FILTRATION OF HEAVY BRINES WITH A VERTICAL PRESSURE LEAF FILTER UNIT.

SUMMARY OF MAJOR POINTS

Set up separate circulating system with storage/frac tanks (500 Bbl.), circulating measuring tank, and filtration unit.
Use a min. 600 sq. ft. D.E. filter with duplexl 50 element filter unit downstream. Avoid polymer sweeps if possible. During drilling fluid displacement, reverse circulate at maximum rate.

HEAVY BRINE FLUID CHARACTERISTICS

Heavy brines, calcium and zinc bromides have dramatic effects on filtration techniques. These effects vary significantly with the increases in fluid density: First, pump pressure increases as the specific gravity of the brine increases. Second, viscosities are 10 to 40 times the viscosity of water, sea water or low density brines. Third, filtration rate is described by Darcy's Law for fluid flow through porous media. To achieve a flow rate (3 to 5 BPM) sufficient to properly displace mud from the hole, it is necessary to either increase the filtration area or engine/pump speed and pressure. To minimize pressure increases, and thus hose failure and equipment leaks, filter area, manifold and hose size must be maximized. Calcium and Zinc brines are corrosive and should be inhibited before and during use to protect equipment and tubing.

CONTAMINANTS

Iron (Fe2+, Fe3+) is a major contaminant and constantly precipitates. Sand, scale, mud contaminates and perforation debris is suspended longer in heavy brine than in low density brine. Therefore, there is less settling in the tanks and more solids are trapped in the filter unit which shortens cycle time. Maintenance of heavy fluid density is critical, therefore, use of lightweight spacers should be minimized. Polymers adversely affect filtration rates and should therefore not be allowed in the system or, when present, should be diverted before reaching the filter unit.

RIG OPERATION PROCEDURES

Effective sweep in fluid displacement is best accomplished by reverse circulation when lightweight fluid displaces heavy weight fluid. Reverse circulating rates should be maximized. Take into account casing, liner, tubulars and bit restrictions and surface equipment. Displacement should be with displacement pumps (cement unit), not rig pumps. 4a. Separate, clean frac tanks should be used in the circulating system. 4b. Rig tanks, flow lines, troughs, etc. should be hand washed, to remove mud, polymer, scale, loose paint, etc. Circulation for displacement, once begun, should proceed without stopping at the maximum acceptable rate. To avoid interruption, the storage capacity on rig or boat to receive mud and spacers should be 1-1/2 times well hole volume. Pipe movement is preferred, but is not always possible when circulation is reversed. Spacer volumes should be sufficient to cover 1500 to 2000 ft. of annular space at its widest diameter.

FILTER RECOMMENDATION

The filter area should be as large as possible, thereby, optimizing the flow rate to filter area. The precoat volume held in the reserve tank should be equal to the filter capacity. Clean fluid should be kept in reserve at all times to insure a proper precoat. All heel fluid remaining in the filter unit should be saved before washing out. The Twin Filter vertical pressure leaf filter units insure 100% heel fluid recovery. When precoating filter, Cellulose fiber (Pre co floc) should be used in conjunction with D.E. material. Four parts medium coarse D.E. material (Celite 535 or Decalite 4200) to one part Pre co floc is recommended. This practice with reduce filter element waste due to solids bypass. (Please refer to the Pre co floc Technical Brochure for a description of benefits.) Use a mechanical mixer in the precoat tank to properly disperse D.E. material into the heavy brine. Twin Filter filter re-circulates blender for proper mix. Expect considerably higher pressures during precoat and filtering cycles than those experienced with low density or sea water brines.

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HEAVY BRINES WITH VPL

DOWNSTREAM GUARD OR POLISH ELEMENT FILTERS FOR HEAVY BRINE- 2MICRON, BETA 5000 ELEMENTS

The downstream guard filter unit should have the maximum filter area available to reduce the inherent back pressure. Utilize a unit with 50 element, 40" x 70mm OD pleated glassfibre, approximately 70 m^2 filter area. Be aware also that polypropylene elements may deteriorate in bromide brine. Polymer prematurely blinds pleated absolute elements due to the gelatin nature. If the heavy brine is contaminated with polymer, prepare to swap out the fluid and treat the contaminated fluid at the land based storage terminal. If mud contaminants pass through the main unit and plug the guard filters prematurely, open the cartridge filter unit bypass and make one circulation, or as needed, until fluid clears of mud. Make one additional circulation using a new set of filter elements. If salt precipitates on the filter elements, periodically wash elements down with fresh water.

ON-SITE CONSIDERATIONS

Filtration should be from the active return pit to the active suction pit. Do not pump directly to the filter unit from the circulation or displacement pump. Crews consisting of at least two experienced operators should man the filtration unit at all times. An easy to reach emergency shut down switch and an operable master valve should be employed to reduce losses if a hose should burst or disconnect.

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