Agenda

1. Introduction to EV
2. Introduction to Visual Analytics
3. Challenges of the North Sea
4. Solutions to North Sea challenges
5. Case studies
6. Q&A
About EV
Why we exist
The Leader in Downhole Visual Analytics

EV provides market leading 4D visual well diagnostic solutions to the oilfield.

We enable:
– Clarity of understanding
– Confident decision making
– Decisive, effective action

Quantified visual information delivers life of well diagnostic solutions for well integrity and well performance.
"A Picture Says A Thousand Words…"

Over 7000 successful surveys globally
Cutting Edge Technology

Features
- High definition
- High frame-rate
- Full colour video
- All conveyance types

Benefits
- Clear understanding
- Confident decision making
- Decisive, effective action
Advanced Answers

The Application of Visual Analytics
Visual Analytics

Clarity of understanding
- Quantified visual inspection

Real-time decisions
- Instant answers provided at the well site

Simplify the complex
- Integration of quantified video and log data
UKCS in Numbers

Integrity
- Planned well life ≈ 25 years
- Average well age = 19 years
- Oldest live well = 52 years

Production
- Average water cut ≈ 80%
- TOP10_{min} water cut = 4.9%
- TOP10_{max} water cut = 93.0%

Complexity
- Average well length ≈ 4km
- Average water depth ≈ 140m
- Well components > 1,000
Valve VA – Why?

valve (noun):  
A device that regulates, directs or controls the flow of a fluid by opening, closing, or partially obstructing various passageways.

Valves in wells:  
Master valves, wing valves, swab valves, safety valves, annular safety valves, BOPs, injection valves, SSD, ICD, gas lift valve, circulating valve, frac valves, cement collars, isolation valves, knockout isolation valve…

Key parameters:  
- They are critical for optimising production and productivity of the well  
- They are critical safety devices, protecting life and the environment

Challenges:  
- They are complex, moving components operating in harsh environments  
- They are expected to work on demand
Valve VA – Diagnosis and Cure

Challenge
- Managing well integrity in late field life
- Maximising profitability on marginal wells

Solution
- Intervention with hydraulic workover unit
- Video inspection of SCSSSV

Result
- Full understanding of SCSSSV performance
- Support decision making to mill stuck flapper
- Avoid lengthy unsuccessful fishing operations
Valve VA – Diagnosis and Cure

Stuck Flapper

Milling Token
Valve VA – Enabling Decisions

Challenge
- Safety Valve Failure (not closing)
- Multiple Inconclusive Investigative Efforts
- Offshore, High Temperature Gas Well

Solution
- Rigless intervention program
- Integrated Video Caliper

Result
- Successfully diagnose root cause of failure
- Avoid unnecessary remediation work
- Time and Cost Saving
Valve VA – Enabling Decisions

Challenge
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Valve VA – Enabling Decisions

Cost Saving
- Workover Avoided

Time Saving
- Increased Operational Efficiency

- Intervention
- Workover

- EV
- Conventional
Valve VA – Subsea Intervention

Challenge
- Maximising production from subsea wells
- Managing risks during well interventions

Solution
- Rigless intervention program
- Video While Tractoring
- Shifting Tool, Stroker and Mill

Result
- Clear understanding of downhole conditions
- Decisive remedial action
- Successful isolation of produced water
Valve VA – Subsea Intervention

Visual diagnosis of FS1 valve
- Confirmed to be in partially closed position
- Verified that application of well key system had shifted sleeve closer towards fully open
- Verified that ball valve was in suitable position to be milled

FS1 valve in initial condition
Note indentations caused by impact during previous unsuccessful interventions
## Valve VA – Subsea Intervention

### The reactive way

1. Perform drift run #1 & #2  
2. Perform LIB run  
3. Mob. camera via helicopter  
4. Perform camera run

### The proactive way

1. Perform vision-assisted drift  
2. Manipulate with well key  
3. Inspect with camera  
4. Perform milling run

### Sailing #2: EV on-board

5. Manipulate with well key  
6. Inspect with camera  
7. Perform milling run

Total time ≈ 185 hrs

Total time ≈ 69 hrs

Time saved ≈ 116 hrs
Valve VA – Subsea Intervention

The reactive way

The proactive way
Valve VA – Subsea Intervention

Time Saving

116 hrs saved

Cost Saving

$1.2M saved
Video Applications

- Water Shut Off
- Well Integrity
- Fishing Assistance
- Wellbore Restrictions
- Plug and Abandonment
- Sand Screen Inspection
Video Applications

- Leak Detection
- SSSV / Valve inspection
- Milling Inspection
- Corrosion Evaluation
- Sand / Solids Entry
- Production Optimisation
## Contact Information

<table>
<thead>
<tr>
<th>Region</th>
<th>Email</th>
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<tbody>
<tr>
<td>Europe</td>
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The application of advanced diagnostic services:
- High value information
- Cost effective service
- Highly efficient operations

Stop guessing…
See what is happening.
Seeing in the Dark

Preparation and Process
Pre-Job Testing

Water (1.60 NTU)  Cola (3.96 NTU)

- Turbidity accounts for level of particulates suspended within a sample
- Fluid colour plays just as big a part as to whether we will get usable pictures
EV Case Study – Sub Sea Abandonments

Key Learnings:
- Detailed program for bull heading and displacing well to kill weight brine

0-1 NTU
30 NTU
40 NTU
EV Case Study – Sub Sea Abandonments

Key Learnings:
Implemented and tested dissolvable bags for initial well entry
EV Expertise

Origins and Capabilities
1990-2010 world leaders in extreme specialist cameras for world wide TV including:

- Formula 1
- World Rally Championship
- Round the World yacht racing
- Offshore power boat racing
- Top Gear
- JCB Dieselmax WR

EV - The best downhole camera solution
In-house R&D and Engineering

>150 years combined experience

Leader in innovation & technology

Bespoke in-house research and engineering

>$2M annual investment in product development
EV-Epidote Capability

>140 years combined experience

Experts
- Well integrity analysis
- Production log analysis
- Pipe Deformation
- Perf Dimensioning
- Software development
- Algorithm development
- Seismic processing
- Software management
- 3D visual systems
- Software development

Leaders
- in well integrity analysis
- software development
- and simulation
<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Applications</th>
<th># Jobs</th>
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<tbody>
<tr>
<td>E-Line HD Camera</td>
<td>High definition, high frame rate (&lt;25 fps), side view and down view cameras with surface read-out capability enabled by bespoke telemetry operating at up to 300 kbps</td>
<td>Completion inspection, Fish/restriction inspection, Leak Detection, Gas/Water entry</td>
<td>&gt;1500</td>
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<tr>
<td>Memory HD Camera</td>
<td>Up to 6 hours of high definition, high frame rate (30 fps) down view camera footage</td>
<td>Completion inspection, Fish/restriction inspection, Leak Detection, Gas/Water entry</td>
<td>&gt;2500</td>
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<td>Video While Tractoring</td>
<td>Full E-Line HD camera capability simultaneous totractoring</td>
<td>Intelligent Drift, Obstruction Avoidance, Fluid Entry, Sleeve status and manipulation</td>
<td>&gt;25</td>
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<tr>
<td>Dimensioning</td>
<td>Linear and area measurements of items captured from side view or down view images from various camera products</td>
<td>Perforation Analysis, Completion Damage, Fish size, Sand Screen Analysis</td>
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<tr>
<td>Passive Acoustic</td>
<td>Passive leak detection tool to locate depth of tubing to annulus or casing leak. Combinable with EV E-Line HD camera and auxiliary logging sensors (P/T/GR/CCL/MFC)</td>
<td>Locate tubing to annulus communication, Gas Lift Valve Operation, Plug/packer/straddle leak detection, Locate flow behind pipe, Cement channelling</td>
<td>1st job Jan 17</td>
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