The Future Outlook and Uptake of Inspection and Maintenance Robotics: Lessons Learned

Petrobot Closing Seminar, 25 October 2016
Outline

- How Petrobot started
- Lessons learned along the way
- Current Situation and outlook for Inspection & Maintenance Robotics
- Conclusions
PETROBOT: Objective

PETROBOT aims to open up the oil- gas and petrochemical market for robotic inspection.

HOW?

By developing and validating robotic solutions for two use cases with big market potential:

- Off-line inspection of pressure vessels
- In-line inspection of storage tanks

DRIVERS:

- Personnel safety
- Minimising asset downtime
- Stimulate innovation in robotics and robotic inspection services
Assumption: Success requires the whole value chain

Proved to be very true!
Key success factor of PETROBOT: All parties had interest in commercialization of the end products
Complexity of successful market introduction is enormous

- Technical, Safety, ATEX, user acceptance of technology
- Deployment, operations, usage in the field, SOP, guidelines
- Cost of robotics, cost of service
- Work Practices
- Operations
- Storage Tanks
- Pressure Vessels
- Guidelines & Regulations
- Inspection Methods & Tech
- Market Uptake
- Robotics
- Understanding the environment and operations of AST
- Understanding the environment and operations of PV
- What are the rules of the game; what is the law.
- Current methods of inspection and existing inspection technology
- Current and future robotic solutions, autonomy, sensing, mobility

Business case for PETROBOT, what % of the market can we access.
Learning: Invest in understanding each others world

We are all professionals but in different fields with very different perspectives

- Visit petrochemical installations: many engineers have never been exposed to this world. Get familiar with the environment, safety requirements ...

- Visit tech companies: understand and accommodate technical limitations

- Learn about the challenges of Service companies

- Perform field trials at very early stage

- Use every opportunity to interact (Reserve plenty of travel budget, there is no substitute for direct contact and exposure)
Specifications are key, but a fine art too
Lessons learned...

- Petrobot started with a very general solution description and a fixed budget.
- Creating mutual understanding of requirements caused project delays of at least 6 months.
- Safety considerations are central to the industry (e.g. ATEX). However: Requirements vary, adapting to the highest standards (the sum of all requirements) is not always the quickest route to success. Partial solutions or solutions with some short comings may go a long way in opening up the market.
Very complex interconnecting requirements from each Value Chain member.

Understanding this dynamics is key to acceleration
Uptake Strategy for Robotic Inspection: Keep it simple

- Start with viable business cases
- Start with minimum viable solutions

Only then:

- Build on more added value and more complexity (Robot Features and Assets)
- Combine technologies, and other inspection methods (e.g. RBI, Camera on a pole, etc.) and deploy robots to targeted applications
Commercialization Strategies

- Start by deploying Minimal Viable Product (MVP)
- Technology development stages with increasing complexity over time

Uptake Strategy for Robotic Inspection:

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<tr>
<th>Time</th>
<th>Technological Metric</th>
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<tr>
<td>1st Technology</td>
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<td>3rd Technology</td>
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<td>Plateau of Stalled Technology</td>
<td>Apparent Exponential Growth of a Technology</td>
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- Technology develops faster than Industry can absorb it
- Many challenges are of a non-technical nature e.g:
  - Investment needs
  - Adaptation of work procedures
  - User acceptance
  - Availability of service
  - Familiarity of potential customers with the solutions
  - Validation/Qualification

- Close this gap is key to success
- Rebalancing of
D5.3 – Uptake Strategy for Robotic Inspection

- Conduct technology trials and target “low hanging fruit” to build end-user confidence in novel technology.

- Incentivize users to abandon the old ways of “try it with my neighbour first” and “let someone else try it first.”
So where are we now: Just getting started

Service robots for professional use. Sold units 2014 and 2013 (continued)

Source: IFR World Robotics 2015
So where are we now: Just getting started

Cumulative cash flows

Development

Valley of Death

Product launch

time
The PETROBOT effect

Product launch

Development

Valley of Death

Cumulative cash flows

Time
Immediate Spin off from Petrobot: Input for H2020

- Published March 2014
- download via www.quasset.com
- OR send email to info@quasset.com
The SPRINT Robotics Collaborative

Direct spin off from Petrobot
Conclusions: The business case is there

- Petrobot business case:

The use of the PETROBOT solutions is estimated to save the oil industry €300M per year across the assets, and the robotics industry has a market size potential of €96M per year.
Conclusions: So how do we harvest this potential?

- Start with valid business cases for the use of robotics
- Start Simple (Minimum Viable Products)
- Target easy, "low hanging fruit" application areas
- Demonstrate, Demonstrate, Demonstrate
- Share successes and limitations
- Technology changes at breath taking speed: Culture change is needed to reap the benefits
- Develop Staircase approach to the development of technology
- Investment and cooperation by the whole value chain is essential: Your competitor’s success is your success
- Petrobot started with Inspection, but Robotic maintenance tasks offer massive potential
www.petrobotproject.eu