Flooding and Dewatering of a Deep-Water Dual Diameter Pipeline

Aidan O'Donoghue, November 2025

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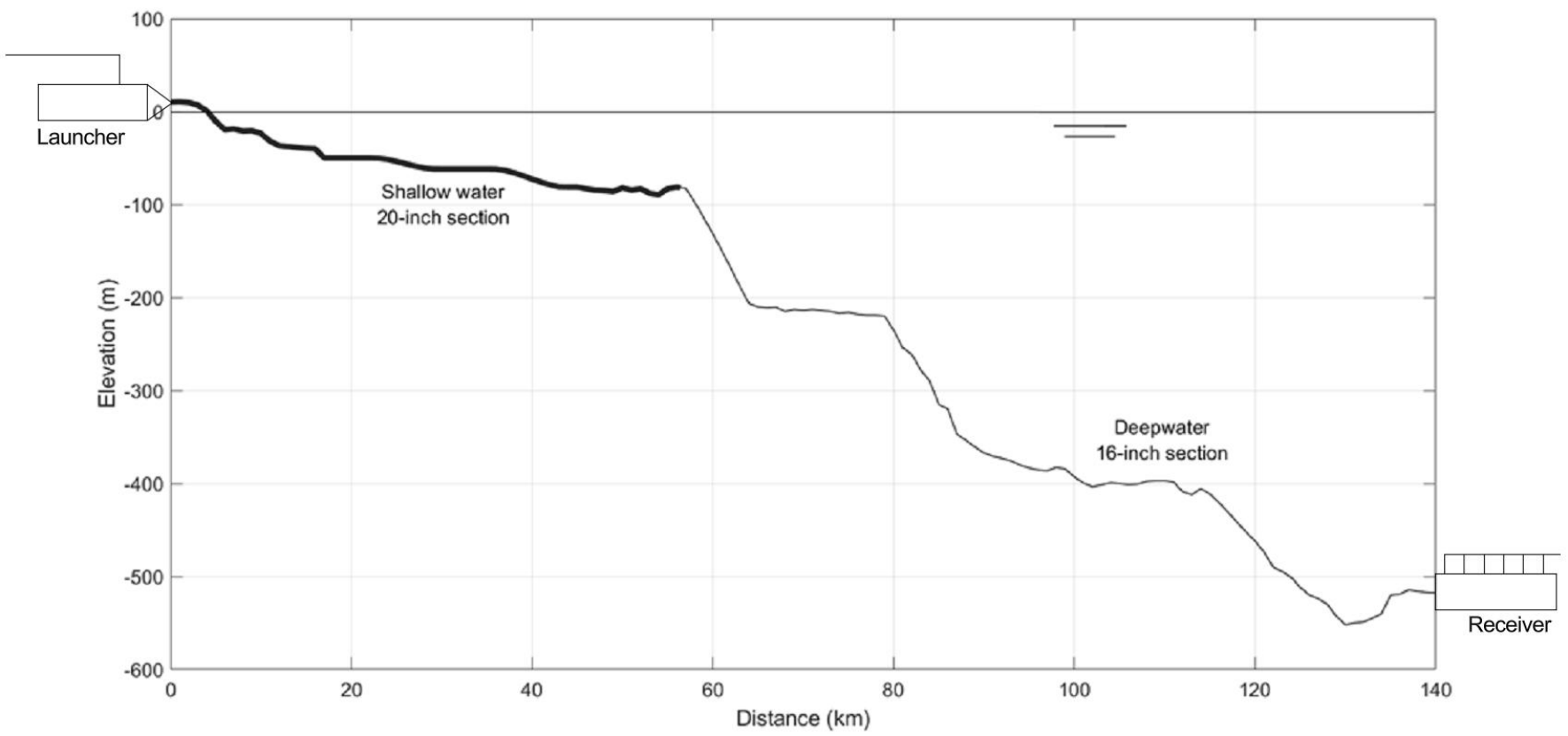
PIGGING PRODUCTS & SERVICES ASSOCIATION

The pipeline



- 16 x 20-inch, 24,4% increase in diameter;
- 20-inch epoxy lined;
- 518 m water depth;
- Pre-comm from shore, 20-inch to 16-inch;

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Pre-commissioning Tasks

- Develop 20 x 16-inch pre-commissioning pigs;
- Flood, Clean and Gauge (FCG);
- Hydrotest;
- Dewater to sales gas quality (<2% water in MEG in final batch).

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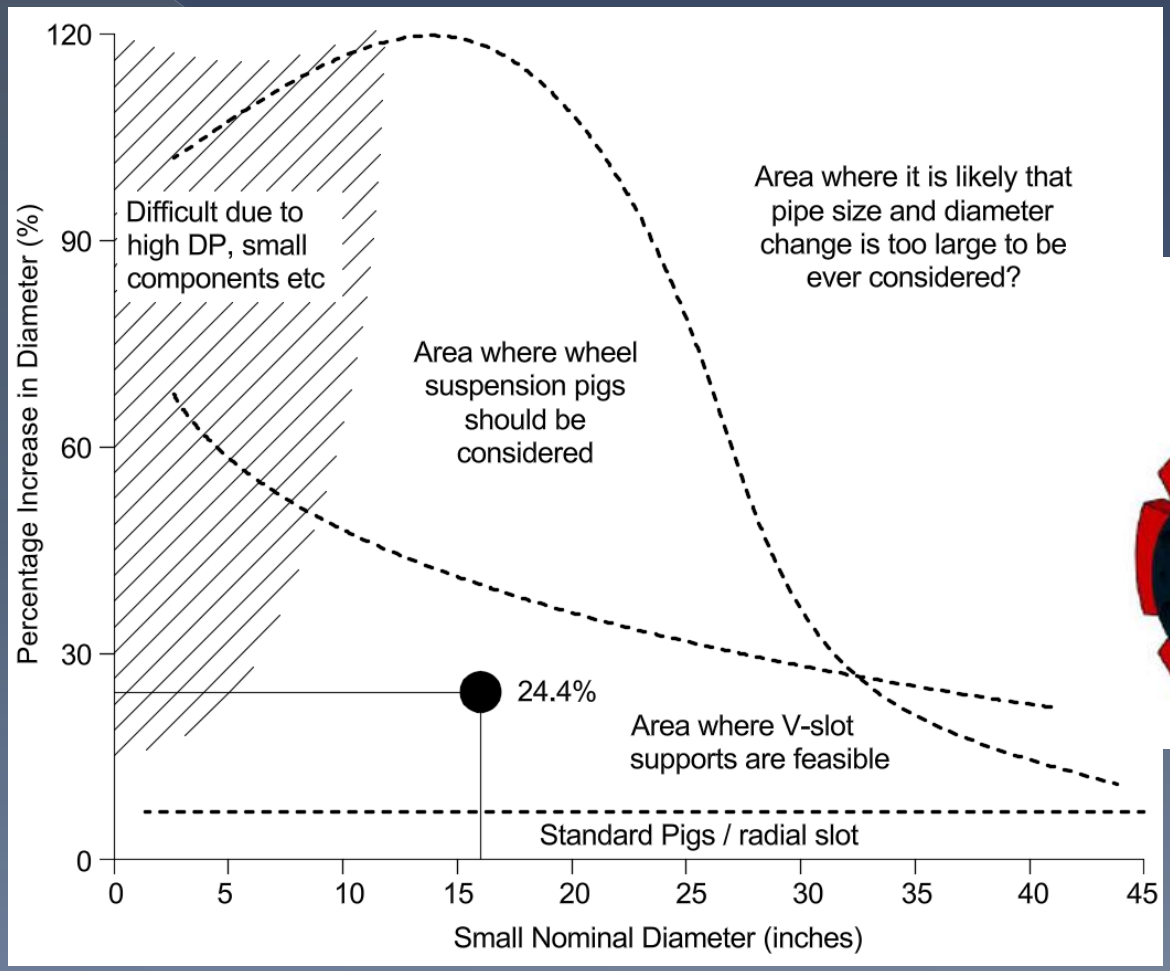
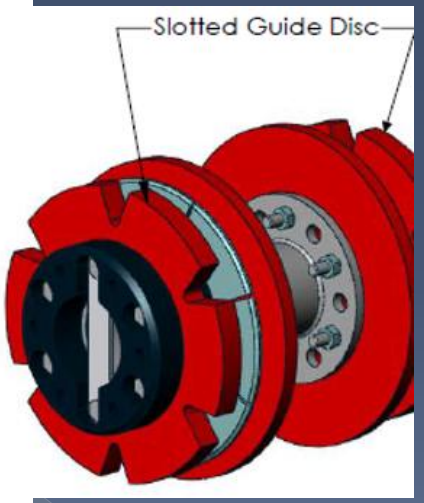
Dual Diameter Pig Selection





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Functional Requirements

FCG	DEWATERING
• Good cleaning ability and reasonable sealing. Consider directional bypass in first pig to help remove loose debris; • Bi-directional / reversible; • Include magnets for ferrous debris; • Negotiate / span all pipe features; • No trapped cavities in pigs or in pigs in contact; • Correct length for receiver; • Signalling and tracking included; • Locking of all fasteners (to agreed standard)	• Normally uni-directional pigs / excellent sealing required (test required – "No visible leakage"); • Ability to seal when static and at longitudinal welds; • Negotiate / span all pipe features without leakage; • Locking of all fasteners; • No trapped cavities in pigs or between pigs in contact; • Bumper noses to avoid contact; • Signalling and tracking included – isotope is ideal; • Silicone sealant to avoid through body / bolt leakage.

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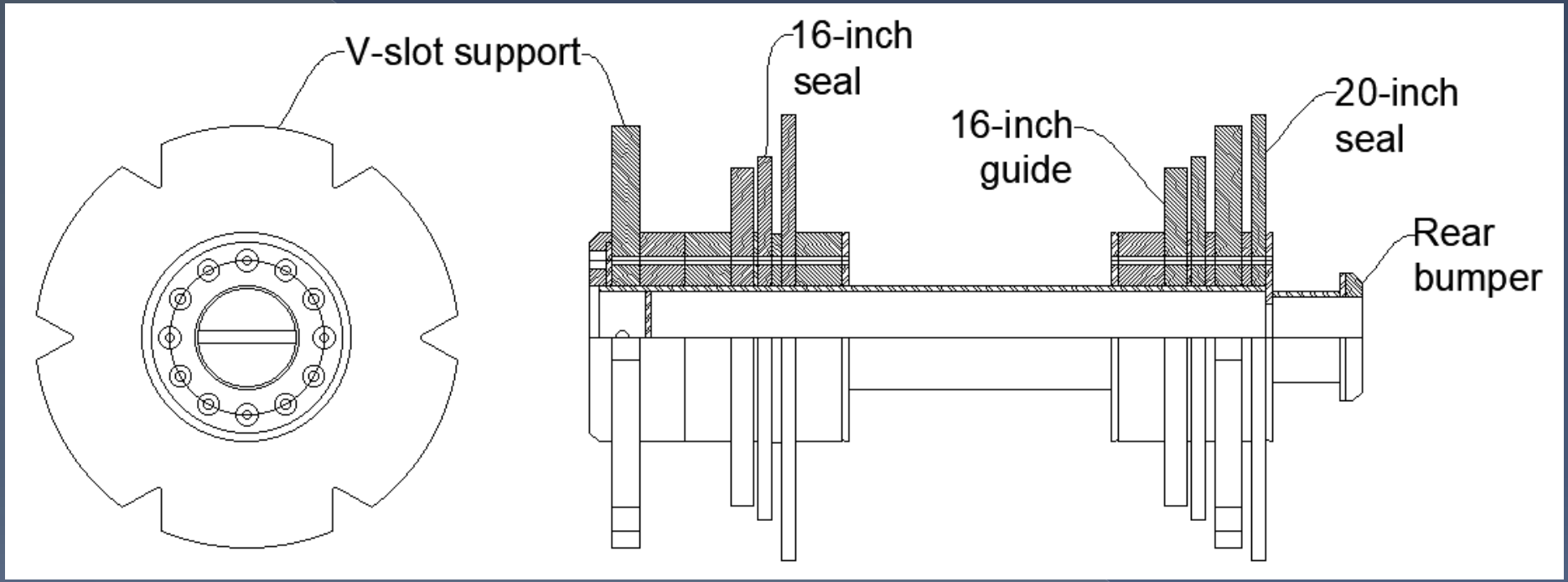
Initial pig design



- Shore 85A V-slot and solid supports;
- Shore 60/65A sealing discs;
- Extended bumper nose to avoid clash in 16-inch line.

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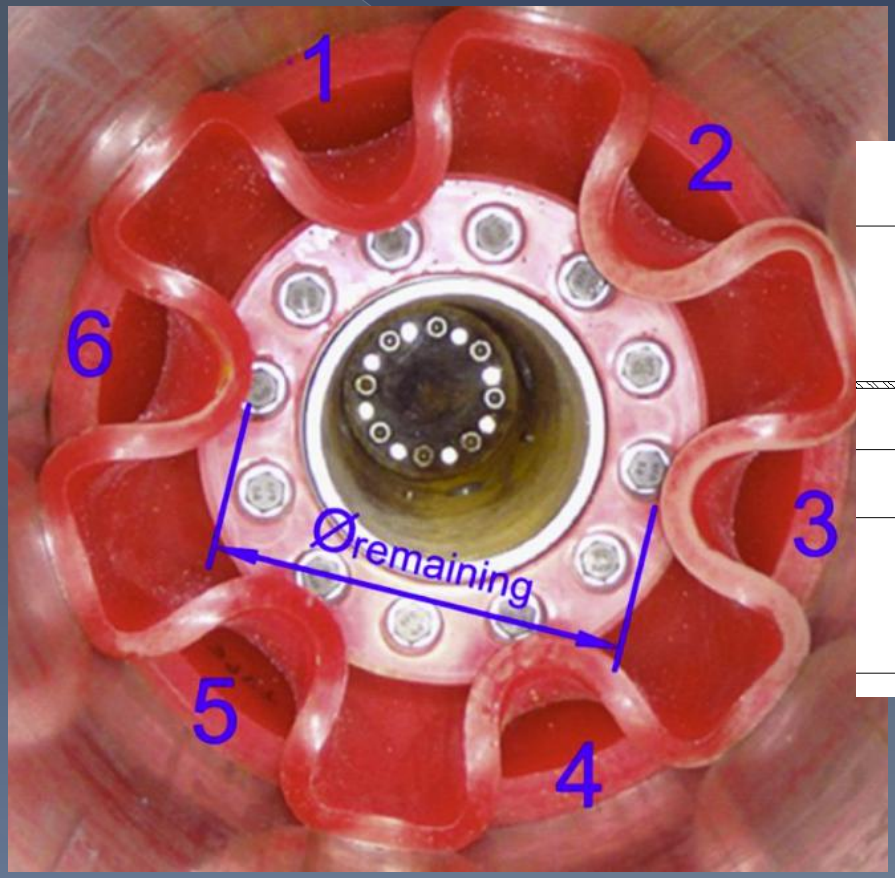
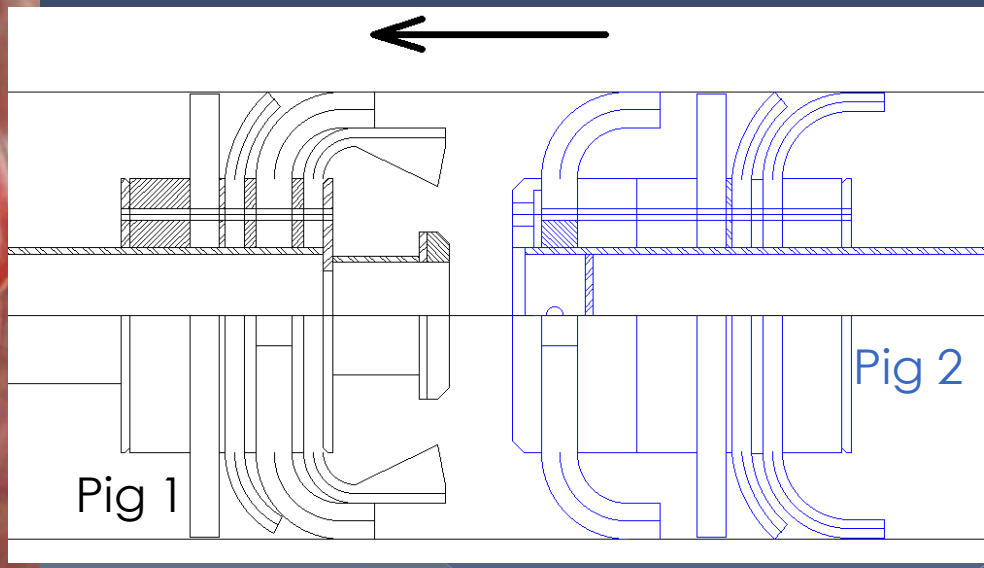
Seal buckling





- Optimise number of buckles and know inner diameter;
- Design rear bumper nose for pigs pushing on pig ahead.

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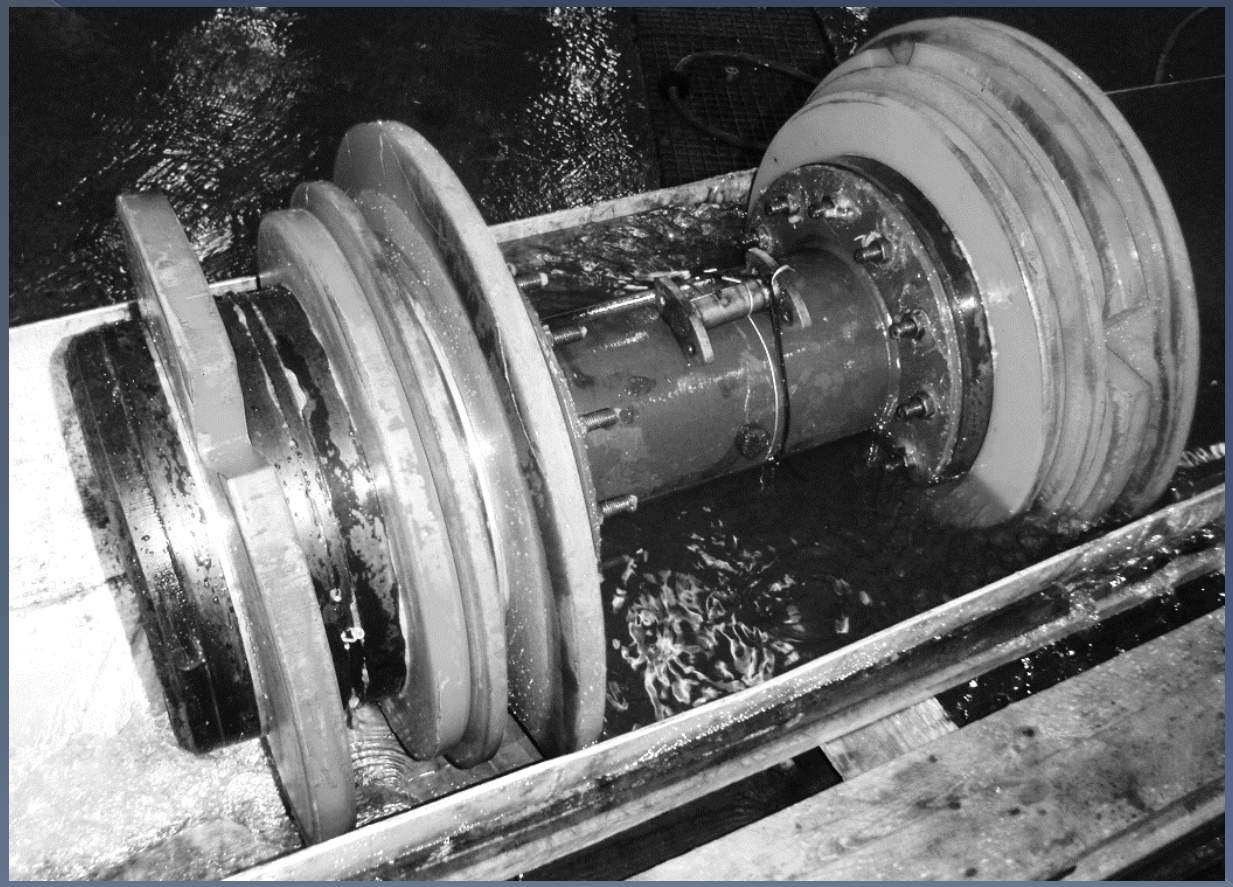
Testing and pig parameters



- Open ended testing
- DP in 20-inch 0.25 bar;
- 1.5 bar in 16-inch straight.

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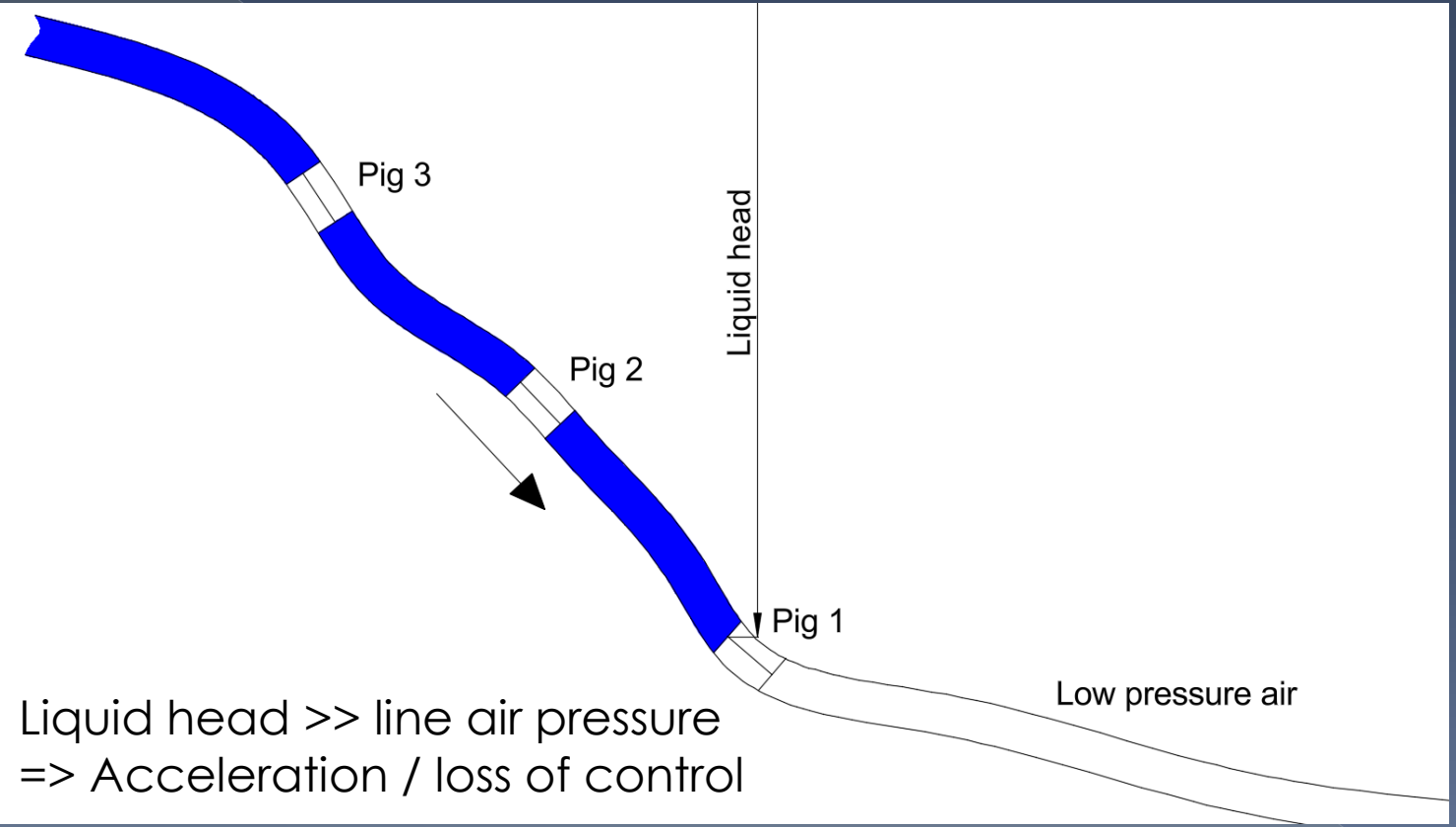
FCG – Pig train runaway



- Pre-pack with air
- Pre-flood with water
- Partial pre-flood

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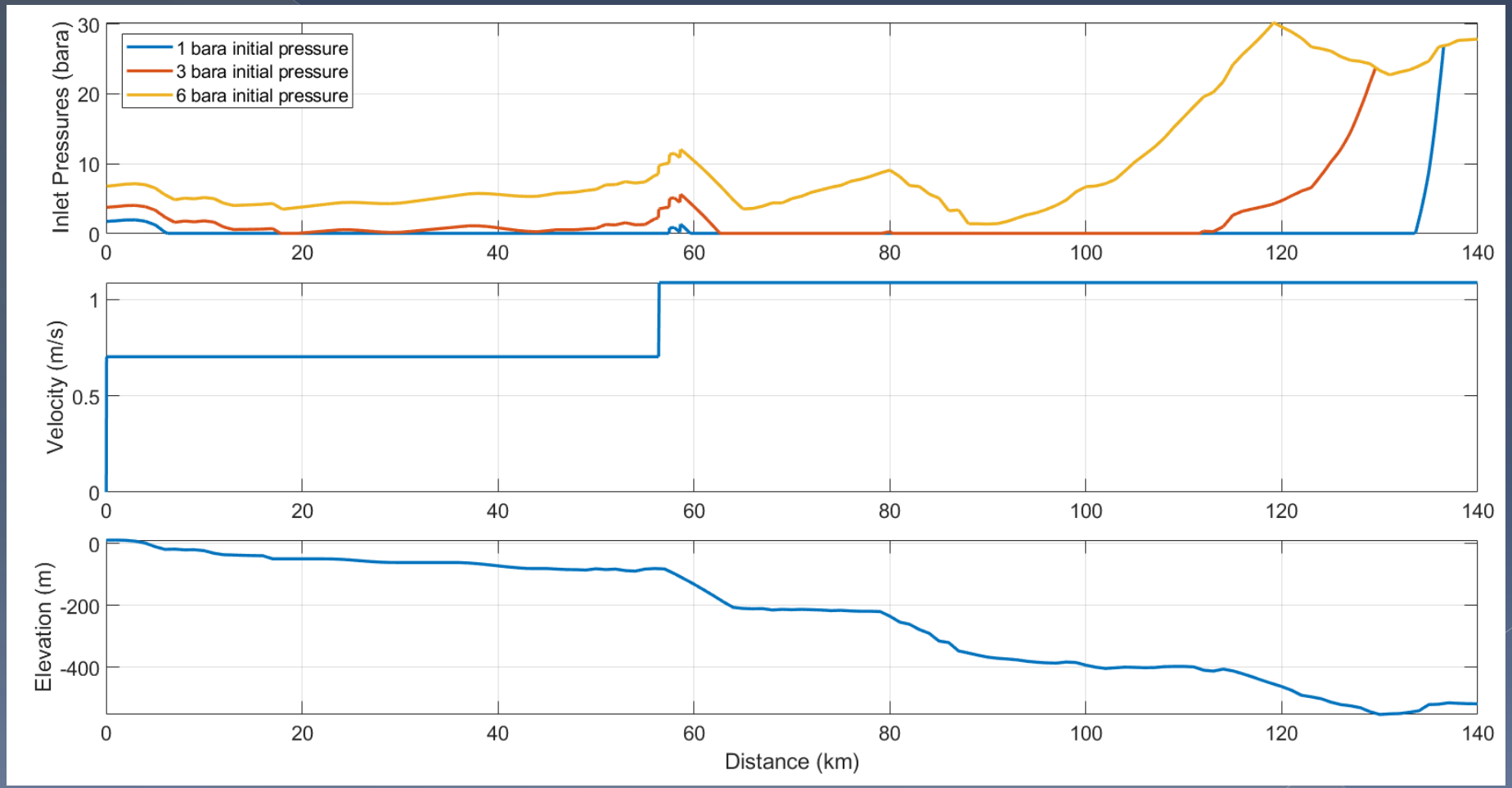
Determine pre-pack pressure



6 bar pre-pack, inlet pressure stay above 1 bara
No risk of suction of air into the line

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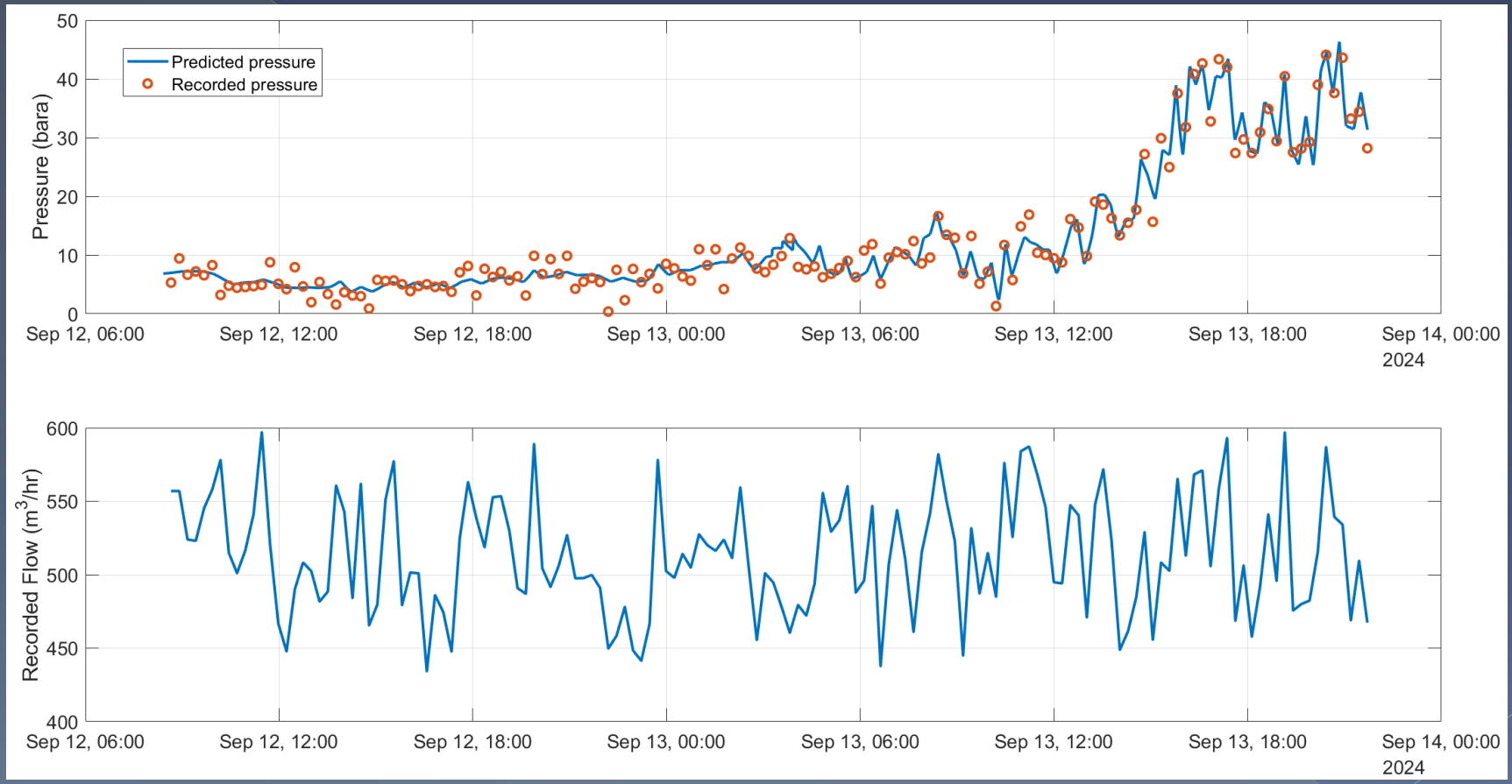
Tracking during FCG



Plot actual and expected inlet pressure against time using actual flowrates. Major deviation could indicate problem.

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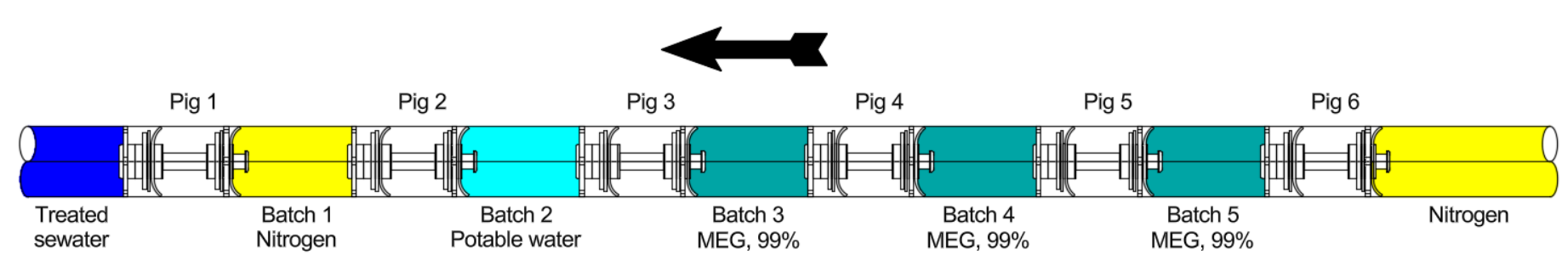
Dewatering pig train design



- To achieve <20 ppm chloride;
- <2% water in MEG in final batch;
- No subsea sampling, calculations are sufficient.

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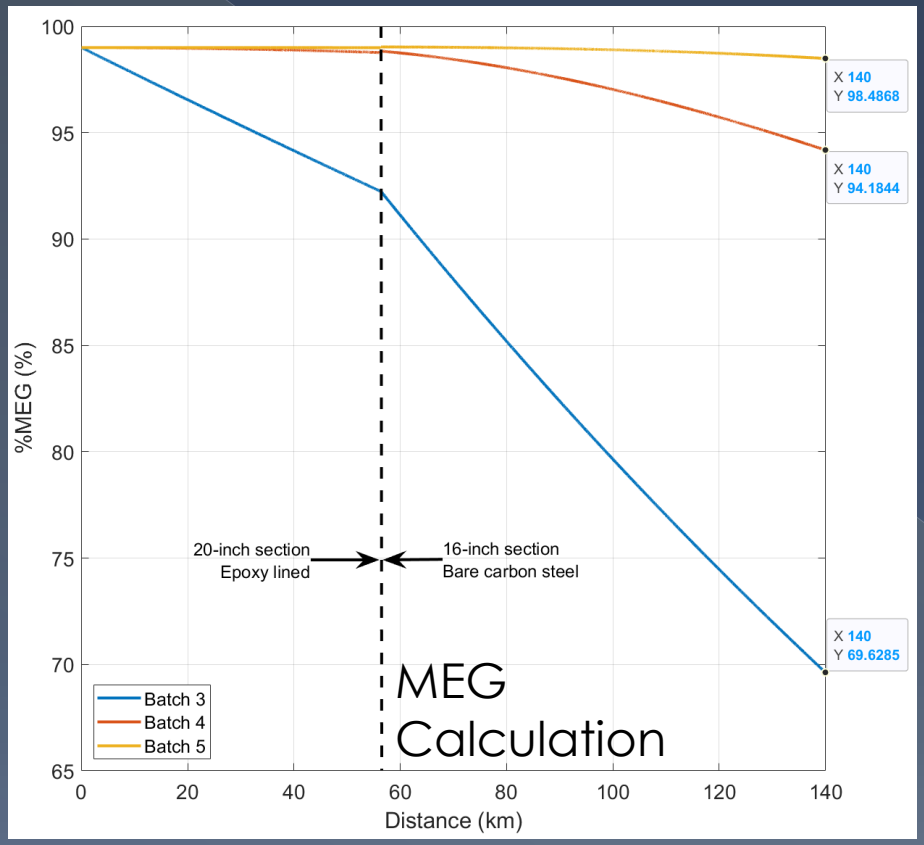
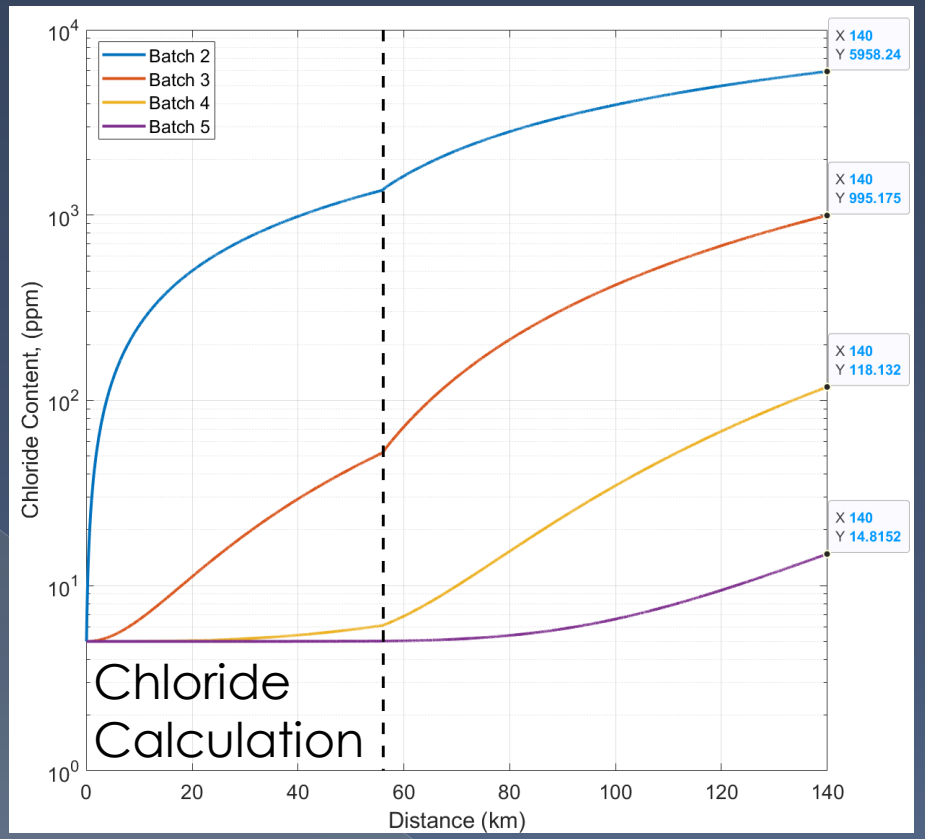
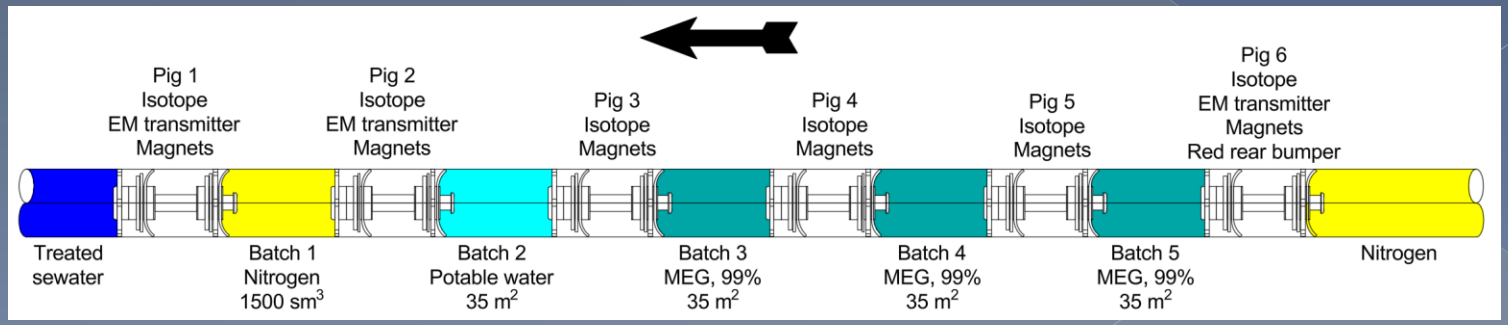
MEG and Chloride Calcs







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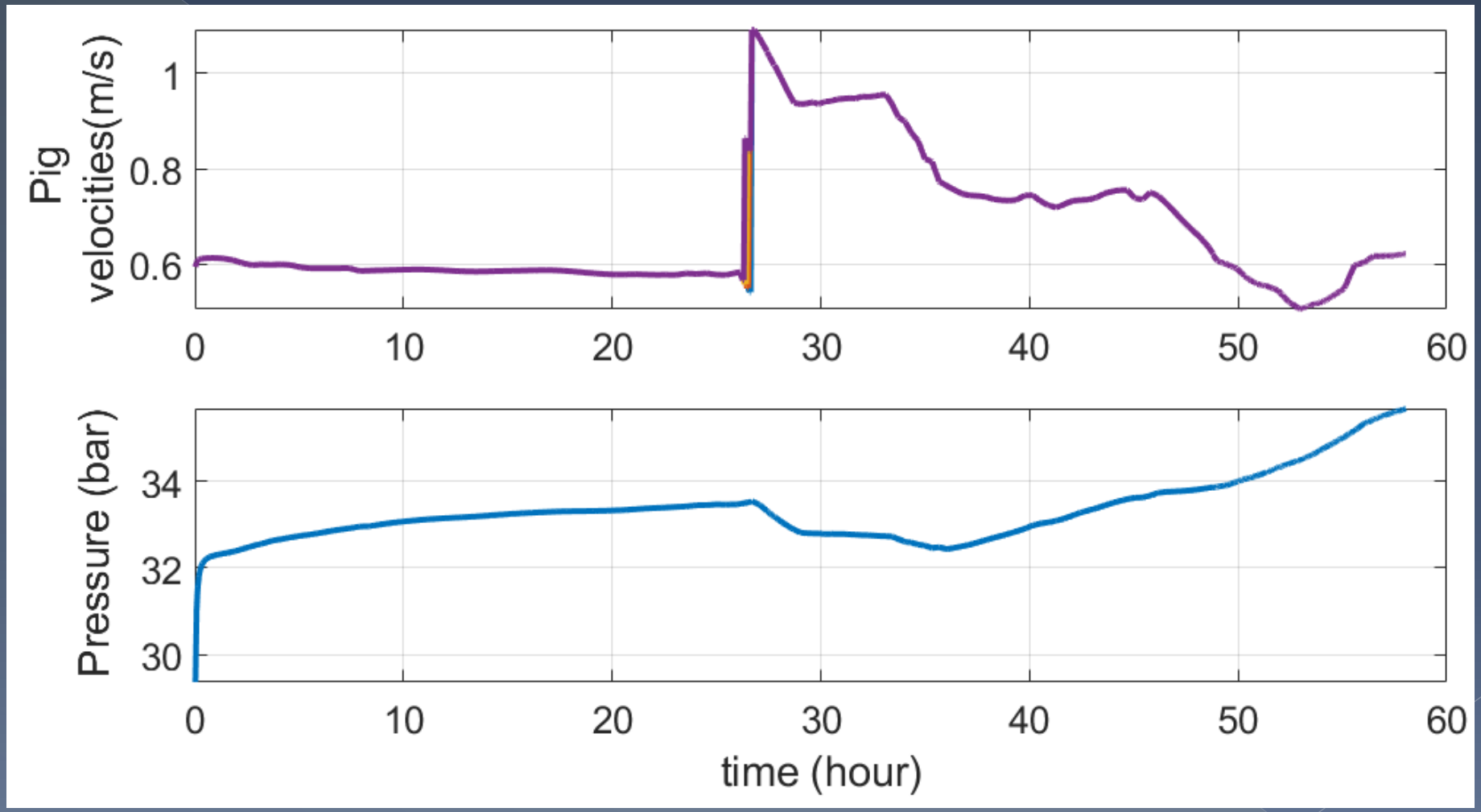
Dewatering simulation



Disagreement – we are saying the train does not stop at the reducer

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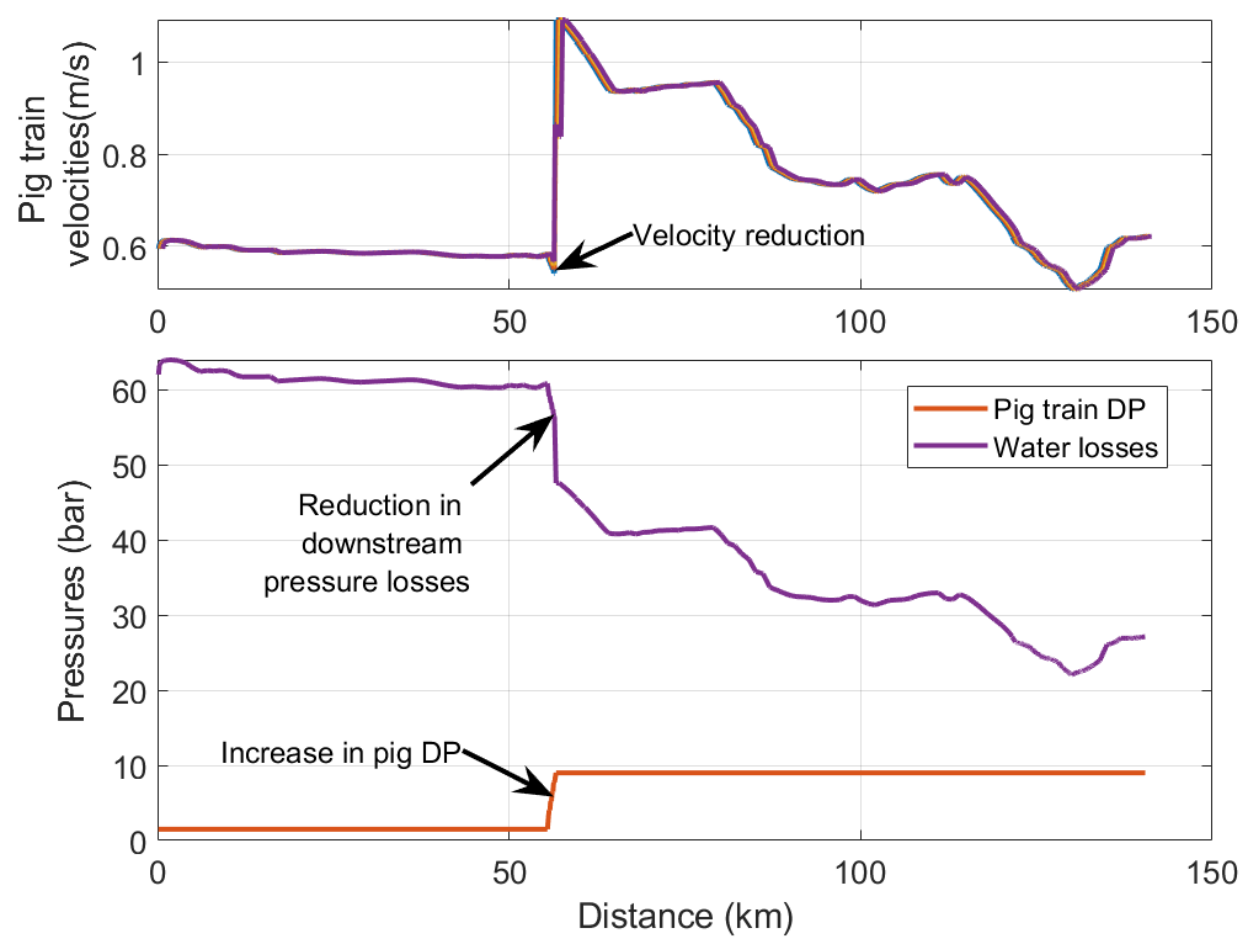
Why no stop?



Instead of air pressure building up, upstream – the water pressure drops downstream and the pig train continues without stopping…

Re-adjust the timetable, boat plan to go direct to the receipt end of the line.

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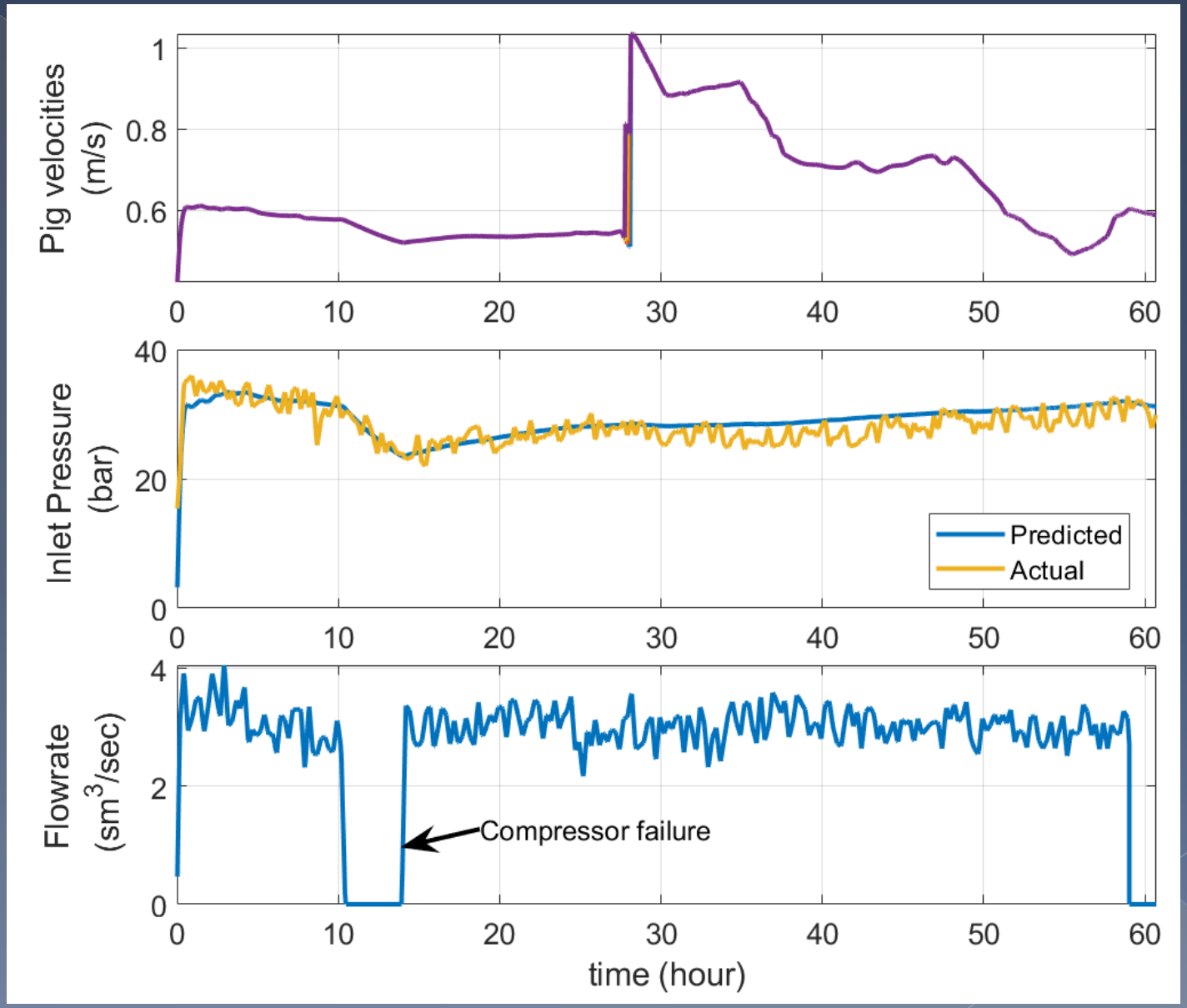
Tracking the dewatering



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Conclusions

- Same pig concept for FCG, dewatering and basis of operational pig;
- No compromise on sealing efficiency, aim for "no visible leakage";
- Rear bumper nose to avoid plug;
- Open ended testing to validate pig design;
- Pre-pack or pre-flood to avoid FCG train runaway;
- Dewatering calculations to optimise pig train design to get < 2% water in MEG;
- FCG and dewatering can be tracked against predicted;
- It is not necessarily the case that the pig train stops at the reducer!

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Thank you…

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