



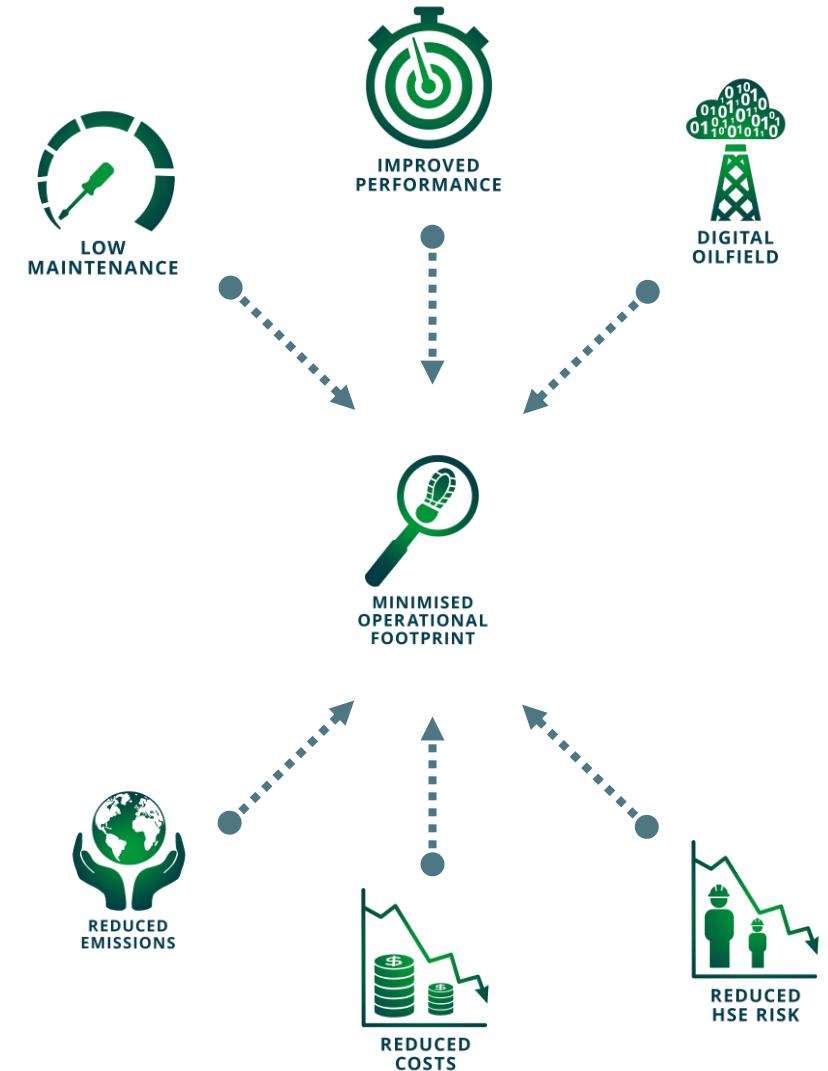
M-Flow - At the heart of the digital oilfield

## M-Flow Measurement & Data Systems

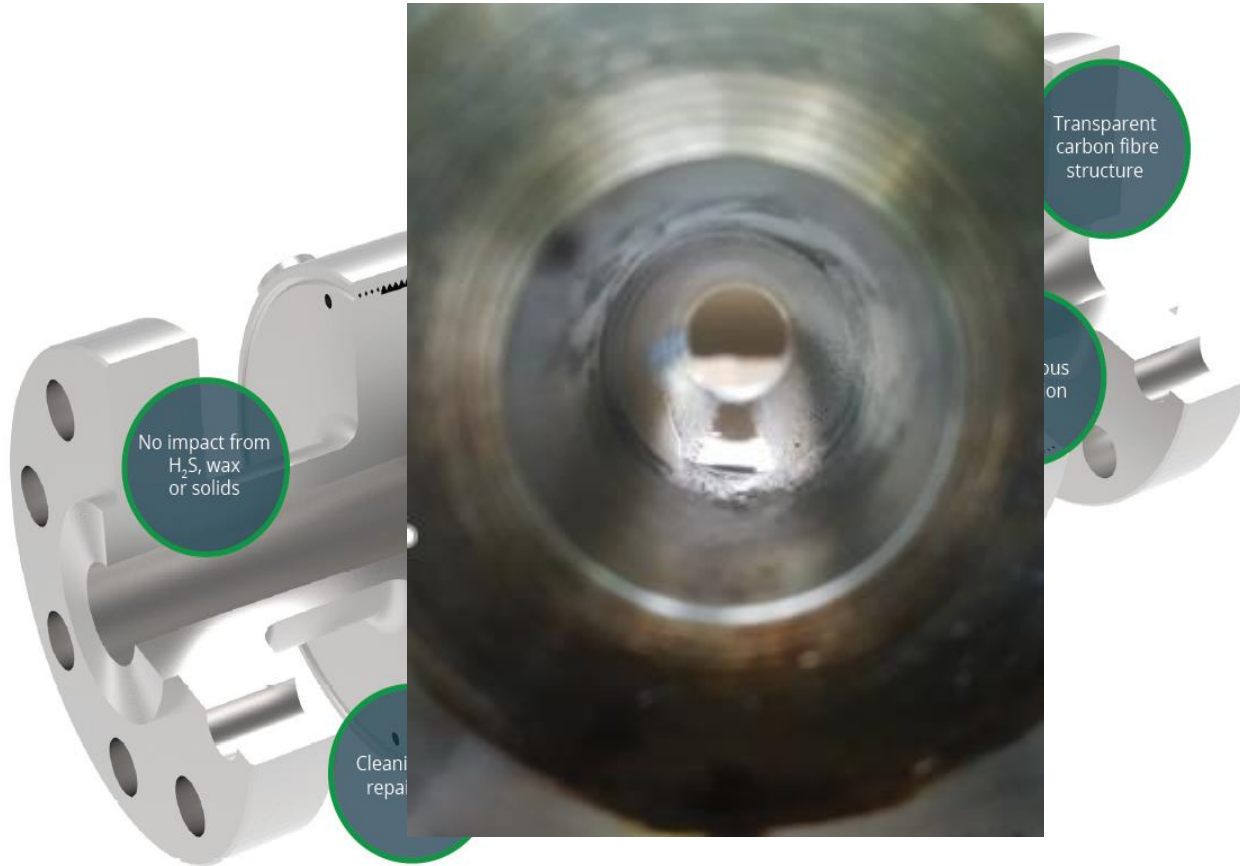
Accurate multiphase and water cut measurement for the digital oilfield

# M-Flow Value & USPs

- UK based company – Operating Globally:
  - Specific technology choices around the use of carbon fibre composite.
  - Distributed data architecture incorporating ‘Internet of the Oilfield’ themes.
- These advantages drive benefits and value in the key industry focus areas:
  - Improved measurement – repeatable and accurate
  - Reduced Costs
  - Reduced Maintenance
  - Reduced HSE exposure
  - Delivery of actionable, decision-making data
  - Reduced global warming emissions
    - Remove fugitive wellsite methane emissions
    - Reduce Transport & Operations related CO<sub>2</sub> emissions
    - Reduced embedded CO<sub>2</sub> in equipment manufacture and site build



# Carbon Fiber Transparency With Proven Sensor Technologies



## Patented carbon fiber pipe

- Patented carbon fiber/PEEK pipe
- High Pressure
- Sour Service Standard

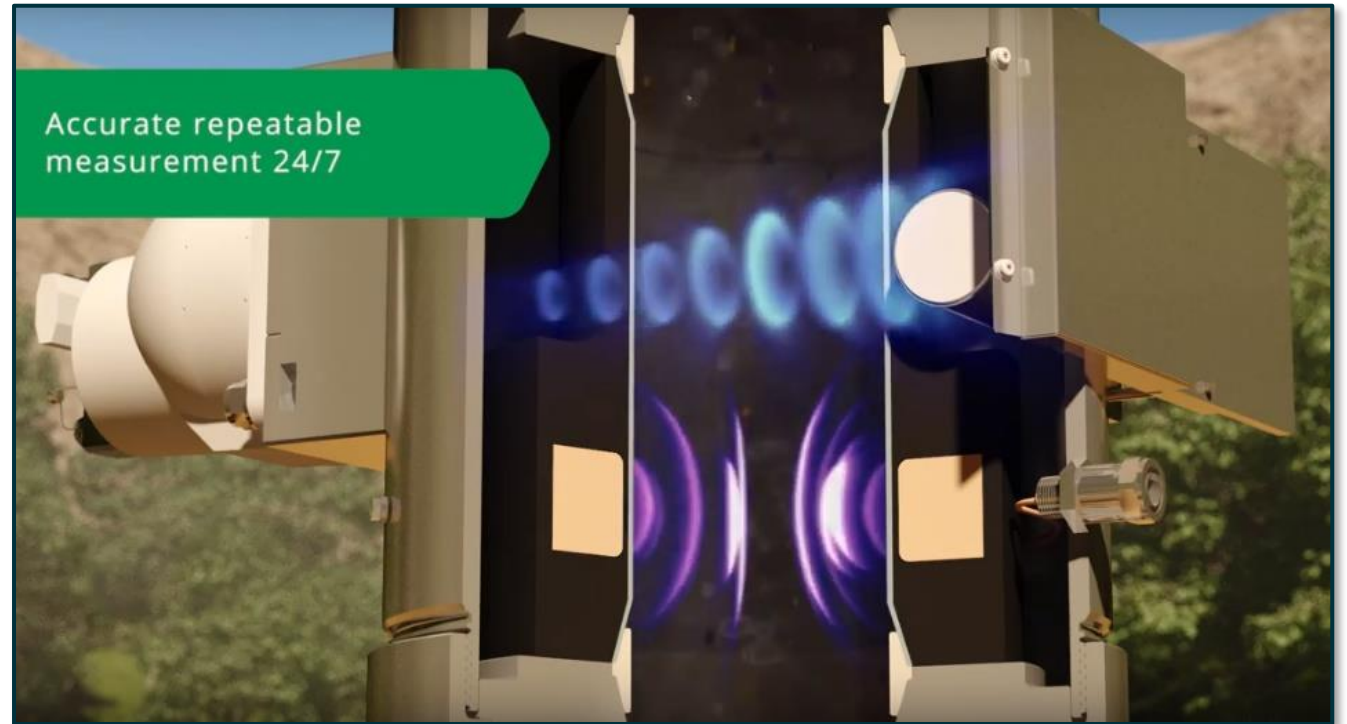
## Sensors embedded in pipe wall

- Pipe integrity not compromised by penetrations
- Highly accurate measurements
- No contact with fluids
- No damage or fouling of sensors
- No cleaning or repair
- No calibration change due to fluid effects
- Measure across entire pipe diameter

**When the measurement changes, the fluids have changed, and not the measurement system.**

# M-Flow Composite Meter Measures Oil:Gas:Water Fraction

- Microwave
  - Measures fluid permittivity
  - Sensitive to water fraction
  - Water-Cut Meter
- Gamma
  - Measures fluid density
  - Sensitive to gas fraction
- Combined Measurement
  - Fractions of oil, gas and water
  - Whole pipe measurement





# Product Range

- Multiple Sensor Systems built around the composite platform.
- Integrated as data sources to meet the field requirement.



Sure-Cut<sup>®</sup> Lo  
Low Water Cut



Sure-Cut<sup>®</sup> Hi  
High Water Cut



Multiphase

\*All Zone 1 rated (US, Can, ATEX) – Pressure classes to #2500, API 10,000 psi currently being certified.

# Sure-Cut® Measurement Range

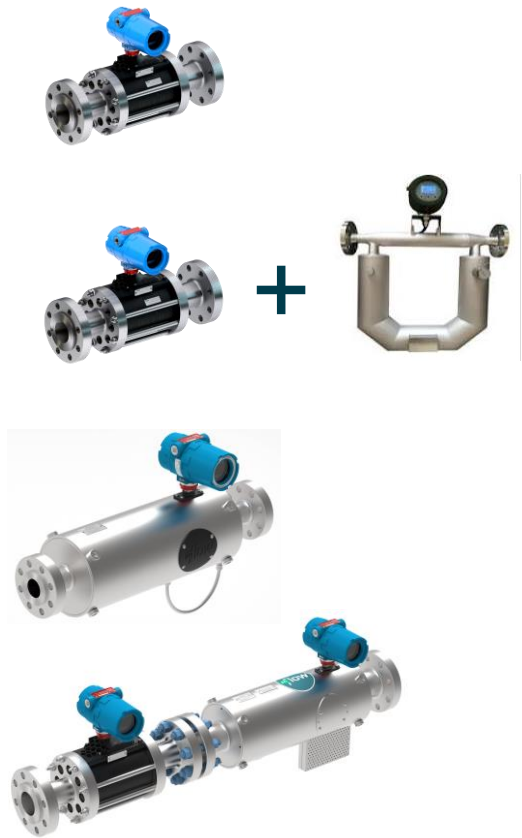


Sure-Cut Lo: Custody transfer & process

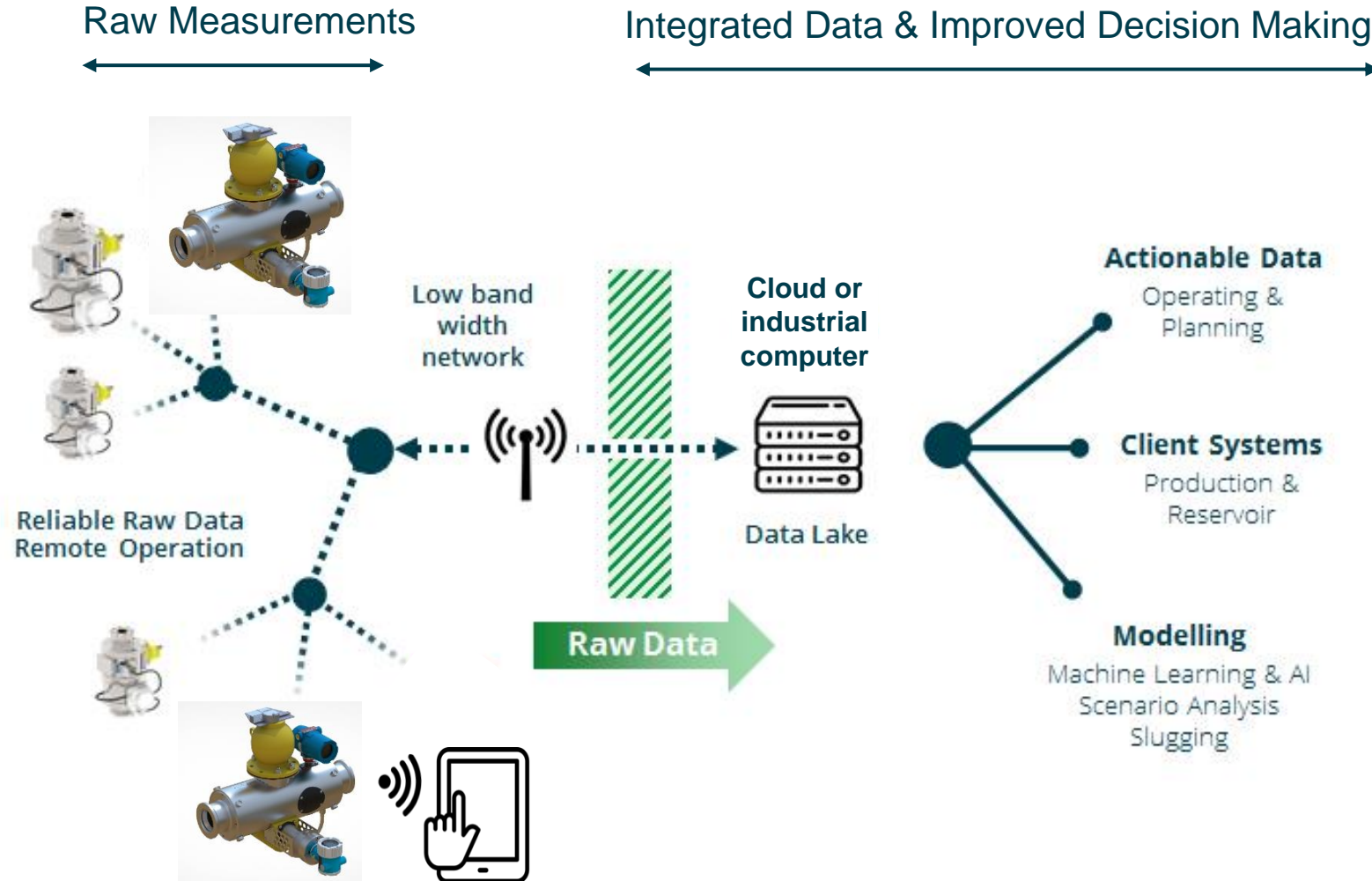
Sure-Cut Lo Extended Range for intermittent slugs

Sure-Cut Hi – Long Term Hi Water Cut

Sure-Cut Full

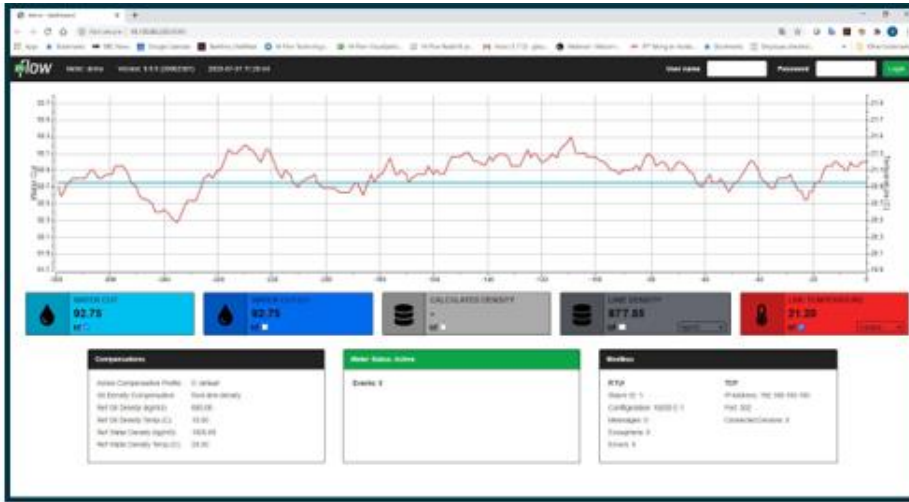


# IoT & Big Data Multiphase Solutions

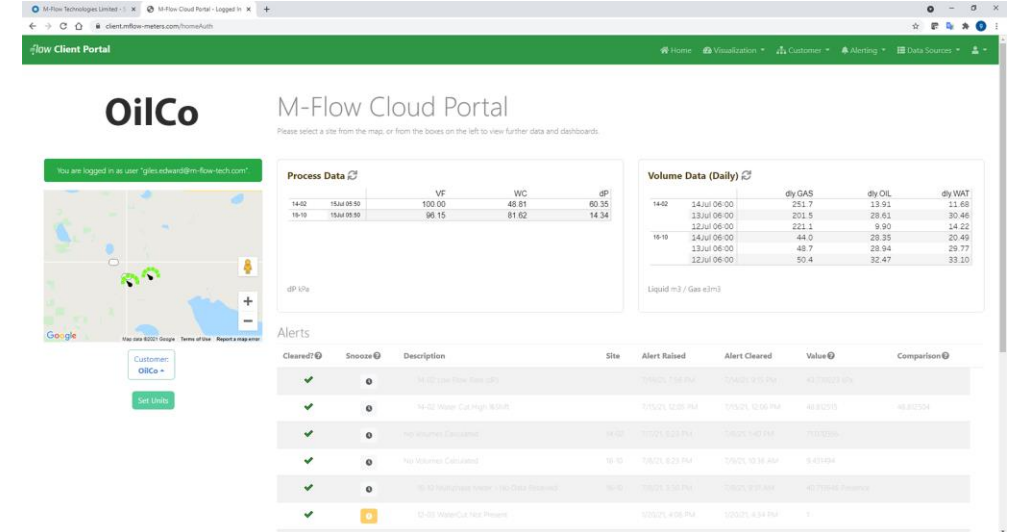


- M-Flow differs from traditional suppliers who seek to present Multiphase meters as an integrated single package
- M-Flows approach:
  - Integrates raw data from across an oil field.
  - Does sophisticated data processing in the back office or cloud.
  - Gets processed data to engineer's desks to enable action.
    - Including instantaneous data at site.
  - Manages data for multiple future uses.
  - Facilitates system learning.

# Client Set-Up, Data & Support



- Local GUI:
  - Wi-Fi or wired Ethernet
  - Set-up and diagnostic
  - Live data & data download
  - M-Flow devices are managed by local/client engineers with minimal training.
  - M-Flow support is back office, based on diagnostic files sent by client.



- Remote web-based portal:
  - Available anywhere 24/7
  - Cyber secure authenticated login with data permission control
  - Customised to client
  - Live and historical data.
  - Where used, M-Flow support is via remote link.



# Flexible Field Installation Configurations



# Custody Transfer Water Cut Metering Field Case Study

- Meter installed on refinery inlet
- Daily offloads of oil types 17-37 API across 1 year
  - Using auto density compensation
  - Offload flow weighted water cut range 0 to 3%
  - Offloads include water slugs to 30% water cut.
- M-Flow meter compared to API 8.2 in-line sampler (ILS):
- Zero failures or maintenance requirement



	Sure-Cut
Uncertainty vs ILS	+/- 0.14%
Average reading difference vs ILS	+0.04%
Largest Discrepancy vs ILS	+0.18%

# Track Record - Sure-Cut®

PO date / installation	Qty	Client	Location	Product Type
May 2014	1	Black Swan Energy	Canada	Sure-Cut Lo
September 2015	1	Chevron	US	Sure-Cut Lo
September 2017	1	UKOG	UK	Sure-Cut Lo
January 2018	1	Pembina Pipeline	Canada	Sure-Cut Lo
July 2018	1	Tallgrass Energy	USA	Sure-Cut Lo
February 2019	1	EPI	Guatemala	Sure-Cut Hi
September 2019	3	Plains Midstream	Canada	Sure-Cut Lo
November 2019	1	Husky Energy	Canada	Sure-Cut Hi
January 2020	1	Tervita	Canada	Sure-Cut Lo
March 2020	2	Irving Oil	Canada	Sure-Cut Lo
April 2020	1	Oryx Midstream	USA	Sure-Cut Lo
March 2021	1	Teine Energy	Canada	Sure-Cut Hi
March 2021	2	Total	UK	Sure-Cut Lo & Hi
April 2021	1	Perenco	UK	Sure-Cut Lo
May 2021	15	TechnipFMC	USA	Sure-Cut Lo
November 2021	2	TAQA (Harding)	UK	Sure-Cut Lo
February 2022	1	JAG Energy	USA	Sure-Cut Lo
August 2022	1	Bonterra	Canada	Sure-Cut Lo
August 2022	1	Al Mansoori	Oman	Sure-Cut Lo
October 2022	1	CNRL	Canada	Sure-Cut Lo
October 2022	1	Aerion	USA	Sure-Cut Lo
November 2022	1	Harbour Energy	UK	Sure-Cut Lo
December 2022	3	Surge Energy	Canada	Sure-Cut Lo

PO date / installation	Qty	Client	Location	Product Type
January 2023	1	TAQA (Brae)	UK	Sure-Cut Lo
April 2023	2	Tamarack Valley	Canada	Sure-Cut Lo
May 2023	2	CNRL	Canada	Sure-Cut Lo
May 2023	1	Canary Biofuels	Canada	Sure-Cut Lo
May 2023	1	Al Mansoori	UAE	Sure-Cut Lo
May 2023	1	Oxy	USA	Sure-Cut Lo
July 2023	1	TAQA (Harding)	UK	Sure-Cut Lo
July 2023	2	NuVista	Canada	Sure-Cut Lo
August 2023	1	TankLogix	Canada	Sure-Cut Hi
August 2023	1	Perenco	UK	Sure-Cut Hi
August 2023	1	Perenco	UK	Sure-Cut Lo
October 2023	1	CNRL	Canada	Sure-Cut Lo







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Accurate multiphase and water cut measurement for the digital oilfield