

## Customer Application Brief Filtration of Completion and Workover Fluids

### Introduction

Weighted brines are commonly used to prepare oil and gas producing wells for completion and the initiation of production. These brines are often referred to as completion fluids. The proper type and concentration of brine is required in order to prevent blowouts and ensure well safety by balancing the formation pressure. If the system is under-balanced, when the formation pressure is greater than the well bore, oil and gas will enter the “hole” endangering the rig and crew. As a result, most work is performed in a slightly over-balanced situation, where the fluid pressure in the hole is slightly greater than the formation pressure. When over-balanced, large volumes of expensive brine may be lost to the formation. Since these fluids will come in contact with the formation, perforation and gravel pack, it is important that they be free of suspended solids so that they do not damage or reduce the permeability of these production zones.

Workover fluids are similar to completion fluids except that they are used when an already completed well requires maintenance in order to increase its productivity. A well bore may be “swabbed” and reperforated through the workover fluid as part of this operation. As with completion fluids, it is important that they be free of suspended solids that can reduce the permeability of the production zone formations.

This Application Brief will discuss the benefits of using cartridge filtration to reduce the level of total suspended solids in completion and workover fluids, resulting in reduced formation plugging and increased production.

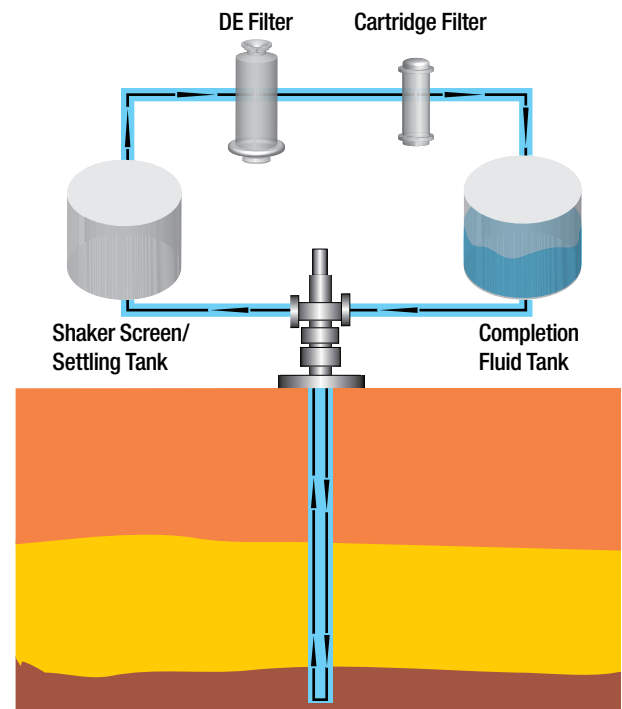
### The Processes

On completion of the drilling operation of a new well, after insertion of the casing but before casing perforation, the completion fluid displaces the mud from the well bore. The brine displaces the mud particles and carries the drilling mud to the surface where the brine is separated from the mud (Figure 1). The brine is circulated through the well and the filter until an acceptable level of cleanliness is achieved. The operator then perforates the well casing and the adjacent rock to gain access to the oil producing formations. Well workovers are completed in a similar fashion. During the life of an oil producing formation, particles can restrict the flow of oil to the casing perforation. A workover fluid is injected to displace the particles and restore the oil flow. The workover fluid is filtered and re-circulated until an acceptable level of fluid cleanliness is achieved.

### The Problem

Although many completion and workover fluids are relatively “clean” before they enter the well bore, once they are circulated in a closed loop system, they quickly become contaminated with drill cuttings, drilling mud, cement, formation fines, etc. These contaminants, if injected into the formation, will quickly damage the well’s permeability and reduce the well’s production capability.

Figure 1. – Typical Completion Fluid Operation



Since formations containing oil and gas often have low permeability, they are susceptible to plugging with small particles. Appropriate filtration will reduce the chances of particles directly plugging the formation pores and reduce the incidence of particles causing damage by bridging formation pores. Particles can cause problems in the following areas:

- Formation-particles will invade the formation blinding off flow channels in the producing zone resulting in lost oil/gas production
- Perforation-particles will plug the perforation resulting in reduced production and increase the need for additional workovers.
- Gravel Pack-used for sand control, can become plugged with particles resulting in reduced production and increased need for workover.

## The Solution

It is critical to minimize the level of total suspended solids in the completion/workover fluid before it enters the wellbore to minimize formation damage from particulates. 3M Purification's 2 micron Micro-Klean™ RT series filter (Figure 2) downstream of the appropriate pretreatment equipment, usually diatomaceous earth (DE) filters, provides reliable and cost effective well protection.

Micro-Klean RT series filters are manufactured using 3M Purification's rigid extrusion bonded technology to achieve a rigid, coreless structure that resists unloading at higher differential pressures. An optimized groove pattern effectively doubles the filtering surface area, resulting in longer filter life and fewer change-outs. The unique thermally bonded fiber structure offers superior flow characteristics, resulting in flows up to ten times that of competitive filters for a given differential pressure. The result is a robust product that provides consistent filtration performance throughout the filter's long life.

**Figure 2. – Micro-Klean™ RT Series Filter Cartridges**



## Features & Benefits

### **Rigid depth filter construction**

- Reduces unloading at high differential pressure
- Efficient reduction of deformable materials
- Consistent superior particle reduction throughout filter life and at high flow rates (flux)

### **Enhanced contaminant holding capacity**

- Fewer filter change-outs
- Long filter life

### **Grooved cartridge with extended surface area**

- Promotes fuller utilization of the depth matrix
- Long filter life

### **All polypropylene construction**

- Compatibility in a wide range of applications and operating conditions
- No adhesives, binders, surfactants, lubricants

### **Coreless filter structure**

- Ease of disposal via incineration or shredding

## Conclusion

The productivity and profitability of a well depend on maintaining the permeability of the oil producing formations. If the formations are restricted, less oil will be produced. During well completion, appropriate filtration of the completion fluids is necessary to maintain an open formation and maximize the volume of oil produced. During well workovers, the workover fluid must also be clean. Proper selection of the filter provides the greatest level of particle reduction to protect the oil-bearing formation from restriction when perforated. 3M Purification's Micro-Klean RT series filters efficiently reduce particles to protect the formation, while providing dirt holding capacity that allows cost effective operations.

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