Aged Facilities

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Aged Facilities - Main Problems

- **Impact on Facility Integrity**
  - Change in the project bases – Designed X Used
    - Type of oil to be treated
    - Percentage of Water and Pollutants (CO_2, H_2S, Naphthenic Acidity)
    - Volume
- **Outsourcing**
  - More stringent requirements
    - Safety
    - Costs

Aged Facilities - Main Problems

- **Automation – Depopulation**
  - Employees in Operation X Maintenance
- **Feasibility – Safety, Environmental and Economic**
  - Stricter Monitoring, Assessments
    - Evolution in Environmental Sensitivity
    - Long-Term Exposure - Analysis with different parameters
      - Prevention of Chronic and Systemic Impacts
    - Impacts of Events of Lack of Operational Control

Aged Facilities - Main Problems

- **People**
  - Pressure due to new Technologies and Processes
  - Operation Defects x Changes
- **Projects**
  - Consider Life Cycle – Initial Cost X Feasibility of Extending Field Exploitation
    - USA -> 2005 US$ 19.6 billion -> 2006 US$ 20 billions (*)
  - Assess Production Evolution
  - Consider premise of "Intrinsically Safe" Plant replacing the condition “Controlled Risk”

(*) http://www.climatechangecorp.com - BP's safety commitment: hot air or the real deal? 19 Apr 2005 | Author: Lisa Roner

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Aged Facilities - Main Problems

- **Consider time to Configure Facilities**
  - **Type of Equipment**
  - **Options for more lasting Technologies - Compound Materials**
  - **Population Growth**
    - **Evolution of Communities around Facilities**
    - **Increase in actions to respond to Emergencies**

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- ***The risks inherent to the company's activities must be identified, assessed and managed to avoid accidents and/or to guarantee minimization of their effects.***
  - **Conducting periodic or custom-made risk assessments to identify changes in processes**
  - **Incorporation of risk assessment in all phases of undertakings and products, including those related to the protection of manpower, neighboring communites and end consumers.**
  - **Conducting periodic or custom-made risk assessments to identify changes in processes**
  - **Implementation of mechanisms to set priorities in identified risks, as well as the documentation, information and follow-up of control measures taken**

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- ***New undertakings must abide by the legislation and incorporate the best practices in safety, environment and health in all their life cycle.***
  - **Adoption of practices and technologies that offer to new understakings excellence models along their life cycle, from their conception, design, construction and pre-operation to their eventual decommissioning.**
  - **Analysis, approval and documentation of any changes in the original projects and confirmation of their implications related to SMS**
  - **Incentive for the implementation of projects which incorporate the concept of sustainability for the use of visible development mechanisms and to optimize the use of inputs, such as water, energy and materials**

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- ***The company's operations should be carried out in accordance with established procedures, using adequate facilities and equipment which have been inspected and which guarantee that safety, environment and health requirements are met.***
  - **Systematic verification and update of all operational procedures in compliance with the recommendation resulting from risk assessments**
  - **Execution of specific inspection, test and maintenance programs associated with facilities safety, integrity and protection systems in order to guarantee their reliability**
  - **Identification, analysis and follow-up of impacts caused by the company's activities on health and the environment, seeking the continuous reduction of their effects.**

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- ***Temporary or permanent changes should be assessed to eliminate and/or minimize the risks that may result from their implementation***
  - **Assurance that changes comply with legal requirements, with established procedures and preserve the integrity of manpower, of facilities, and the continuity of operations**
  - **Identification of new needs derived from changes, such as training of manpower, intensified training and review of procedures and contingency plans**

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- ***Emergency situations must be anticipated and faced rapidly and efficiently, aiming at reducing their effects to the minimum***
  - **Assurance that contingency plans of each unit have been assessed, reviewed and updated, and integrated into regional and corporate contingency plans of the company**
  - **Development of educational and training programs for communities potentially exposed to risks with a view to their incorporation to contigency plans**
  - **Adaptation of contingency plans to any risk variation identified**
  - **Periodic training exercises and drills with the participation of all those involved, and subsequent evaluation of the results**

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- ***Continuous improvement in environment, health and safety must be promoted at all company levels, in order to ensure progress in these areas***
  - **Implementation of corporate program of evaluation of SMS management for continuous improvement**
  - **Execution of plans of action based on the results of those evaluations, for prevention and/or correction of potential deviations**

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Risk Management

- **New Opportunities – *Aged Facilities***
  - **Installations already paid off**
  - **Impact of production extension systems - water & gas injection, reduction of wells protective mesh**
  - **Evolution of Elevation Method**
    - **Emerging**
    - **Pumping Unit (safety arc), Underwater Centrifugal Pumps, Progressive Cavity Pumps**
      - **Altered Hazards - New risks to control**
  - **Different oil blends in the evolution of the production - adaptation of process**

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Risk Management

- **New Opportunities**
  - Impact on Facility Integrity
    - Specific Integrity Inspection Program - project requirements considered at completion
      - Environmental Alteration -> alteration of corrosion rate - subterranean systems - tubing and pipelines
    - Maintenance Program - Feasibility Difficulty - Maintenance Costs X New Facilities

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Risk Management

- **Operational Safety**
  - Work Authorization
    - Planning - Work Stoppage X Work Not to Stop
    - Responsibilities and Authorities
    - Training for Planners and Executors
  - Change Management
    - Employees with Experience - adaptation of the facilities to their methodology without registration

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- **Operational Safety**
  - **Process Management**
    - **Pneumatic Instrumentation X Logical Controllers**
      - **Modernization Advantages and Hazards**
    - **Alarms and Intertwining - Operator Response Time**
    - **Electrical Fittings - Classification of Areas**

- **Operational Safety**
  - **Failure with Probability of Serious Events**
    - **Greater dependence on Inspection, Integrity and Maintenance Programs**
  - **Response to Emergencies**
    - **Response Systems - Fire - Brigades X Remote Systems**

Risk Management

- **People's Behavior**
  - **Impact on people structure**
    - **Aged Facilities**
      - **Challenges with more problems**
      - **Trend to a greater number of accidentes**
    - **New Facilities**
      - **More Evident Challenges - Current Studies, Operational Advantages**

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Risk Management

- **People's Behavior**
  - **Keep employees motivated**
    - **Production reduction**
    - **Maintenance challenge / production expansion**
    - **Old employees with consolidated knowledge, greater refusal to updating X New employees, recent knowledge, no experience, more open to updating**

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Conclusion - Aged Facilities

- **Project**
  - Establish adequate guidelines for the lifecycle
  - Evaluate from an economic viewpoint the inclusion of sustainable technologies - Environment, Energy, Operation
  - Evaluate the reduction of costs in the "aging" of the facilities - Adaptation to the production curve
    - Materials technologically more appropriate
    - Operational flexibility for new process technologies of process, automation and safety

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Conclusion - Aged Facilities

- **Operation**
  - Adapt costs in compliance with maintenance programs and technological evolution gradually;
  - Permanent evaluation of changes in basic operational guidelines - type of oil and related pollutants - impact in the process
  - Greater attention to the analysis of the causes of nonconformity and diagnosis of problems (operating losses - equipment failure - incidents and accidents), ensuring efficiency in the solution
  - Environmental control (updating the environmental sensitivity of the area and impact of the operations and scenarios of accidents), thus ensuring prevention for reduction of vulnerabilities

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Conclusion - Aged Facilities

- **Decomissioning**
  - **Area recovery plan - try to recover from the impact related to vulnerabilities**
  - **Monitoring to guarantee recovery**

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Muito Obrigado

Thank you

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