KUALA LUMPUR 2012 WORLD GAS CONFERENCE

IGU

25th world gas conference

"Gas: Sustaining Future Global Growth"

Best Practices

WOC2-SG2.2 report

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CS2.3: Competencies & Innovative Technologies For UGS

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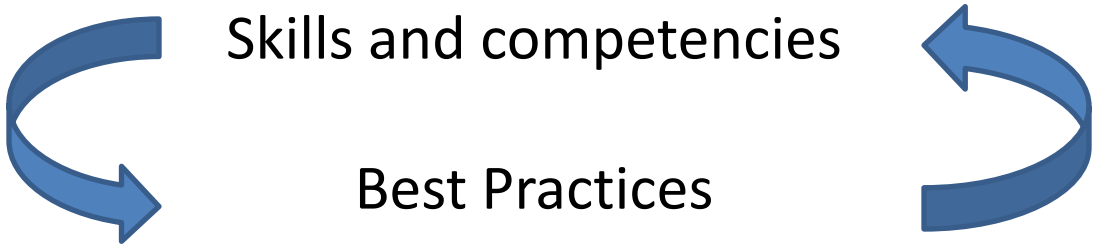
Best Practices for UGS



Two topics were addressed during the triennium by the Study-Group 2.2

- **Methane emission reduction in UGS operation**
- **Well integrity management**

Methane emission reduction - Context

- Gas storage operation is not a major contributor to methane emission: approx 5% of the gas chain (excluded oil and gas production branch)

But

- Methane global warming power is 21 to 23 times higher than that of CO2, so the release into the atmosphere of 1000 m^3(n) of methane (natural gas) is the same as releasing 16.33 tCO2e.

- Every branch of the gas industry is required to promote best practices in the field of emission reduction
  - To change the way of thinking/acting of every company /every professional
  - To mitigate global climate change
  - To save cost of operation

- IGU has been involved for years in the evaluation of emissions and the promotion of best practices for methane emissions reduction:
  - One reference of this study is the report of Study Group 8.1 on “Methane emission caused by the gas industry worldwide “ WGC 2000 (Nice, France)

Methane emission reduction – Method

- **1. A questionnaire** was sent to all members of WOC2.
- Three simple questions were asked:
  - Are there **regulations** in your country about methane emission?
  - What is the **ranking** of the Sources of emissions for UGS operation.
  - What are your **Best practices** ?

- 12 answers mainly from Europe and CIS were obtained

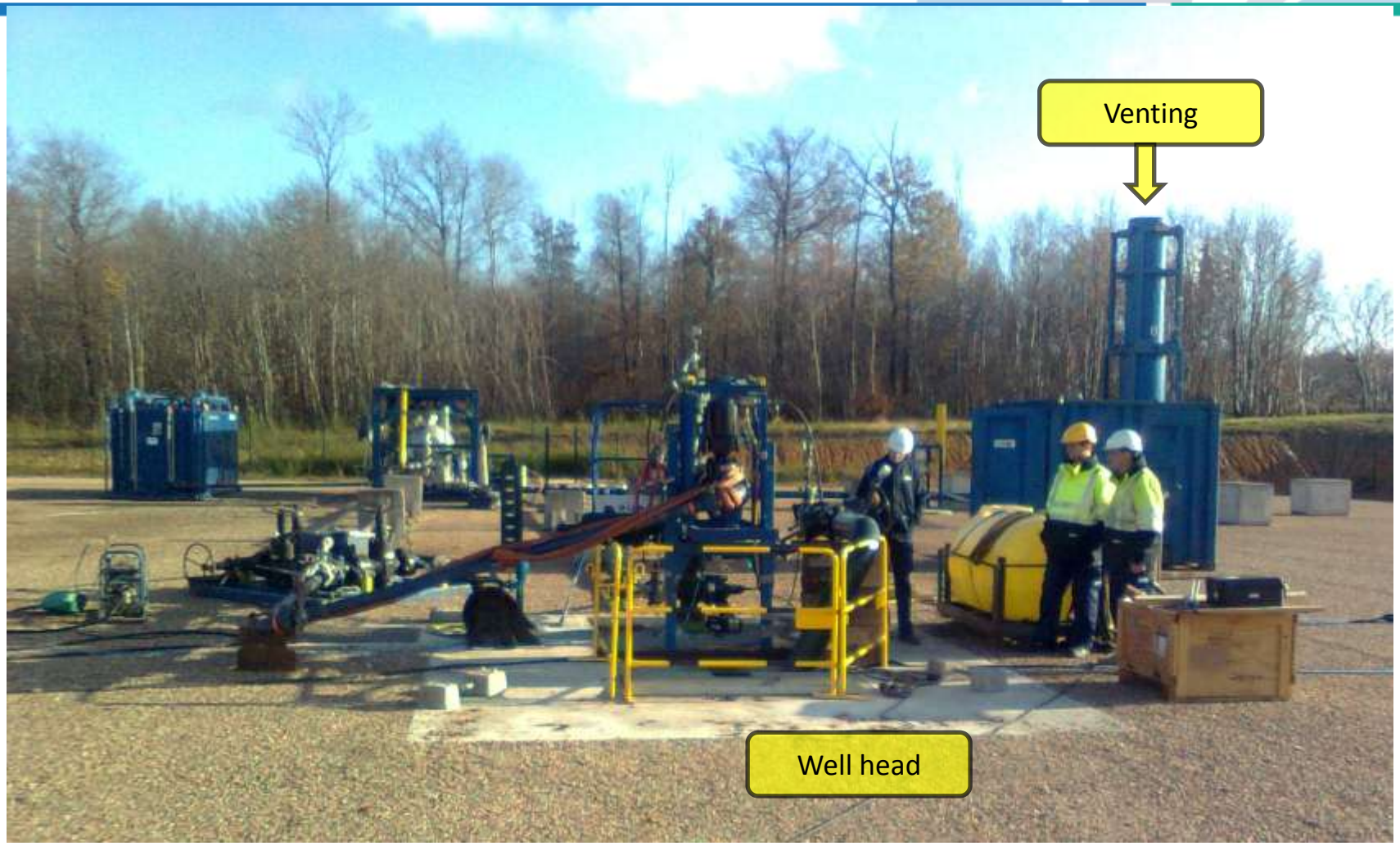
- **2. A review of environmental reports** that all major companies in oil and gas business are publishing every year as part of their annual report, especially that are registered ISO 14001.

Methane emission reduction – Results

- **Ranking of sources**
  - 1. compressor
  - 2. venting part of facilities for servicing
  - 3. well servicing including testing
- **Best Practices**
  - control of emission of seals of compressor by either gathering leak system for re-injecting in pipes or installation of encapsulated compressor
  - recovery of gas during planned venting, including well testing, by re-injection in pipes.
- **Emission factor**
  - Definition: the average ratio of methane emission compared to working (or cycled) gas volume
  - Approx 500 $m^3(n)$ per million $m^3(n)$ of working gas, i.e. **0.05 %.**
  - In the IGU 2000 report, the average emission factor was estimated to **0.1% of the working gas volume** (0,05% at the lowest and 0,7% at the maximum).

Encapsulated compressor installation on a storage facility

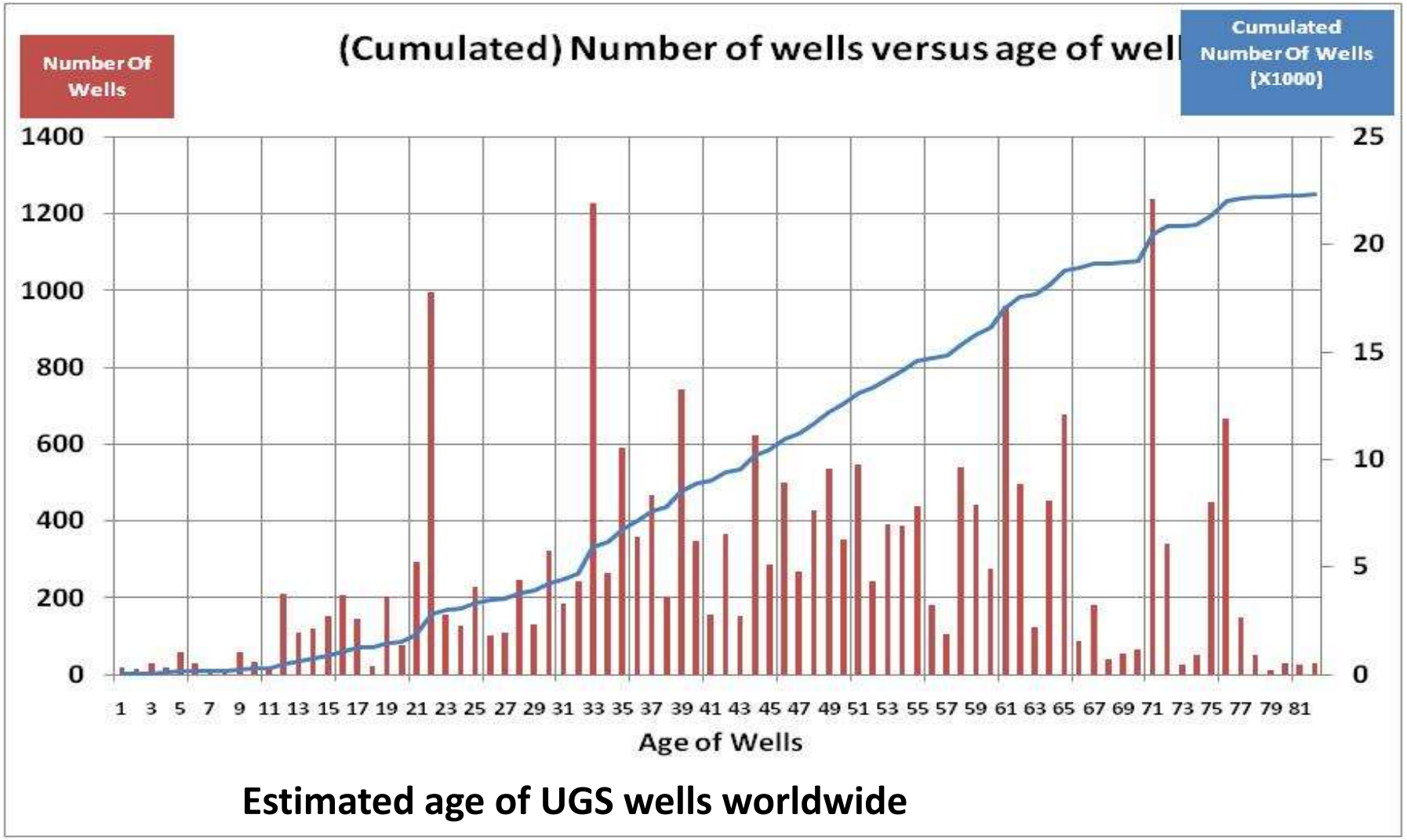
Preparing the clean-up of a well



Methane emission reduction – Conclusion

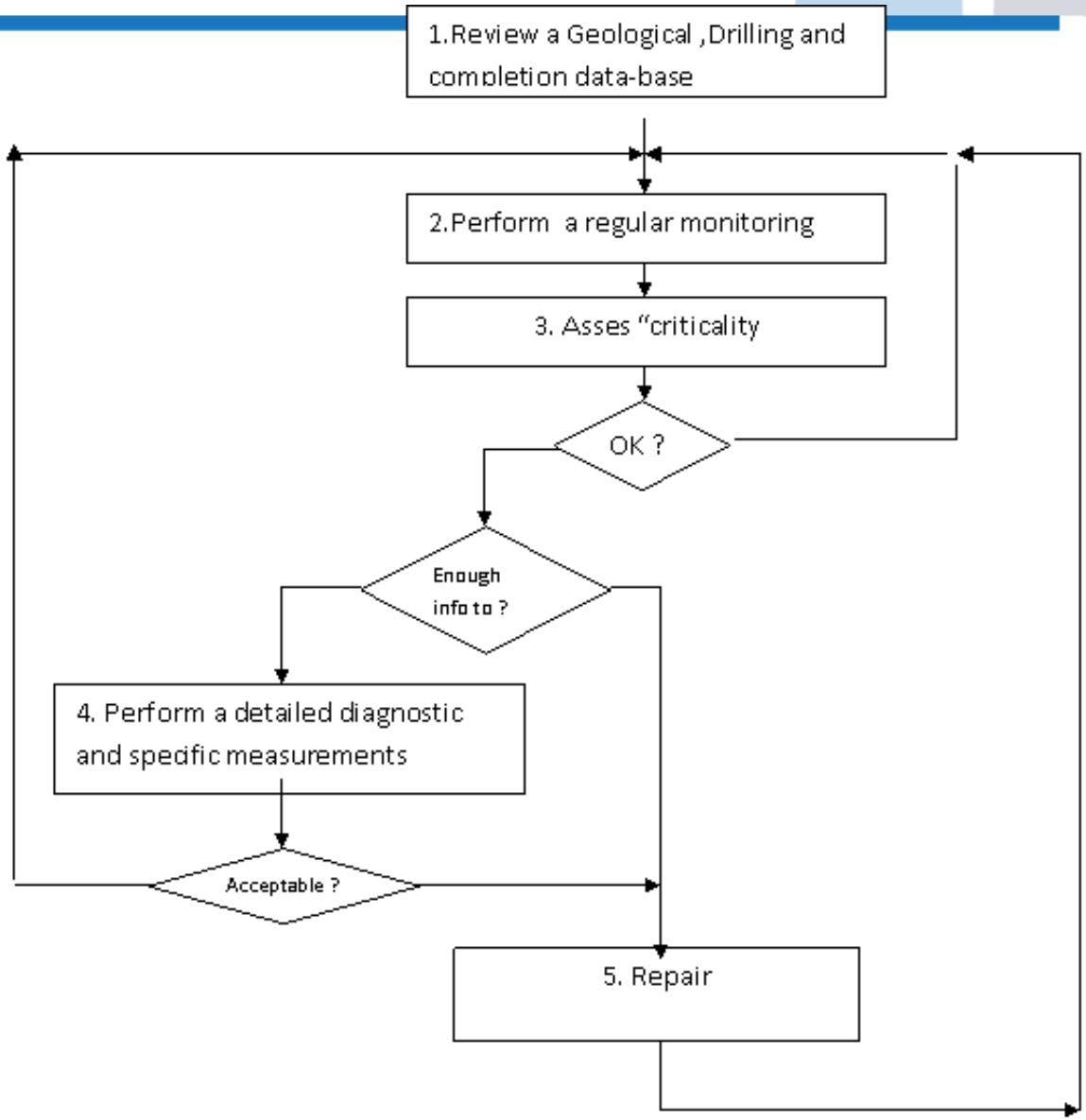
- Even if UGS is very low methane emitting activity, the emission factor has decreased in the recent years
- This has been made mainly by voluntary efforts of the operators, since regulations in the field of methane emission are not broadly implemented.
- **Minds and practices are changing !**

Well Integrity Management -Context



Estimated age of UGS wells worldwide

Well Integrity Management Flow-Chart



Well Integrity Management . Steps 1-2- 3

Review

- **1.Review a Geological ,Drilling and completion data-base**
- Initial data (geological, logging, drilling, completion) data are very important
- All wells of the area are important, exploration wells, operation wells, observation wells, even old production wells not used or abandoned.

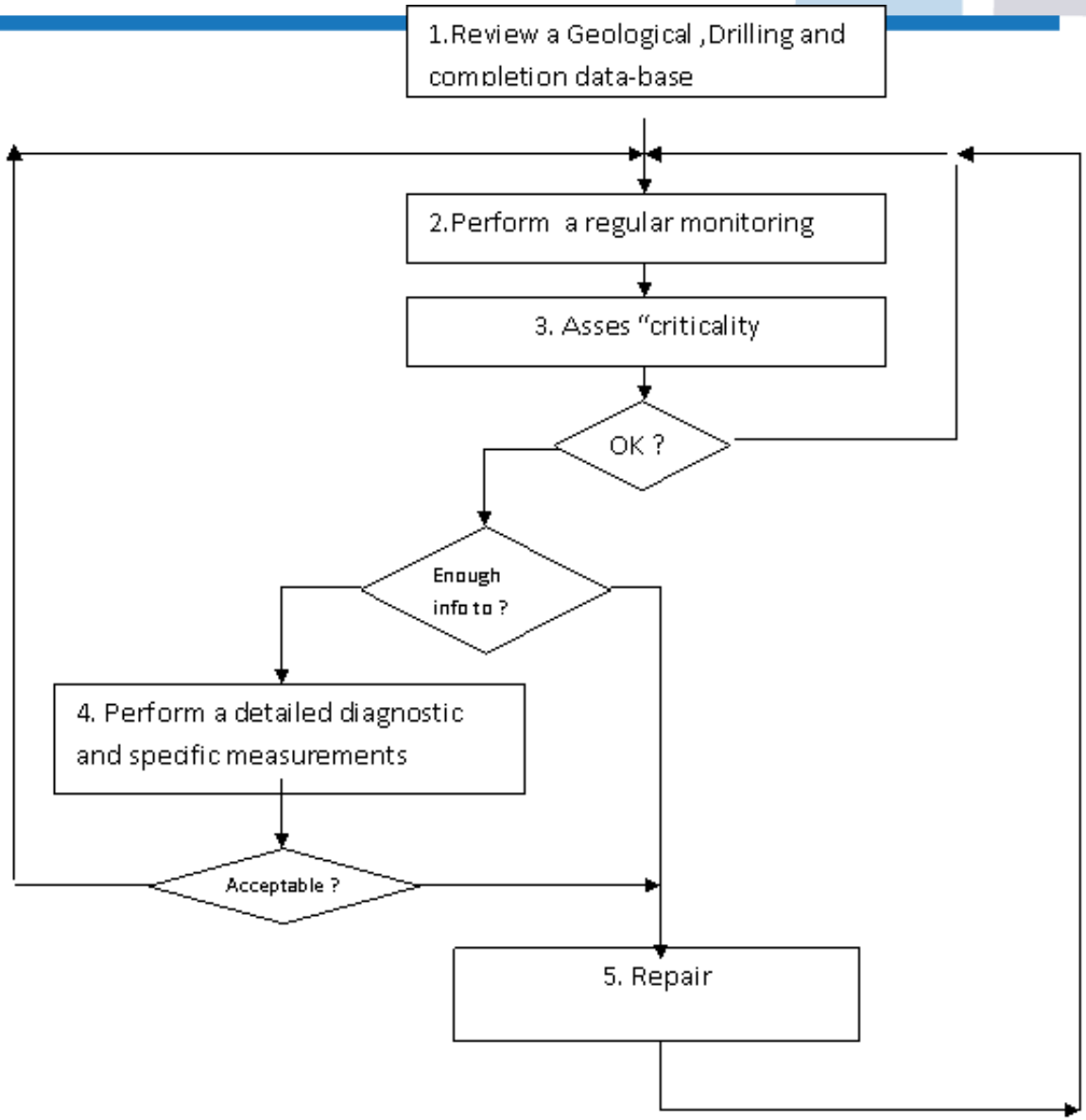
Monitor

- **2. Perform a regular monitoring**
- Parameters/ Frequency depending on feasibility/regulation

Assess

- **3. Asses Criticality (= probability of failure combined with importance consequences of the failure)**
- **= risk assessment methods**
- ⇨ List of wells having integrity problems

Well Integrity Management Flow-Chart



Well Integrity Management . Steps 4 and 5

Diagnostic

- **4.Detailed diagnostic and specific measurements**
- Value of the information versus Cost of the information to be considered
- Investigation without work-over preferred
- Several measurements and time are needed

Repair

- **5. Repair job**
- Value versus Cost versus Risk of the operation toe be considered
- Operation without work-over preferred
- Specific programme (combining diagnostic/repair?)

End

- **The cycle is over**

Well integrity management – Conclusion

- **IGU WOC2 2009**: *"Wells maintenance programs are mainly based on case by case approach. But this method should evolve towards a long term planned maintenance program driven by risk assessment. At this moment this method is not yet used frequently" (New Technologies Enquiry)*

- "**Well Integrity Management**" is a "new" concept

- This "new" concept /methodology/set of practices could help UGS operators to manage aging wells and go on safe operation.