Data, the value of data and how to use it in a real time environment

Presenter

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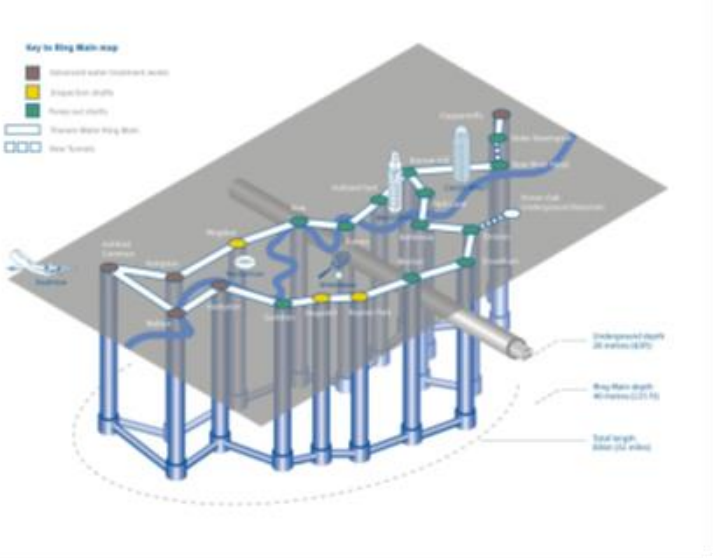
Introduction

Background:

As the worlds leading pipeline hydraulic and surge analysis organisation, the Hydraulic Analysis Group have undertaken over 8,000 steady and unsteady flow studies on water and wastewater pipelines / networks over the past 45 years.

We specialise in installing pipeline real time simulators and leak detection systems.

We operate in 50 countries and have in depth knowledge and experience of water pipelines and networks around the globe.



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Big Data

- Advances in sensor technology, communications and batteries mean that data is increasingly becoming available in large quantities. The rate of data acquisition and the volume of data gathered is going to increase exponentially over the next 50 years

- Whilst dashboards and platforms are becoming more sophisticated and user friendly, the gathered data needs to be compared to expected operation to identify areas which require action

- Pipeline systems require a hydraulic model (an engine) behind them to enable field data to be compared to expected data so the magnitude of any discrepancies can be calculated and displayed accurately

- Prior to this the model must be reviewed and calibrated against site data so a true picture of the current situation is acquired

- The use of models and open data will be standard practice by 2065

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The Current Position (2017 not 2065)

- Before we can contemplate what 2065 will bring, we first need to understand what we are currently capable of achieving and what we can do better

- We can currently achieve a lot from data even for a simple A to B pipeline with limited data acquisition rates (1 minute update rates)

- For pipelines and networks we need to focus on the hydraulics to reduce risk, improve efficiency, identify unhealthy assets and lower carbon emissions

- 2065 will see a significant expansion of the use of models to monitor asset health and performance but the challenge in 2017 is data acquisition and data flow

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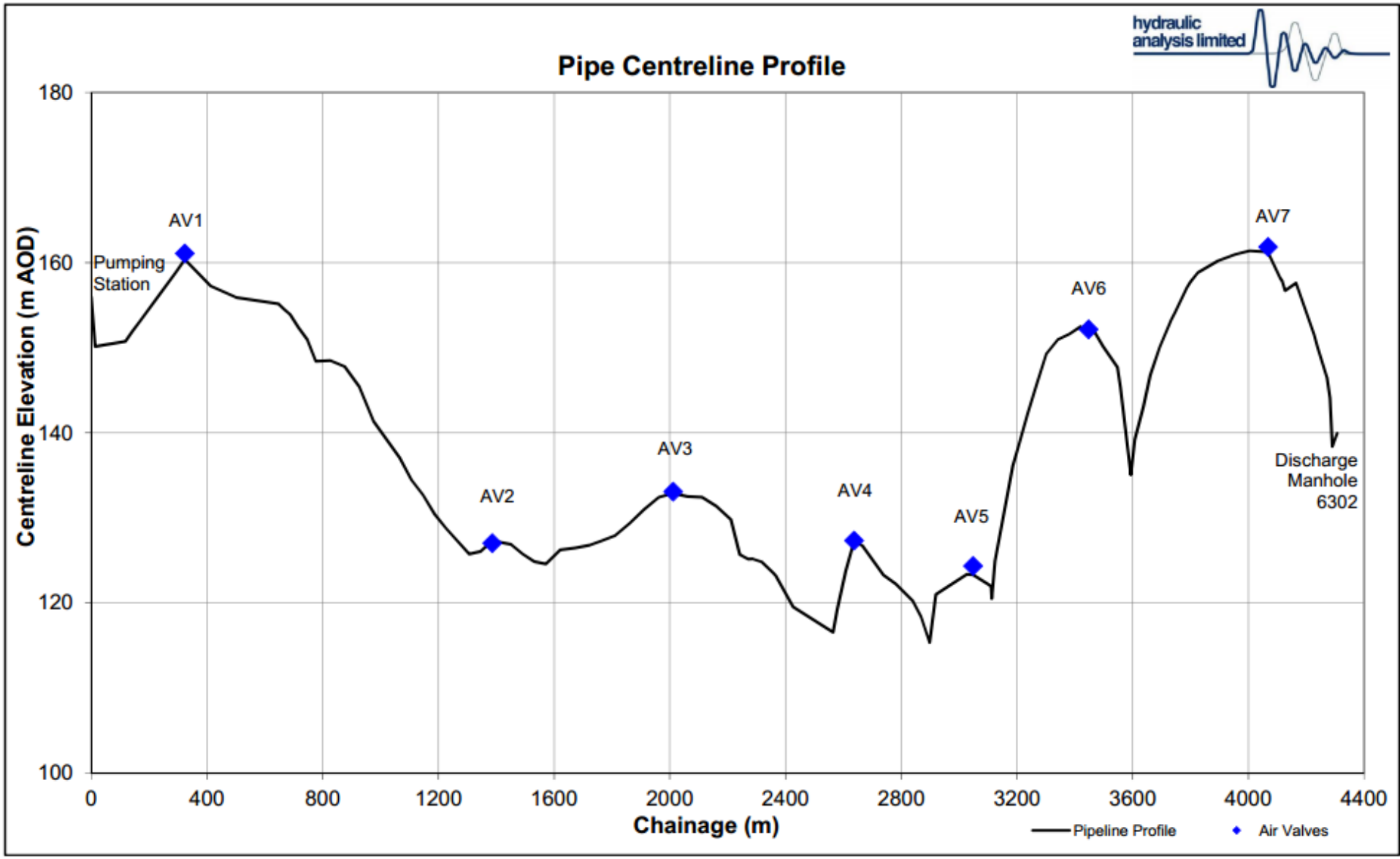
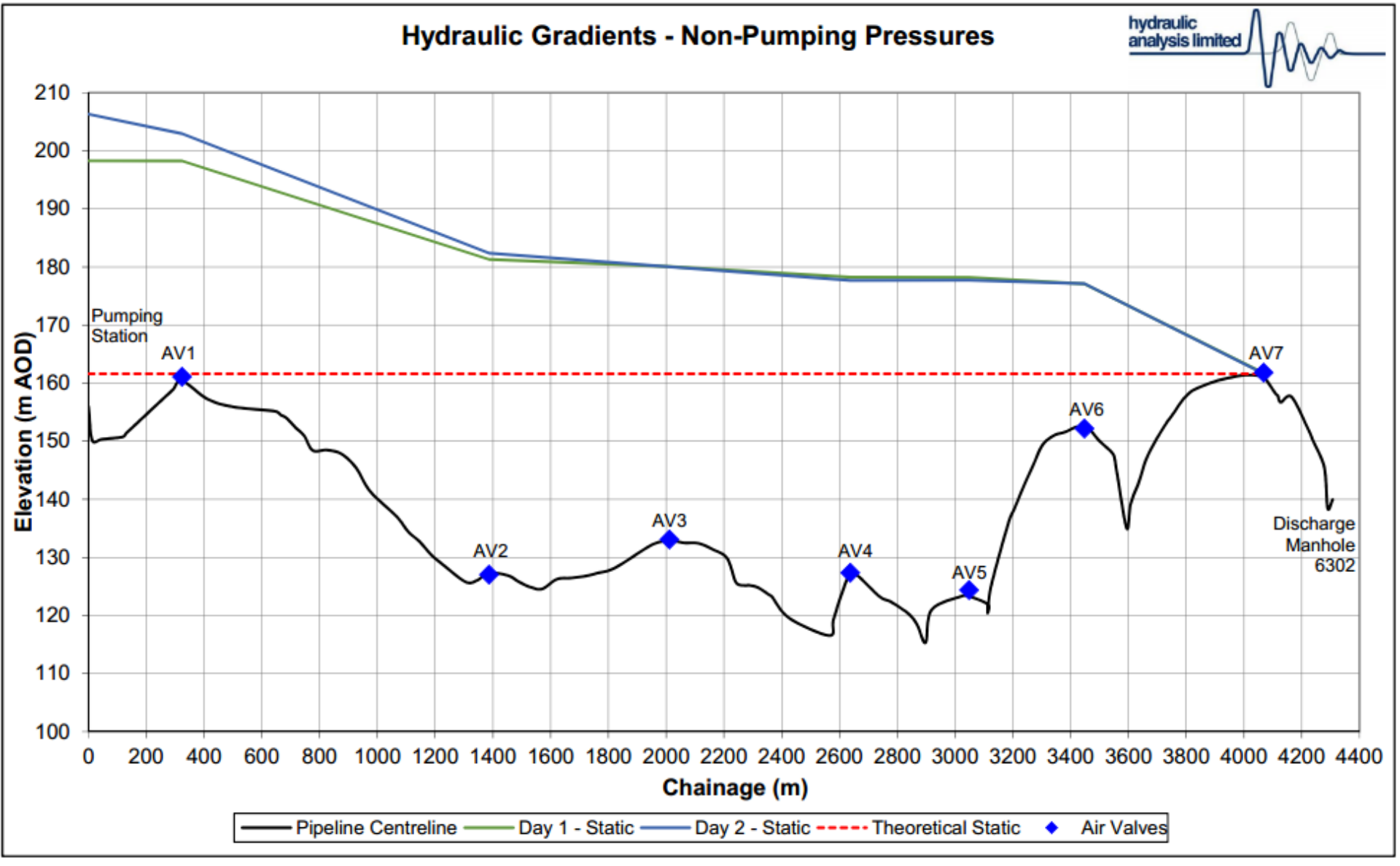
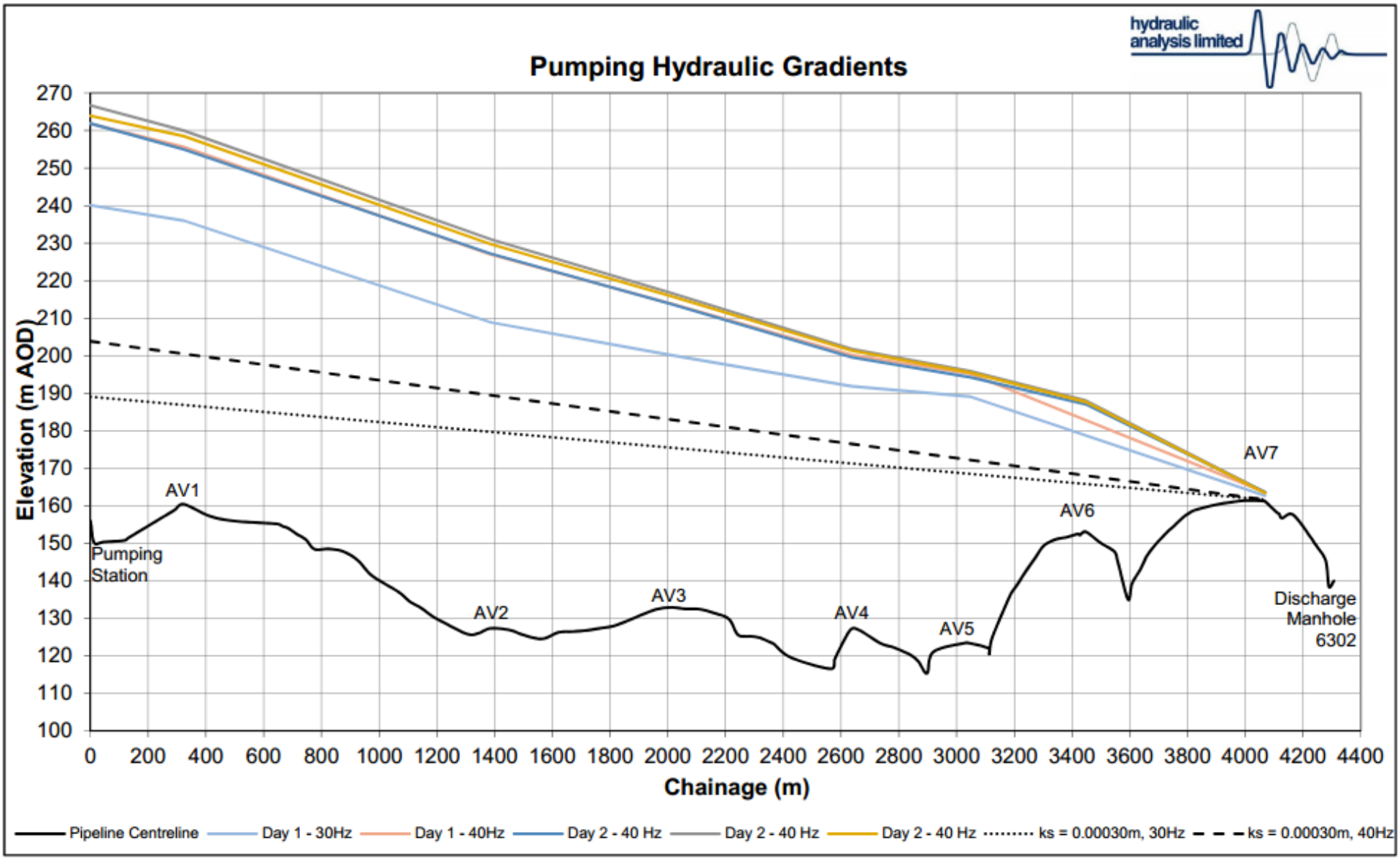
Data – Simple A to B Wastewater Pipeline



The value of data



How to use data



Pipeline Condition Monitoring

Pipeline Condition Monitoring Overview

- In 2015 Severn Trent Water instigated a pilot programme with HAL to understand and improve the performance of 20 sewage pumping mains
- The aim was to determine the system characteristics through a site asset health check, provide a rapid real time pipeline burst alert service and to then optimise asset performance
- The objective was to reduce the likelihood of future bursts and minimise the consequence should a burst occur via a rapid alarm response to the event
- This will minimise customer disruption, reduce pollution incidents and provide live monitoring of the asset's health, to improve system performance and reliability
- Modifications have been made to high risk rising mains, with evidence of more stable operation which indicates a reduced likelihood of bursts

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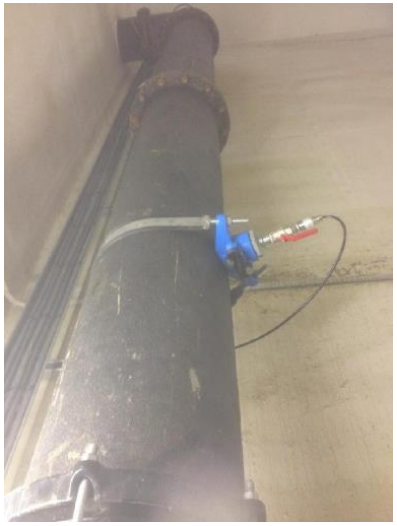
Pipeline Condition Monitor

The Solution involves:

- Pressure transducer clamped to pipeline
- Data logger with GSM connection
- Cloud-based data warehouse with web-login visualisation
- Alarm response via customer contact centre



Pressure Transducer

Data Logger & Battery pack

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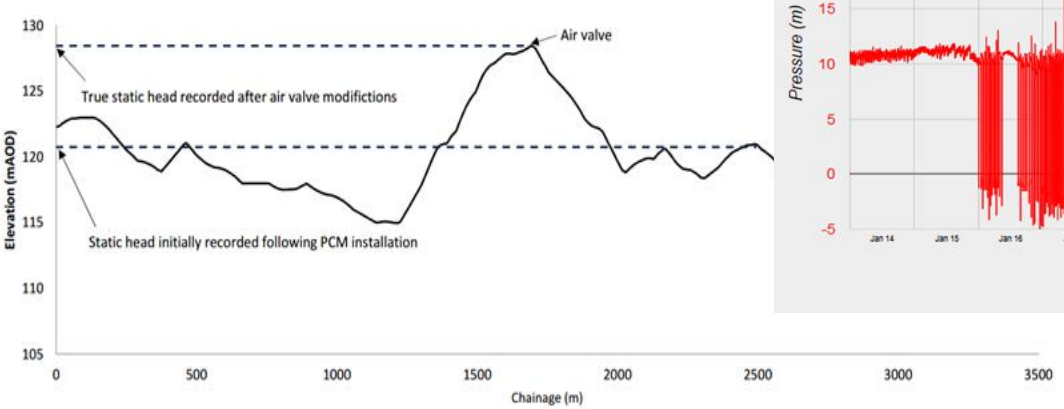
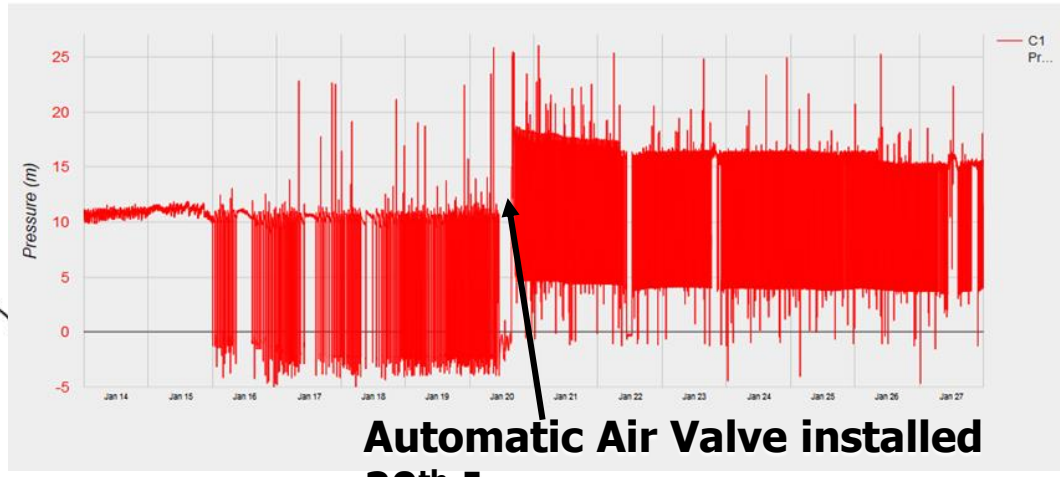
Case Study 1 - Derbyshire

Performance - Air Valve affecting Static Head



Rising Main profile showing Static Head



Pressure trace before and after AV install

- Expecting 5m head, observed -1m
- Based on profile, this looked like an ineffective air valve
- Temporary variable speed drives were installed to reduce pumping pressures and pressure excursions.
- Following replacement of manual air bleed, operating pressures restored to near-design conditions.

Photo – Manual Air Bleed

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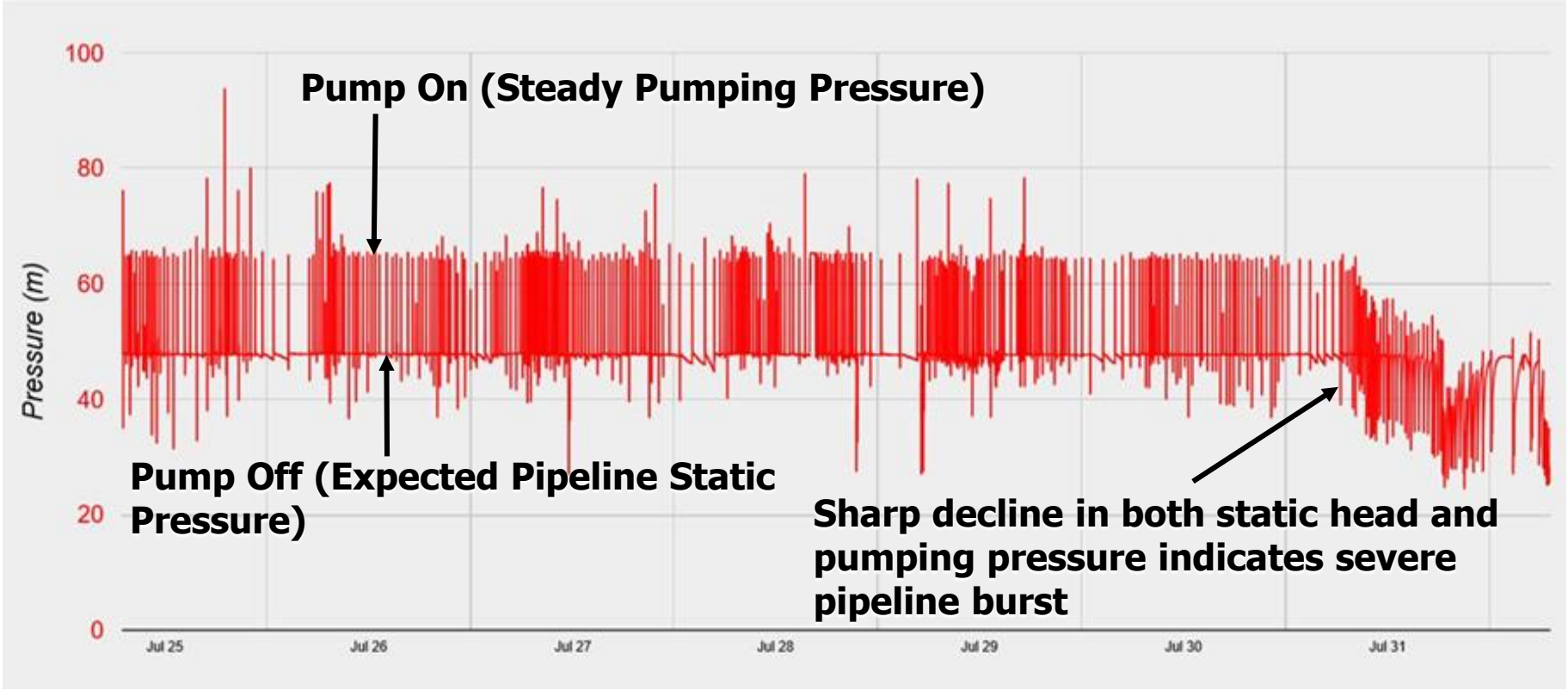
Case Study 2 - Gloucestershire

Alarm – Severe Pipeline Burst



Pressure trace showing drop in static pressure

- Expecting 48m head, observed with transients
- On July 31st at 09.01 Alarm raised and crew attended site

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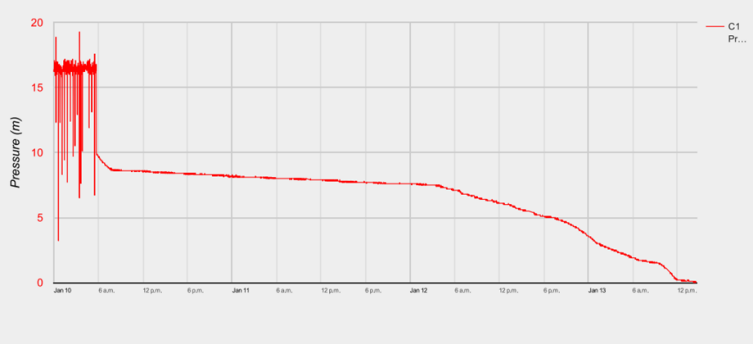
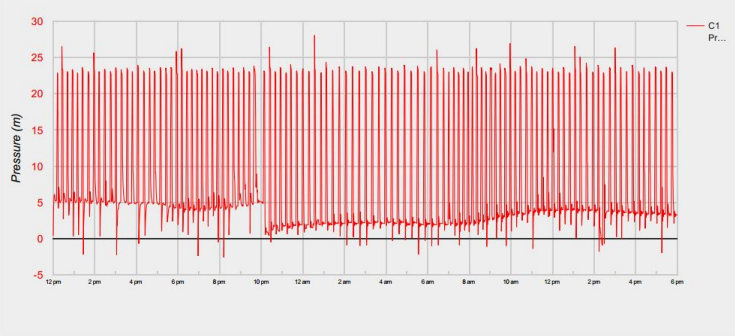
Common Issues

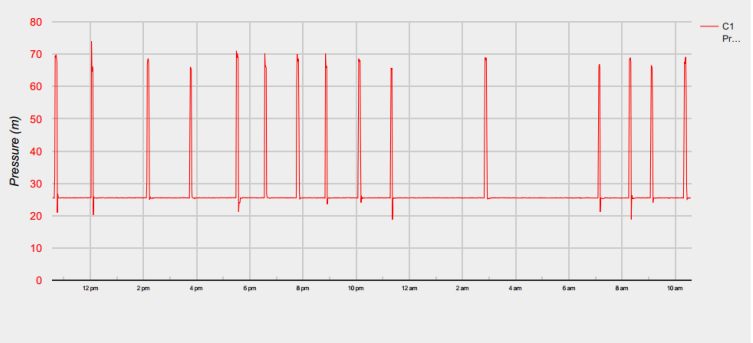
NRV not seating



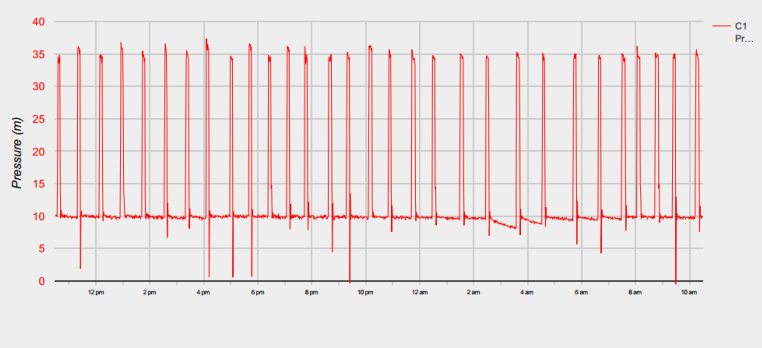
Trapped air results in erratic performance



Severe transients on pump stop (high and low surge pressures)



Sludge in main causes higher operating pressures than expected



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Pipeline Condition Monitoring Benefits

The benefits of carrying out an asset health check and installing a Pipeline Condition Monitor are:

- Lower pressure excursions (pressure changes) and less severe sub-atmospheric pressures i.e. a calm and healthy system
- Improved chance of rapidly detecting pipeline bursts
- Evidence of system performance improvement pre and post works
- Reduced pumping costs / energy consumption / carbon emissions
- Reduction in risk of pollution and prosecution

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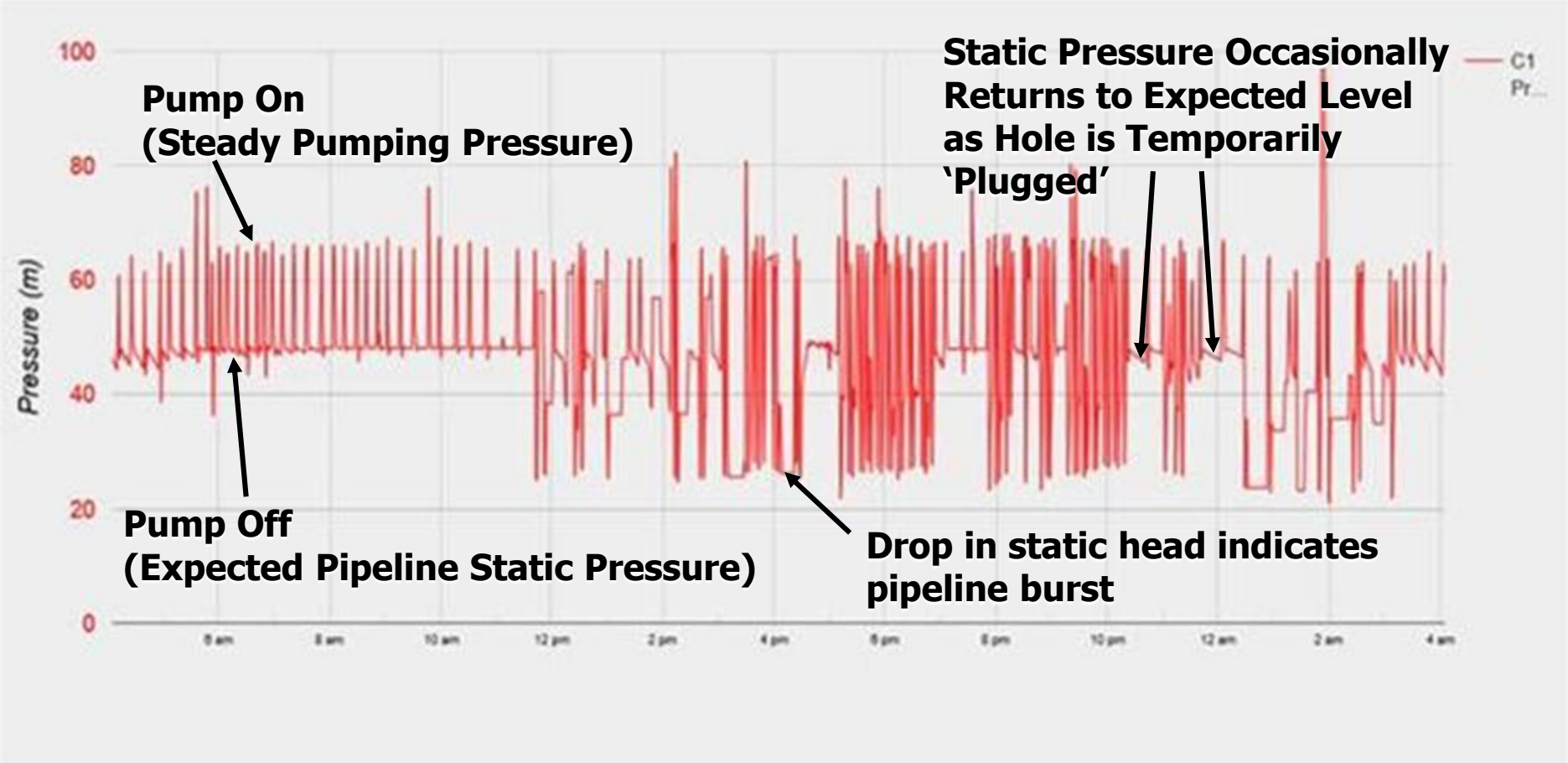
Pipeline Burst – Repeated Plugging



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2065

- The future will bring increased data volumes, faster data acquisition, open data and more effective communication

BUT

- This will be countered by higher pipeline flowrates (due to population increases) and older assets (200+ year old pipelines) i.e. higher risks

AND

- Engineers will still need to review abstracted data, check databases for errors, manually review data and optimise systems based upon experience

- Until AI matures, there will always be an element of manual intervention and interaction on any SMART network

- Hydraulic models will drive understanding of the performance and health of assets based upon real-time field data - this is already standard practice in the oil and gas industry but it requires data

- Installing pressure loggers and flowmeters on every pipeline will be essential if we are to maximise the benefits of technology but it is not about lots of data – it centres around effectively interpreting data for operational intelligence and control

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