Gas Lift Surveillance and Optimization

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All I get from you people is solutions, solutions—when are you going to come up with some decent problems?

ACME
COMPUTER
GAMES

Funny Business by PEALE
Optimization Problems

- Optimization - a word often used, but rarely understood
- Often mentioned but rarely achieved
- If achieved rarely sustained
- One definition – Improving the bottom line by timely, effective and sustained use of sufficient, good production information
Gas Lift Optimization

Target – Sustained Optimal Production at all times
Measurement problem

- How can you optimize if you can’t measure?
- Like flying with a blind pilot?
Misleading perceptions

- More injection gas, more oil?
- Audit problem – who adjusted injection, when and why?
Compressor Problem

- What do you do if you lose a compressor Sunday 3 am?
- If you were optimal before, will you be optimal after?
- How do you handle the process upset?
Data problem

• How does the engineer get access to gas lift data?
• How long does it take?
• How much time does he spend chasing data?
Well Surveillance Problem
- need to make the hidden obvious!
Safety Problem

- Sending Operators in hazardous vehicles to hazardous locations
- Many times the visit is unnecessary
- Operators scurrying around unnecessarily
Apply real time technology sparingly

- Define/articulate the problem
- Minimize instrumentation – 80:20 solution
- Maximize use of existing infrastructure e.g. PI
- Use modular applications where possible
- Minimize cost, maximize benefit

Take care with trendy concepts like:

- Smart Fields
- Smart Wells
- Real time asset management
- Digital oil field
- Especially for brown fields (>80% of business
Multi-Phase Flow meter to monitor individual wells?

- Expensive - not yet a commodity
- Needs “tender loving care”
- Can’t afford to install on all wells
- Is there an 80:20 solution?
FieldWare FlowMonitor
- Cost effectively monitor individual wells

SCHEMATIC DIAGRAM OF FLOWMONITOR TEST EQUIPMENT

- Hardware Requirements
  - Commodity pressure transducers connected via ½ inch NPT couplings
  - Not exposed to damaging fluids & easily removed for maintenance
Fieldware Flow Monitor

- Continuous online monitoring, bringing well performance to the desk top.

Trial Results for Well 2

- Liftgas shut-off
- Flow restricted with block valve
- Well closed-in to change bean
Production Universe – How does it work?
1. Build Well Models using Well Test Data
2. Use Model and real time measurements to estimate well oil, gas, H2O flows
3. Real time signals input to model in SCADA/Historian
4. Data-driven, dynamic, non-linear, minimal maintenance model
PU Results

- Individual well oil, gas, water flows continuously estimated
- Well flow estimates reconciled automatically against the installation’s overall export meter.
- Gives continuous reconciliation factor for each stream for the current day and the last 24 hours.
- Engineer can gauge the current health of gas lift system.
- If reconciliation factors are within acceptable bounds production system is under control – well models accurate, instruments working etc. If this is not the case it is possible to drill down to process, header and well level.
FieldWare GasLift

- **Closed loop control**
  - Continuously control gas pressure/demand - injection rates for stable pressure, maintain constant injection rate
  - Real time allocation of available gas for max production
  - Monitor production, injection & stability

- **Smart Alarms**
  - Well dead, well dying, injection heading, production heading, hydrate conditions, blowing around, injection frozen
  - Executive action of detection of significant event
FieldWare GasLift and 2 Phase Flow Models

- FieldWare GasLift – real time monitoring, control and optimization module
- Gas lift modeling tools for design and surveillance of gas lifted wells
- FieldWare GasLift and WinGLUE have been interfaced
- PRODML initiative addresses more generic interface
PRODML - Shared Solution for Oil and Gas Companies to Optimize Production

- Participants – BP, Shell, Chevron, Exxon, Statoil, Weatherford, Halliburton, Schlumberger etc.

- What is the Problem?
  - Data volumes growing and need to be automated.
  - Without additional data exchange standards, incredible amounts of reinventing the wheel is inevitable!
  - Get systems to work with other systems or products without special effort on the part of the customer Without Excel as the grand-unifier

- Optimization scope
  - Create standard XML-based bi-directional communication between applications and data stores in the Office Domain
  - Base on drilling standard WITSML
  - Real time PCD data, manual data, model data, derived data

- Status
  - Multi-company teams working Proof of Concept
  - Delivery of standard Q4 2006
Scope - high-level architecture

Monitoring, optimization, modeling software from multiple vendors

AP 1  AP 2  AP 3  AP 4  AP 5  AP x

External data transfer

Initial scope

Office Domain

Future Scope

Process Control Domain

Application Databases

Historian

real time apps

DCS historian

Fields instruments
Customer Experiences

• 5 - 15% more production using significantly less gas lift gas
• Production sustained during gas lift compressor outage
• Easier for operator to stabilize process after compressor outage
System Cost Problem

- Minimize instrumentation
- Complement/re-use existing infrastructure and applications
- Maximize commodity, minimize specialty
...online applications...

“Fieldware” Gaslift, FlowMonitor

• Simple integration into existing PI/DCS/SCADA system.
Conclusions

• The prize
  • Safer operations - less travel; improved technical integrity
  • Higher productivity - > 5% more production
  • Lower costs – 10% less gas - less maintenance and logistics

• Next steps
  • Better understanding of the gas lift problem
  • Convince folks to change and sustain way business is run
  • Convince folks that better information is money
  • Technical issues relatively simple
  • Share experiences – participate in SPE TIG