

ENVIROUNIT

APPLICATIONS

Offshore rigs with large volumes of cuttings and fluids that must be processed in order to recycle the fluids for reuse. Input streams include:

- Oil-, synthetic- or diesel-base drilling fluids contaminated with water or brine
- Water or brine contaminated with oil-, synthetic- or diesel-base drilling fluids
- Invert-base sediments from rig tank-cleaning operations

PROBLEMS

Zero-discharge regulations and other environmental restrictions are forcing operators to either treat their on-board drilling waste streams or have the materials hauled to shore for treatment. In the case of deep and ultra-deepwater wells, the cost of haul-off can be prohibitive.

SOLUTIONS

The ENVIROUNIT* module from M-I SWACO is a scaled-down version of our ENVIROCENTER facilities. The chemical and mechanical processes are identical to the onshore facilities, but the capacity is tailored to offshore operations.

ECONOMICS

Operators can significantly reduce their haul-off charges and reclaim valuable drilling, reservoir drill-in and completion fluids. The economics are especially attractive where there are large volumes of expensive fluids and/or the distance to a shore base is a major factor.

ENVIRONMENTAL

The ENVIROUNIT processes provide an environmentally proven solution for operators working in highly regulated areas where zero discharge and waste minimization are high priorities. The ENVIROCENTER approach can document a remarkable average of 90% waste reduction and recycling of all reusable components.



With the petroleum industry moving toward zero discharge from offshore installations, there is a growing need for rig-based, purpose-built, modular units that can treat and recycle fluid resources that are currently sent onshore for waste disposal. This is particularly important for deep and ultra-deepwater wells far from shore disposal facilities and that rely on enormous volumes of drilling, reservoir drill-in and completion fluids.

M-I SWACO can now deliver to the rig the mechanical and chemical processes used in its ENVIROCENTER facilities through its ENVIROUNIT module, a portable ENVIROCENTER facility for offshore applications where the chemical and mechanical processes are identical to the onshore facility. The only difference is that the capacity is tailored to typical offshore operations.

Proven technology scaled for the rig

The ENVIROCENTER concept employed in the ENVIROUNIT module became a success when new processes and chemicals made reclamation of

water- or brine-contaminated oil-base drilling fluids possible, similar to completion-fluids reclamation.

The drilling-fluid-treatment process has a remarkable average of 90% reduction of the total waste volume and an average recovery of 36% of the total volume as high-quality drilling fluid. The 90% recovered includes reclaimed water, brine, drilling fluid and base oil that otherwise would be sent off for disposal. Depending on fluid type and value, level of contamination, cost of disposal and environmental regulations, the recovered drilling and completion fluids can be used anywhere in the world.

What can the ENVIROUNIT processes treat?

Oil-, synthetic- or diesel-base drilling fluids contaminated with water or brine. The original oil- or synthetic-base drilling fluids will normally have a liquid phase with an Oil-to-Water Ratio (OWR) or Synthetic-to-Water Ratio (SWR) of 80:20. Drilling fluids typically become contaminated with excess water during low-efficiency wellbore

displacements to water or brine, or from a water-line valve left open and leaking into pits, etc., both of which take the drilling fluids far out of specification. After contamination, fluids usually consist of 50 to 90% water and 10 to 50% drilling fluids.

Water or brine contaminated with oil-, synthetic- or diesel-base drilling fluids. Water or brine will become contaminated with drilling fluids during wellbore displacements when water or brine is used to displace the fluid. Contamination also occurs during deck and/or pit washing where large quantities of water are used. The water in the tanks will appear to have an oil film at its surface and small amounts of sediment on the bottom. This oil film is typically in the range of 1 to 10%, that is, more than 40 ppm of Total Petroleum Hydrocarbon (TPH).

Oil-base drilling fluids sediment from tank-cleaning operations. During cleanout of drilling fluids tanks (mud pits) on the drilling rig/platform, the main constituent will be sediments and wash water. Depending on whether this is a manual-cleaning (low volumes) or automatic-cleaning (high volumes) process, the amounts of wash water may vary and therefore the percentage of sediments in the water will vary accordingly. The recovered

sediments typically contain 70% weighting material and some small fraction of drill solids, with the heaviest particles settling faster. Usually, barite has a Specific Gravity (SG) of 4.2, and typical drill solids from clay formations have a 2.6 SG.

The basic ENVIROUNIT processes for drilling and reservoir drill-in fluids

- **Breaking the emulsion.** With M-I SWACO proprietary, water-soluble emulsion breakers, the whole drilling fluid will separate as whole fluid and settle to the bottom of the processing tank. The water will break out at the top of the tank along with the emulsion-breaking chemicals and will be pumped off for further treatment.
- **Reclaiming the drilling fluid.** The drilling fluid remaining in the tank normally has an OWR of 70:30 but can have a ratio as high as 80:20, similar to the original fluid. This significant fluids-recovery process saves our customers substantial disposal fees and lowers the total cost of their drilling programs.
- **Processing the separated water.** As many as three separate steps can be involved in processing water separated from the drilling fluids.

Features and Benefits

- The ENVIROUNIT module helps operators reach their overall goal of waste minimization, fluid reuse, increased profit and improved margins
- ENVIROUNIT modules utilize the proven, successful approach and methods employed at M-I SWACO ENVIROCENTER facilities
- The drilling-fluid-treatment process has a remarkable average of 90% reduction of the total waste volume and an average recovery of 36% of the total volume as high-quality drilling fluid
- The ENVIROUNIT reclamation process offers operators significant improvements in drilling fluid costs and environmental expenditures
- The use of ENVIROUNIT filtration and remediation services offshore can deliver significant performance and cost benefits while simultaneously meeting environmental regulations
- New processes and chemicals have made reclamation of water- or brine-contaminated oil-base drilling fluids possible, similar to completion-fluids reclamation

- **Flocculation.** Flocculation chemicals remove the remaining particles and oil trapped in the water phase. The water is pumped off for filtration, and the flocculated particles can be sent to a filter press for further treatment.
- **Filtration.** The water passes through a filter unit equipped with oil-absorbing filters. Prior to discharging or reusing the water, it must be sampled and analyzed according to local environmental regulations and, if required, sends it to a third-party laboratory for independent analysis.
- **Filter-pressing the flocculants (optional).** If further processing of the settled flocculants is deemed cost-effective, their volume can be reduced with the use of a filter press, and the dry filter cake disposed of.

Success stories

North Sea:

ENVIROUNIT GIVES OFFSHORE OPERATOR MAJOR REDUCTIONS IN ONSHORE DISPOSAL OF SLOP WATER

In the Norwegian North Sea, slop water containing more than 40 mg/L of hydrocarbons cannot be discharged overboard, and hauling this waste to shore is expensive. This operator was running an oil-base system but did not want the expense of hauling the slop water to shore. M-I SWACO installed an ENVIROUNIT onboard this well to clean as much of the water as possible to an acceptable level for discharge and recover the OBM.

While previous wells generated an average of 79,252 gal (300 m³) of slops that had to be hauled ashore for disposal, this well turned in some impressive reductions:

- Volume of slop water processed 75,817 gal (287 m³)
- Volume of slop water sent to shore for disposal 15,850 gal (60 m³)
- Volume of water discharged 62,345 gal (236 m³)
- Volume of OBM recovered for reuse 5,283 gal (20 m³)
- Volume of waste returned to shore for disposal 3,038 gal (11.5 m³)