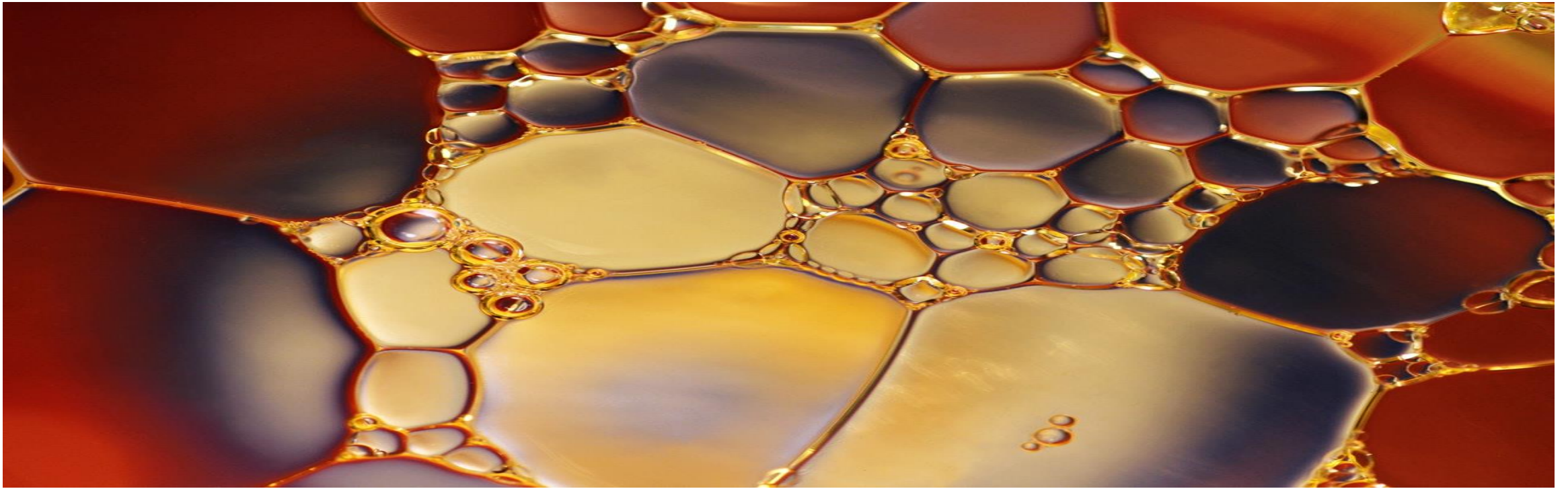


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Challenge 2: Let's just be friends?

Predicting conditions that upset the separation of water and oil in petroleum production



Mentors: Challenge 2



Russell Spradling
Petroleum, BHP



Ravi Gudimetla
Petroleum, BHP



Loran Wilson
Petroleum, BHP



Aubrey Bagley
Petroleum, BHP



Dan Morley
Petroleum, BHP



Nathan Lee
Technology S&I, BHP



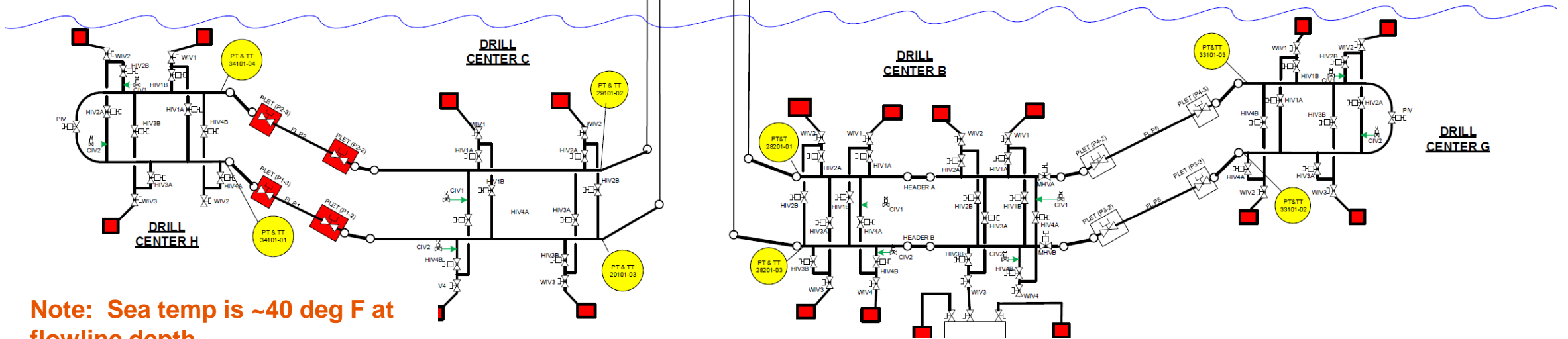
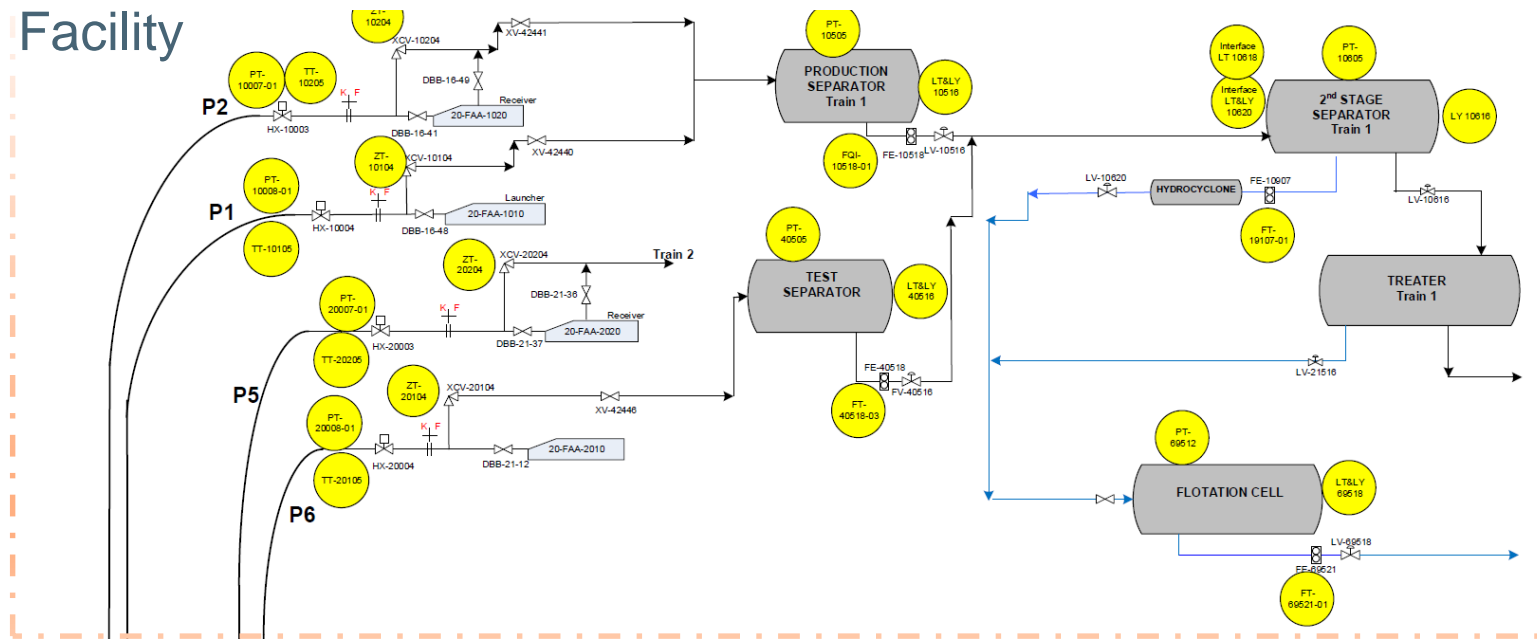
Jose Leviaguirre
Technology Enterprise Sys.,
BHP



Cameron Kingwell
Technology S&I, BHP

The Process

Facility



Note: Sea temp is ~40 deg F at flowline depth

The Data

Reference Data - “Tag Numbers” on Process Layout

Flowline Data - Temperatures & pressures at specific locations in the flowline

- Flowline Characteristics – Distance creates **time lag** between flowlines & topsides

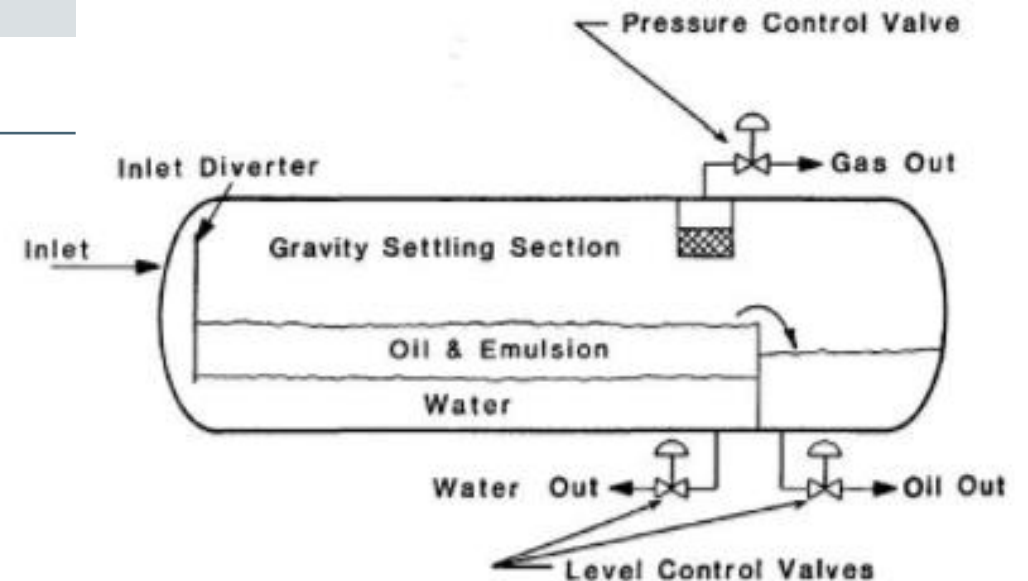
	Pipe Inside Diameter	'C' to facility distance	'C' to 'H' distance	'B' to facility distance	'B' to 'G' Distance
P1/P2 Flowlines	6.6"	13,300 ft	20,600 ft	-	-
P5/P6 Flowlines	8.4"	-	-	12,500 ft	9,000 ft

Facility Data – Describes conditions inside the process equipment

- Temperatures Transmitters (TT)
- Pressures Transmitters (PT)
- Flow Transmitters (FT) – Metered Data
- Level Transmitter (LT) – Inside Separation Vessels
- First level bullet, Arial blue grey
 - Overall Level or Interface (IF)

Data set with known facility upsets is provided for analysis

Typical 3 phase Separator



Separator Upset Prevention

Background – Separation Upset Dates

October 26, 2016

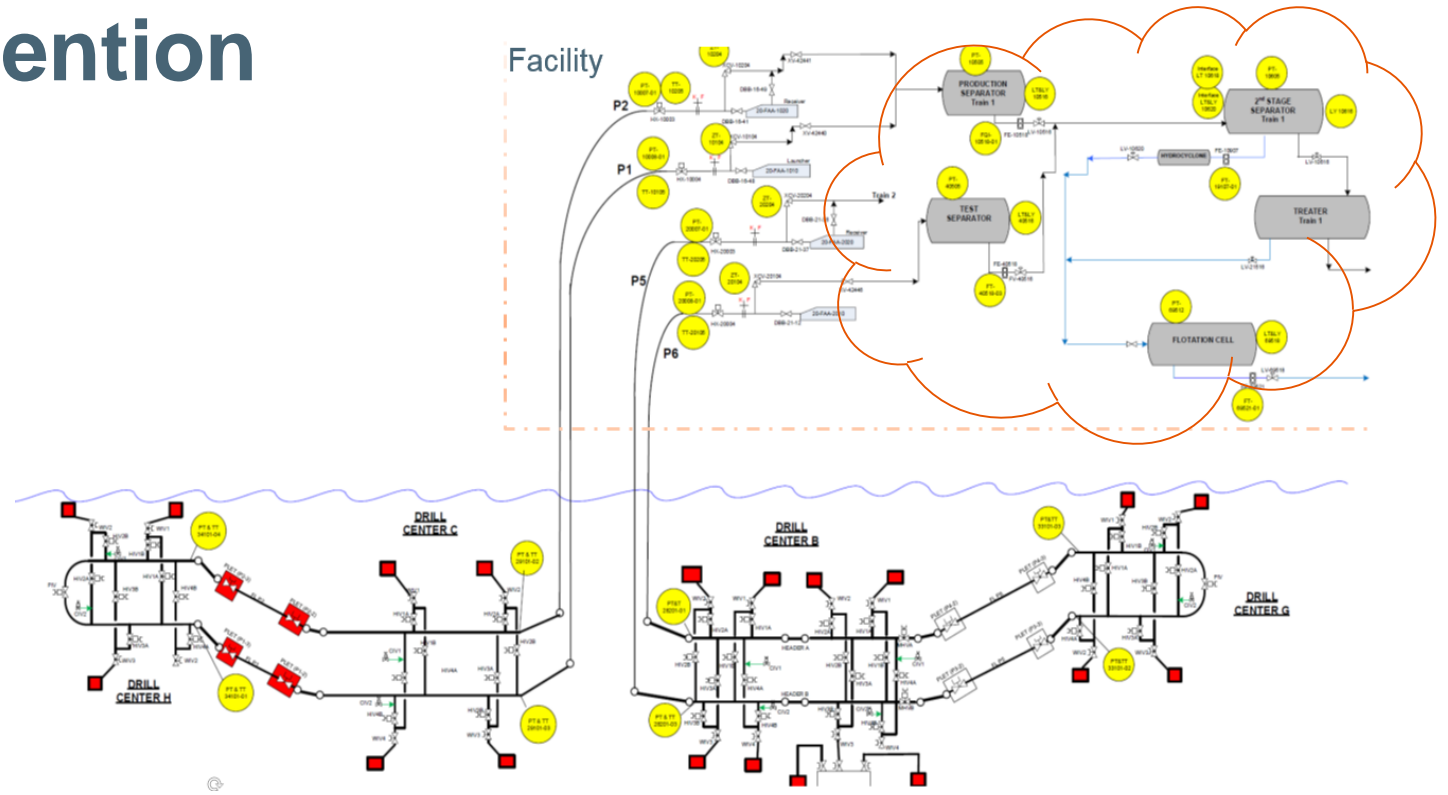
November 11, 2016

November 16, 2016

November 27, 2016

January 28, 2017

March 12, 2017



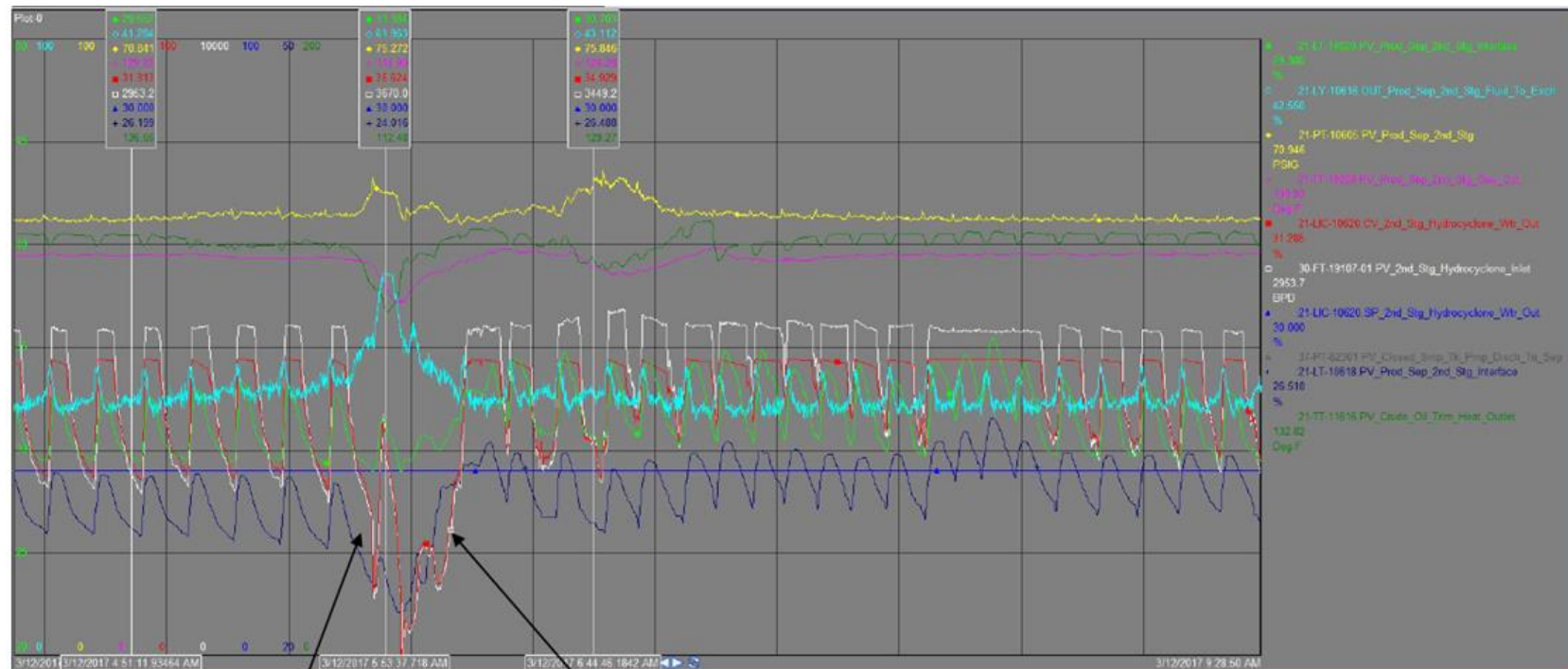
The Challenge – Use data to alert facility operations of a potential separation upset (clouded equipment)

1. Identify a correlation facility separation upsets & flowline process data.
 - Consider the time lag between flowline data & facility upsets.
2. Develop a predictive model or algorithm that could alert facility operations.

Separation Upset Analysis

March 12, 2017 Example

- Event included surge in flow from Production Separator
- Liquids temperature Drop
- 2nd Stage Separator Oil/Water Interface level instability



Loss of phase separation coincident with liquid surge from T1 Prod Sep

Significant temperature drop coincident with spike in liquid rate

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