De-risking of Gas Transport Systems

Best Practices and Lessons Learned for Asset Management

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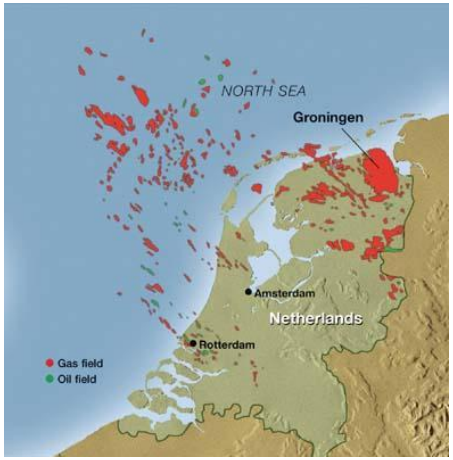
Robert van der Geest

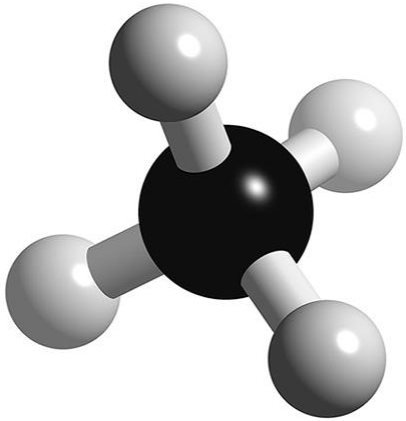
We change the world of energy

History of gas in the Netherlands

1959: discovery of the huge Groningen gas field



◀ 1579 – 1644: Jan van Helmont invents the concept of "gas"



▼ 1963: foundation of the integrated gas company

Gasunie

▶ 2005 – 2009: unbundling:

- gas trading company GasTerra
- gas transport company gasunie
- KEMA gas consulting & services

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Gas transport business issues

Issue	Consequences
① Ageing assets	▷ Considerable REPEX required
② Availability of spare parts for obsolete and bespoke equipment	▷ May need to replace properly functioning equipment
③ (Renewed) focus on external safety	▷ Safety regulator starts to interfere with the duties of the transport company
④ Additional transport capacity required for – behavior of liberal market parties – changing directions of gas supply – integration of renewable energy	▷ Considerable CAPEX required for new pipelines and stations and for system modifications
⑤ Increasing regulatory pressure on cost	▷ Challenges and lengthy procedures to get additional budget

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Proposition

- Q: Do innovations drive asset management of transmission and distribution systems?
- A: No, regulators drive asset management of gas transport systems

Topic of this presentation:

Innovation of the asset management process, so as to stay in the driver's seat

Lesson learned in the financial sector

Asset management = risk management

- Keep the balance between risk, performance, and cost
- (Tariff and safety) regulators want to talk about the risk of accidents and supply interruptions
- De-risking: identifying, assessing, and reducing business risk

Lesson learned in the financial sector

Asset management = portfolio management

'My dear friend Copperfield,' said Mr. Micawber, 'accidents will occur in the best-regulated families...' (Charles Dickens, David Copperfield, 1850)

- Integrated de-risking of the gas transport system
- Prioritize and allocate budget based on ranking of risks
- Unlike the situation in the financial sector, divestment is not an option for a TSO, or is it?
  - Re-define system boundaries with NNOs and DSOs
  - Re-evaluate system design

Best practice: set corporate goals

Universal mission of a gas transport company:
"Provide safe and reliable gas transport
against minimal cost, environmentally friendly"

- Top-down vision, mission, and corporate strategy
- Transparent to external stakeholders, e.g., regulators
- Clear line-of-sight for everyone in the organization
- Define key performance indicators and strive for continuous improvement
- Be leading, rather than lagging

Best practice: use an asset management system, e.g. PAS 55

- Publically available specification (PAS) 55 of the British Standards Institute (BSI) is the *de facto* standard for management of physical assets, such as a gas transport system
- PAS 55 is currently being transformed into the ISO 55000 standard
- Key elements: integrated, risk-based, top-down, transparent

Practical implementation: Company risk matrix

Level	Assessment
C	Critical
H	High
M	Medium
L	Low

Risk	Effect				Probability				
Category	Environment	Efficiency	Reliability	Safety	I	II	III	IV	V
					$p \leq 10^{-6}$	$10^{-6} < p \leq 10^{-4}$	$10^{-4} < p \leq 10^{-2}$	$10^{-2} < p \leq 1$	$p = 1$
A	…	…	…	wounded	L	L	L	M	H
B	…	…	…	many wounded	L	L	M	H	C
C	…	…	…	≤ 10 casualties	L	M	H	C	C
D	…	…	…	10s of casualties	M	H	C	C	C
E	…	…	…	100s of casualties	H	C	C	C	C

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Practical implementation: Universal key performance indicators

Category	KPI
① Safety – External – Workers	 ▷ Pipeline damage (with loss of containment) ▷ Accidents, (lost-time) incidents at work
② Reliability	▷ Interruptions (frequency of interruption, average duration, total downtime) ▷ Non-deliveries, off-spec deliveries, pressure undershoot
③ Efficiency	▷ Fuel consumption per m^3 gas • km distance ▷ Number of personnel per m^3 gas • km distance
④ Environment	▷ Fugitive methane emissions ▷ Carbon dioxide emissions

Principles of asset management (generally accepted)

- Safety has the highest priority ("safety first")
- Comply with legislation in force and company policies
- Use up-to-date information about system utilization for making maintenance and replacement strategies
- Make sure that there is an emergency response organization in place at all times

Principles of asset management (debatable)

- Maintain reliability of the gas transport system at the level of historical performance
- Maintain safety of the gas transport system at the level of industry standards
- Maintain the gas transport system so that it continues to meet design specifications
- Do not allow harmful substances inside the system
- Replace critical system parts if timely repair can no longer be guaranteed
- Do not accept the use of a back-up system as a normal operating condition
- Use best available technologies (BAT)
- Design the system for zero methane emissions during normal operation
- Remove abandoned system parts unless it has been agreed with stakeholders to leave them in the ground

Conclusion

Keep the balance between
risk, performance, and cost…

… and stay in the driver's seat