

# OneSubsea AquaWatcher™

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# AquaWatcher Capabilities



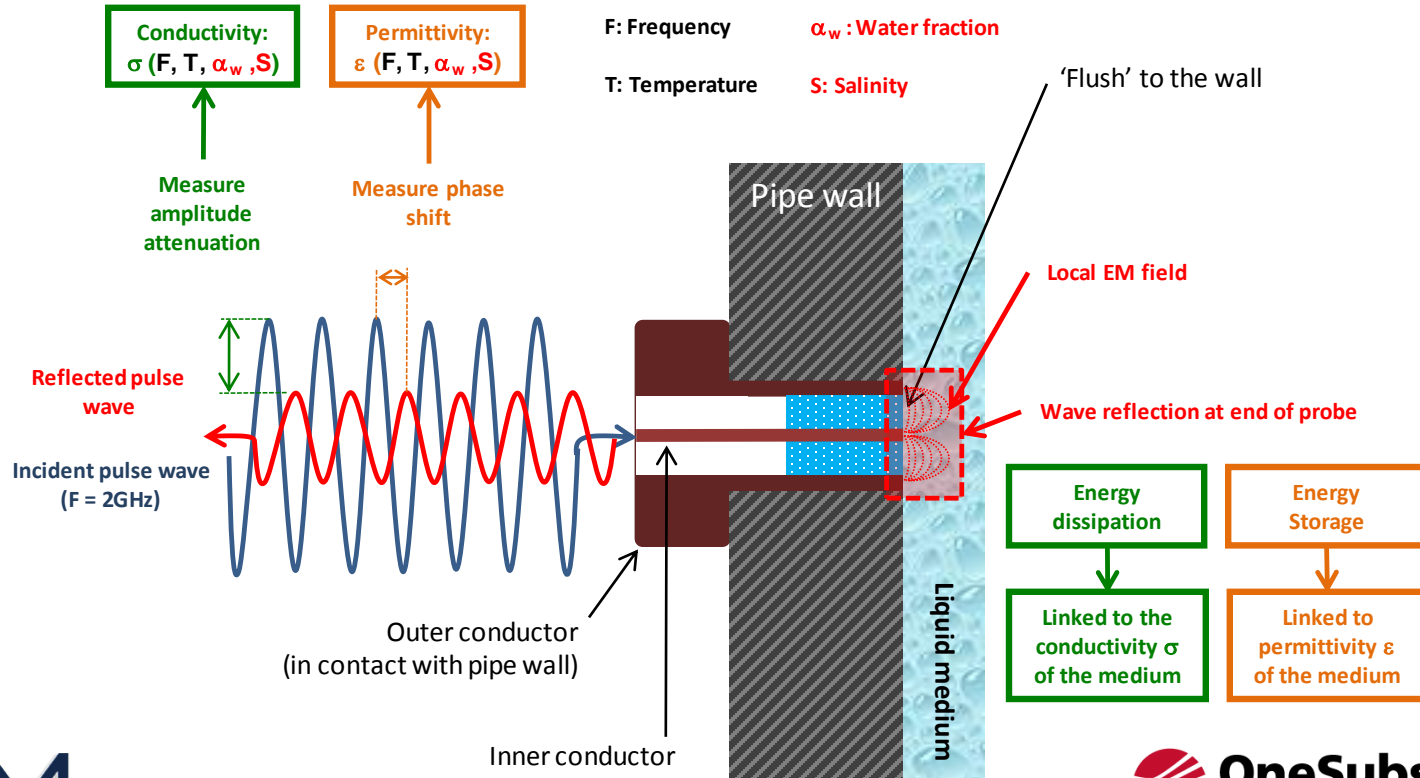
AquaWatcher Water Analysis Sensor Detect and characterize water in multiphase and wet gas flow.

AquaWatcher Water Analysis Sensor has the unique capability to **detect** minuscule quantities of water in **multiphase and wet gas flows**, and determine the **salinity** of that water. It can also determine the **ratio of injected chemicals to water**.

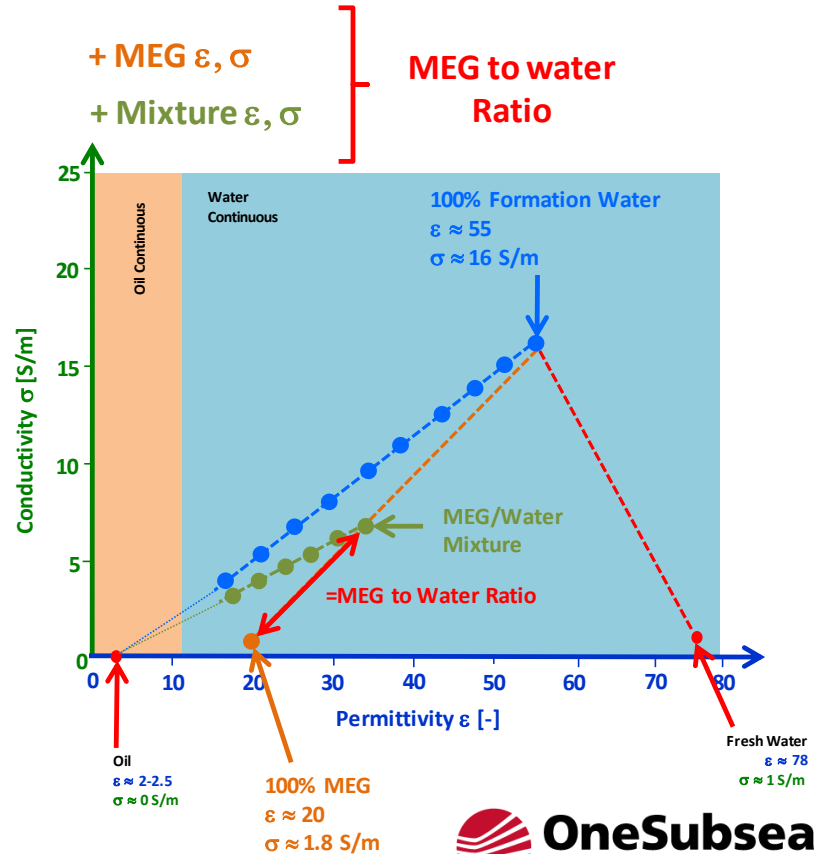
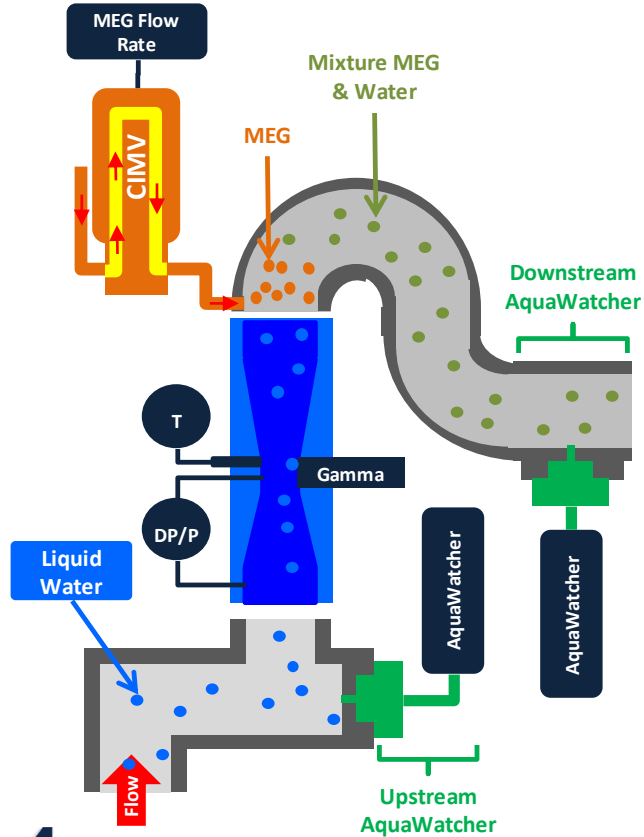
AquaWatcher can measure the **conductivity of produced water** at any gas volume fraction (GVF) and most water cuts, including in the transition zone from oil to water continuous mixtures.

- **Breakthrough of injected water** in water flood applications can be detected at very low concentrations, and crucial information about the origin of produced water can be provided.
- The precise water property measurements by the AquaWatcher can also be used to **improve the accuracy of multiphase meters**.
- AquaWatcher can also determine the **ratio of chemicals to water (MEG, DEG)** allows to monitor accurately the quality of the inhibition strategy.

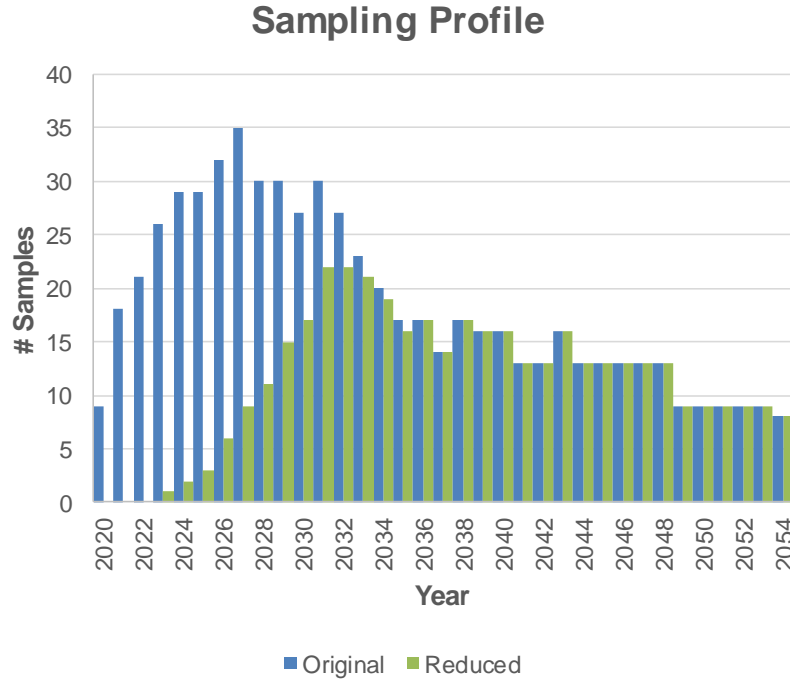
# Measurement Principle



# Formation Water Flow Rate

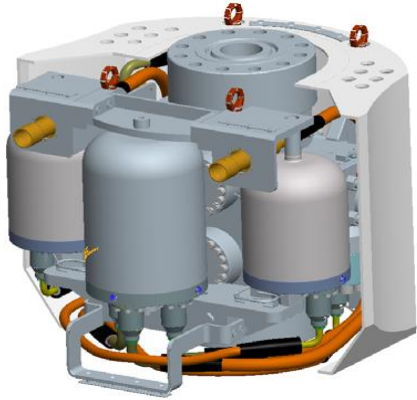


# Oilfield Water Detection



- Major reduction in early sampling for detection of water breakthrough
- Moderate reduction in midlife sampling as only those wells exhibiting water breakthrough require sampling
- Little to no reduction in late life sampling as most/all wells are exhibition breakthrough
- Estimates of accelerated production revenue from reduced sampling range from \$30MM to \$90MM depending on oil price, ROI, sampling frequency, sampling time.
  - \$50MM additional revenue from \$35/bbl, 8%, frequency shown above, and 63 hr sample duration
  - Estimates of change in production rate during sampling conducted using provided production data and appropriate assumptions

# Complete Water Measurement



Information @ WH		Measurements				Fluid Inputs			Accuracy (GVF > 90%)
		WGFM	Cond.	2nd Cond.	CIMV	Form. Wat. Salinity	CGR	Water Saturation	
Gas	Flow Rate	Direct Output							± 2.5%
Condensates	Flow Rate	Direct Output							± 5-10%
		Use CGR					Use P,T		± 5-10%
Vapor Water	Flow Rate	Use Water Saturation						Use P,T	± 5-10%
Condensed Water	Flow Rate	Use Water Saturation						Use P,T	± 5-10%
Formation Water	Flow Rate	Use Water Saturation	Use Water Salinity			Reference Point		Use P,T	± 5-10%
	Flow Rate	Use Water Saturation	Direct Output (MEG to Water Ratio)		Direct Output			Use P,T	± 5-10%
Water Origin	Salinity		Direct Output						± 7.5% ± 10g/kg
MEG Quality	Flow Rate				Direct Output				± 1.5-3%