx at TOTAL ?

- 5 years ago , the IECEx system was still not very well known at Total !

- This was mainly due to 2 reasons :
  - Time devoted to understanding & implementation of the 2 ATEX directives in the Company facilities .
  - Few electrical equipment certified as per IECEx were available on the market ,while most electrical equipment were ATEX certified (even coming from non European manufacturers)

- When the IECEx system became more visible (around 2008) a question came to the mind of many engineers :
  - What are the differences between the IECEx system and the ATEX system ? The answer was not immediate at TOTAL .
  - But next question was :

What would be the benefits for TOTAL (if any) to adopt the IECEx system (outside Europe) in replacement of ATEX directives ?

and the answer took a little time to appreciate these differences!

IECEx at TOTAL ?

- A detailed comparison between IECEx and ATEX was carried out which highlighted again criticisms made against the ATEX directives !

The 2 major ones can be summarized as follows :

- Self certification made by the manufacturer itself is authorized for product installed in zone 2 .No certification by a Third Party is required
- Too many Notified Bodies (Ex NB) have been appointed for which competence equivalence may be questionable !

Such issues do not exist if IECEx is adopted !

- In addition the IECEx offers several advantages :

- **Standards**

- Only IEC standards will be applied , which is a form of guarantee since these standards have been prepared by the largest community of worlwide experts .
- It's easier for people going from site to site to have to know only one set of standards.

IECEx at TOTAL ?

❑ Production Quality

Quality audit at manufacturer's works is based on the most restrictive system for all the type of equipment (equipment for zone 0, 1,2) while with ATEX the audit depends on equipment category with even no audit at all for equipment for zone 2 which are the most numerous !

❑ Other features

IECEx has developed a series of schemes which have no equivalent with ATEX

- Certification of Repair workshops
- Certification of Personnel competence
- Future certification of engineering companies , installation and or maintenance contractors, inspection societies.
- Future adjunction of non electrical equipment in a series of new ISO/IEC standards (as ATEX)

IECEx at TOTAL ?

- **Certificate of Conformity** (CoC - Ex TR - QAR)

  They are **on line** available on the IECEx secured website while with ATEX only paper certificate s are delivered

- Certification of Personnel competence :

- Past experience has shown that many accidents have often a high human content (human error, human deficiency, lack of competence, etc …) compared to equipment failure
- The Ex world has considerably changed during these last 10 years and many people may have not been sufficiently trained and are not aware of new requirements although having worked in the O&G industry for many years
- The Personnel competence scheme is considered as an asset for Operator hiring many people for operation & maintenance on various sites through the world
- More confidence shall be placed in people having their CoPC

Conclusion : IECEx brings more confidence than ATEX

Benefits expected from IECEx

- All type of products (for zone 0,1,2) are certifed by a third party, no self certification by the manufacturer is authorized giving confidence to the USER
- Quality audit at manufacturer works based on the most restrictive system (the one used only for zone 0 for ATEX)and applicable to all EPL
- Certification based on only IEC standards (wellknown all over the world)
- Certificate of conformity (CoC) delivered by the ExCB under electronic format reducing the risk of forgery/frauds.
- ExCB's and ExTL's appointement based on a peer to peer review
- The overall number of Ex CB's and ExTL's remain today limited and well controlled
- Certified repair workshop will provide repaired equipment with a valid certificate

Benefits expected from IECEx

- The IECEx is a comprehensive system designed to take care of the complete Ex chain ie :
  - products
  - services
  - personnel competence

and not only a single product certification system as found in the other certification systems

- All the activities being under the control of a third party, it can be expected that the accident/incident rate will decrease and this must be the target of the IECEx

- This will improve the level of safety and confidence in the overall chain of the installation of the life cycle

CONCLUSION

- **Acting as a global oil company, Total needs a « global Ex certification system »**

- **Until recently nothing did exist at world level and due to ATEX major impact in 2003 decision was made by Total to also apply ATEX outside Europe (except in American influence areas)**

- **Yet today situation has dramatically changed with the IECEx effective arrival and this why Total decided to modify its rules end of 2008 :**
  - **Europe : ATEX shall be applied since it's the European law**
  - **Rest of the world (except North America)**
    - **ATEX still accepted**
    - **IECEx recognised and accepted with no restrictions as from end 2008**

CONCLUSION

- **Evolution in a next future**

- **Endorsement by the UNECE** has stressed the interest for IECEx worlwide use

- One may decide to accept only IECEx (out of Europe and American influence areas) since practically most of manufacturers will have products which are both ATEX **and** IECEx certified (by derogation other certificates for specific products may be accepted)

In summary the situation would be the following

- ATEX in Europe
- IECEx outside Europe

But this is not quite satisfactory for a global oil company to have 2 systems !

CONCLUSION

- Today a manufacturer (installed outside Europe) having a CoC issued by an Ex CB (installed outside Europe) can obtain from an Ex NB (therefore installed in Europe) an EC type examination certificate (after a limited number of verifications) but this is not yet an automatic procedure !

- The IECEx is a ***prescriptive system*** (eg use IEC standards or ISO where IEC does not exist)while the ATEX just defines the Health and Safety targets to be achieved (eg any standard can be used) which makes both systems rather incompatible

- The goal for having **only one system** in the world is still a long way ahead, but efforts should be placed to reach this target and a company like **TOTAL** will support these initiatives .

IECEx and Total

Thank you for your attention

Any question ?