KAM® ML MEASUREMENT LOOP
CREATING A CONSISTENT ENVIRONMENT FOR MEASUREMENT
Accurate oil/water measurement is a function of velocity. In production, insufficient or inconsistent velocity leads to inaccurate oil/water measurement.
In addition, factors such as viscosity, inconsistent droplet ratio, temperature and more can make it difficult or impossible to achieve a homogenous mixture for accurate measurement.

**NO HOMOGENEITY = NO ACCURACY**
The unique design of the KAM ML Measurement Loop creates a consistent measurement environment with a consistent velocity above 7 fps.

- consistent velocity
- consistent droplet size ratio
- consistent homogeneity
- consistent accuracy

Regardless of viscosity, velocity, and temperature
A stratified, low-velocity flow is impossible to measure accurately. Bringing it to API measurement standards can be difficult and expensive.
The KAM ML Measurement Loop creates a consistent velocity, and homogeneity fully compliant with API Chapter 8.2
The ML includes a pump which creates consistent velocity and circulates the flow from the Suction Nozzle, through a KAM OWD Oil Water Detector, and out of an Injector.
The unique design of the injector creates a turbulent flow with homogeneity and a consistent water/oil droplet size ratio.
THE KAM ML MEASUREMENT LOOP

Flow Pattern at Injector Discharge

Suction Nozzle

Injection Nozzle

SALES@KAM.COM

WWW.KAM.COM

+1 713 784-0000
VERTICAL INSTALLATION

Even in a vertical installation velocity and droplet size inconsistencies can lead to inaccurate measurement.
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SOME DETAILS

• Loop size: 1.5”
• Main pipeline: 2” and up
• Suction nozzle: 1.5”
• Injector: 1.5”
ABOUT THE KAM OWD OIL WATER DETECTOR

• Patented 3-antenna design
• Automatically shifts between oil continuous and water continuous phases
• True 0-100% range
• Automatically adjusts for temperature
• No salinity offset required
THE KAM ML MEASUREMENT LOOP

APPLICATIONS

• AWT Automated Well Test
• Separator
• Production management and automation
• Custody transfer
THE KAM ML MEASUREMENT LOOP

APPLICATIONS

In an Automated Well Test (AWT) application, the measurement loop can be placed on the outflow pipe of each well . . .
APPLICATIONS

. . . Or on a central line downstream of multiple wells.
APPLICATIONS

In a 2-phase separator application, the Measurement Loop can be placed on the liquid leg to monitor separator performance.
APPLICATIONS

In a 3-phase separator application, the Measurement Loop can be placed on the oil leg to monitor separator performance.
APPLICATIONS

Real-time oil/water data can be used to automate and optimize production management. Rather than rotating through shut-in and producing wells, operators can use data to optimize performance from high-producing wells. Data can be fed to a central computer and optimization can be based on a large number of criteria, including water content, flow rate, disposal capacity, transport capacity, energy prices, etc.
At no place is accurate oil/water measurement more important than custody transfer. Minor inaccuracies in measurement can result in major financial losses.

### ONE MILLION BARREL TRANSACTION

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An AWT installation in Colombia for PacificRubiales demonstrates the consistency and accuracy of the Measurement Loop versus sampling, in particular in high-water situations.
THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA
THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA

Measurement Loop vs. sampling

Well/Pozo 269 with OFFSET
(17-Mar-11)

Water Concentration/Concentracion de Agua (%)

9:36 10:48 12:00 13:12

Time/Hora

KAM OWD with 0.765 OFFSET
PRE Lab
ANTEK Lab
KAM OWD Reading 2 Min Average
THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA

4 hours of data from ML/OWD

Well/Pozo 269  17-Mar-11  (4 hr Test)
INSTALLATION DATA

Measurement Loop vs. sampling

Well/Pozo 344 (21-Mar-11)

Water Concentration/Concentración de Agua [%]

PRE Lab
ANTEK
KAM OWD Reading: 2 Min Average

Time/Hora

6:00 7:12 8:24 9:36 10:48
THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA

4 hours of data from ML/OWD

Well/Pozo 344  21-Mar-11  (4 hr Test)

% H2O Per Ml
THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA

KAM OWD Comparative Readings per Well / Lecturas Comparativas por Pozo del KAM OWD

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Water Concentration / Concentración de Agua [%]

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THE KAM ML MEASUREMENT LOOP

INSTALLATION DATA
THE KAM ML MEASUREMENT LOOP

KAM OWD Comparative Readings per Well /
Lecturas Comparativas por Pozo del KAM OWD

All Wells Historical Data /
Datos Historicos de Todos los Pozos

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The KAM ML Measurement Loop with a KAM OWD Oil Water Detector is the perfect mix for oil water measurement at the well head.

By creating the ideal environment for measurement, the loop allows instruments to perform perfectly every time.

The consistency and accuracy of performance allows operators to install AWT Automatic Well Test and automated production management systems with complete confidence.
CONCLUSION

Installed at the wellhead or on a separator, the KAM Measurement Loop with KAM OWD provides velocity at or better than API standards, creating highly accurate, consistent, real-time data, even in high-water applications.

Data can be used for production management, AWT, and automated production.