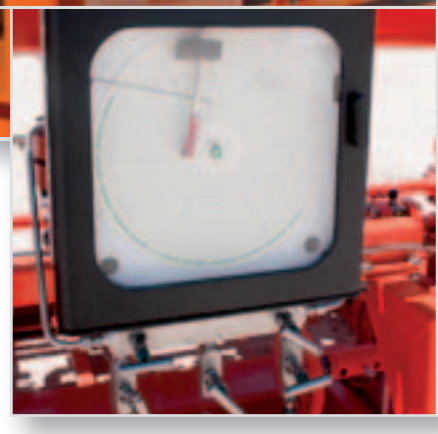
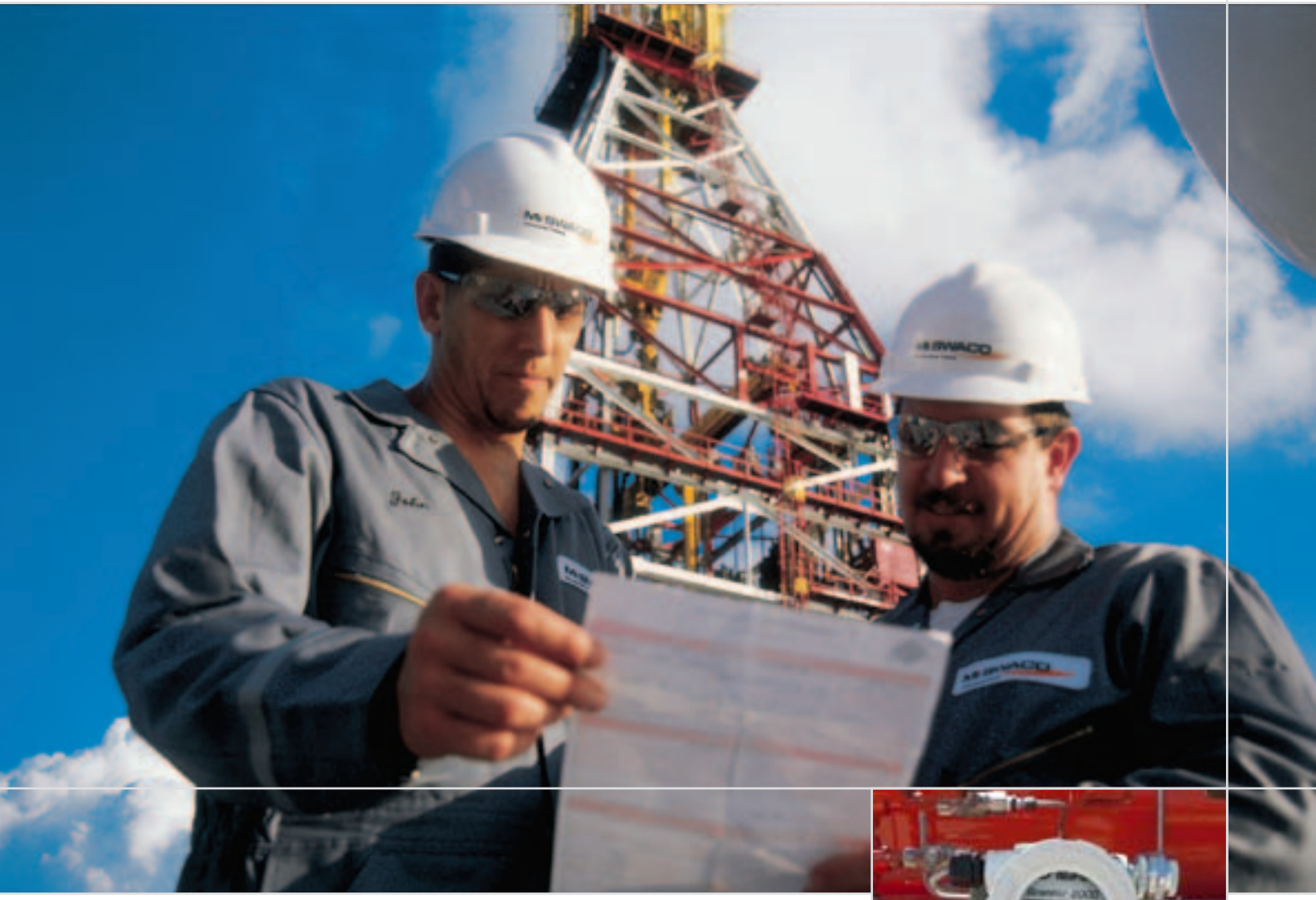
Mi SWACO
A Schlumberger Company



3-Phase Separator

The M-I SWACO 3-Phase Separator is a technically advanced instrumented vessel designed to efficiently separate well effluent into three phases



Features

- Available in multiple configurations, sizes, and pressure ratings to meet individual customer needs
- Skid mounted for easy transport
- Multiple safety valves to re-direct flow in the event of over-pressurization
- Designed to meet all applicable specifications for lethal service, including H_2S
- Replaceable inlet diverter tube to increase vessel life
- External float chambers allow operators to easily check float operation during use
- Bypass capabilities allow for maintenance, repairs and replacements without having to shut in the well
- Comingling capabilities of all fluid phases provides options on how to distribute output

Advantages

- Effectively separates free gas, oil, and water from well effluent
- Uninterrupted production for maintenance and repairs
- Designed with $^1/_8$-in. corrosion allowance for extended vessel life
- Safe for use in H_2S environments
- Long operational life
- Easily transportable
- Promotes cost-effective choices
- Environmentally acceptable
- Provides single-phase surface sampling and flow metering over a wide range of flow rates
- Low maintenance design

Accurate, safe separation and measurement of oil, gas and water from well effluent

APPLICATIONS
The 3-Phase Separator is used for production well testing and frac flowback operations.

PROBLEMS
Not knowing the exact composition and volumes of well effluent can hinder sound economic decisions.

SOLUTIONS
During well testing, the M-I SWACO 3-Phase Separator effectively separates well effluent into three phases: oil, water and gas, allowing for correct distribution decisions.

ECONOMICS
The durable and easy-to-maintain 3-Phase Separator provides accurate dissection and measurement of effluent characteristics to facilitate cost-effective choices. Bypass capabilities allow full production to continue during any repairs that may become necessary.

ENVIRONMENTAL
Should the vessel become over-pressurized, multiple safety valves direct flow to a safe and contained area, thus reducing risk to personnel and the environment.

The M-I SWACO 3-Phase Separator vessel was developed for land frac flowback and well test operations and helps operators understand the performance characteristics of a well efficiently and safely.

The separator consists of the vessel, an oil and water flow measuring system that utilizes turbine meters, and electronic gas flow measurement systems with several sampling points. To provide accurate measurements, the vessel is fitted with pneumatic regulators that maintain a constant pressure and a constant liquid level inside the vessel using control valves on the oil, water and gas outlets.

The separator is fitted with a removable and serviceable effluent diverter tube, a mist extractor, a vortex breaker and a weir plate. These components reduce the risk of liquids in the gas line (carry over) and gas in the liquid line (carry under), which affect the flow rate measurements. The separator can also accommodate small quantities of sand or solids, disposed of via the trash line.

The 3-Phase Separator is built in compliance with ASME VIII, Division 1 and NACE MR-0175 for H_2S environments. Its skid can also be designed to SEPCO OPSO55 and API RP2A standards.

Straightforward operation from beginning to end

During the production test, the produced well effluent, including all gas and liquids, flows into the inlet of the separator. The diverter tube redirects the flow providing interference that allows liquids to settle more readily within the separator.

Free gas in the separator flows through a mist extractor that removes any entrained liquids remaining in the gas. Gas continues to percolate out of liquids while sitting in the separator. The gas then flows out of the top of the vessel and through the gas outlet, where it is measured and put in the sales line if the volume is commercially sufficient, or flared. A metal protector plate blocks any splashing liquid from entering and rising through the gas outlet.

Liquids continue to settle, with the oil separating from the water and rising out of solution. A weir plate allows the oil to pour into the oil chamber while keeping the water in its chamber. The level control valves on both the oil and water outlets allow the operator to control and measure the quantity of fluids removed, to be processed accordingly. Both the water and oil goes through meters to be measured and processed accordingly.

An integral component of the M-I SWACO Production Testing Services, the 3-Phase Separator is available for rental or for sale to third-party customers.

To learn more about the benefits of using our 3-Phase Separator technology, contact your nearest M-I SWACO representative.

3-Phase Separator

General Specifications			
Equipment type	-	Gas Well Testing 3-Phase Separator	
Available Sizes	-	30" diameter x 120" seam to seam 42" diameter x 180" seam to seam	
Maximum Allowable Working Pressure (MAWP)	-	1440 psig on 42" vessel, 2000 psig on 30" vessel	
Maximum Design Temperature	-	200° F (93° C) on 30", 125° F (52° C) on 42"	
Minimum Design Temperature	-	-20° F (-29° C) on 30", -10° F (-23° C) on 42"	
Material of Construction	-	Shell	SA-516-70
	-	Elliptical Heads	SA-516-70
	-	Nozzles	SA-105, SA-350-LF2
	-	Drag Skid (structural components)	A572 GR-50, A500 GR-B, SA516-70, A36
Applicable Standards	-	ASME Section VIII, Division 1 NACE MR0175 ANSI B31.3 Class M (H_2S) API 12J Class I Division I (UL, Exp) Lethal Service (H_2S) Certificates of Conformance	

Mechanical Specifications						
External Connections						
	Inlet	Gas Outlet	Oil Outlet	Water Outlet	Trash	All connections are 1502 unions
30"	3" female	3" male	2" male	2" male	2" male	
42"	3" female	3" male	2" male	2" male	None	

Level and Flow Monitoring		
	30"	42"
Meter Run(s)	4"	6" & 4"
Sight Glasses	Oil and Water	Oil and Water

Vessel misc. (unless otherwise specified, all vessel connections are ANSI 900 raised face flanges)		
	30"	42"
Clean Outs	1 – 4"	2 – 6"
Inspection	1 – 6"	1 – 8"
Washout – Inlet Head	1 – 6" Huber-Yale	1 – 6" Huber-Yale
Washout – Outlet Head	1 – 6" Huber-Yale	None
Manway	None	1 – 18"
Pressure Safety Valve (PSV)	2 – 3"	2 – 3"
Liquid Level Controls	2 sets of 2" (external floats)	2 sets of 2" (external floats)

Success story

Texas: 3-Phase Separator shines in HPHT sour gas application

The situation

A major operator in the Haynesville Shale required a reliable hostile service equipment package for a high-pressure, high-temperature (HPHT) production test of a gas well in an H_2S environment.

The solution

After analyzing the customer's requirements, M-I SWACO recommended a service delivery plan comprising a 15K psi working pressure equipment package that included its field-proven 3-Phase Separator. The 42-in. 1440 psi NACE 3-Phase Separator was suggested as part of a package. Critical to this operation was the capacity of the separator to deliver longer retention times for better separation and the incorporation of multiple pressure relief valves to protect personnel and the environment against vessel over-pressurization and exposure to H_2S gas. In addition, the recommended 3-Phase Separator would include Electronic Flow Measurement for improved accuracy and real-time data acquisition to meet the client's specific needs

The results

Use of the M-I SWACO 3-Phase Separator as part of the high-pressure, high-volume, H_2S environment package allowed M-I SWACO to successfully deliver and execute a solution that met the client's technical objectives. The design of the high performance 3-Phase Separator increased the separation efficiency of well effluents with no non-productive time (NPT) related to the separator. The overall equipment package allowed the customer to process the well, producing greater than 20 MMcf/day of gas, with water rates exceeding 7,000 bbl/day.

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