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Written By Engineers For Engineers

## What You Need to Know About Testing Your Hydraulic System for Particle Contamination

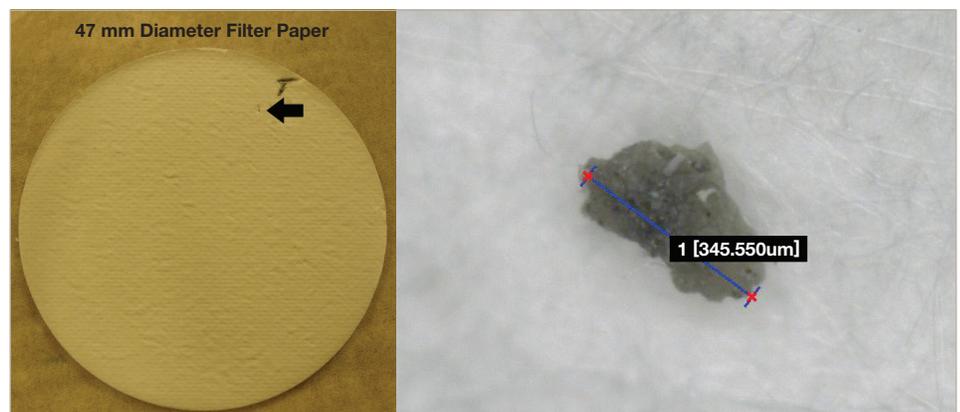
A \$1 hydraulic fitting can ruin a \$10,000 valve. Microscopic metal flakes that fall off tube fittings during installation can travel through the hydraulic system and shred a servo valve depending on the flake size. That's a costly \$1 fitting. It's no wonder OEMs are placing increased emphasis on system cleanliness to optimize system efficiency and extend machine life.

Cleanliness is a game of microns. Most OEMs consider any particle in their system measuring more than 500 microns (1/2 mm) unacceptable because microscopic particles of this size have been known to contaminate hydraulic systems and ruin expensive machinery. Industry professionals are adopting cleanliness testing programs designed to monitor and control contamination to help prevent this from happening.

### Which cleanliness measure is right for your hydraulic system's health?

The two most common methods of cleanliness testing are ISO 4406 and ISO 4405.

In a nutshell, ISO 4406 is the preferred testing method when the overall cleanliness of the hydraulic fluid is critical to the health of your entire system, while ISO 4405 is the best



Normal view of 300-micron particle (left) and view of 300-micron particle at 200x magnification (right).

method to use when maximum particle size is the system's greatest failure threat.

Your hydraulic fitting manufacturer can complete these tests. The results will help determine what measures you need to ensure optimum system fluid cleanliness.

### ISO 4406

When running this test, we use fluid to flush the fitting, then put the flushed fluid into a bottle for laser inspection. This allows us to analyze laser reflections to determine how many particles over a predetermined micron size are contained within the fluid. The result is a grade based on how

many of these particles are present. You have probably seen these grades listed on product prints as sets of two or three numbers such as 18/15 or 21/18/15. Each number corresponds to a projected amount of particles over a certain length.

Minimizing the amount of harmful particles is important in a system that is running at the high end of a pressure threshold where heat is its greatest enemy. Proper fluid viscosity cannot be maintained when hydraulic oil gets too dirty, and machine components must work harder and run hotter to complete the job. This reduces the lifespan of a machine.

## ISO 4405

This testing requires the identification of both mass per area and the longest particle found in the system. ISO 4405 explains the method and apparatus needed to obtain these values.

Particle size is critical. Having one million particles under four micron might not matter for some hydraulic systems because the particles are small enough to pass through the system. On the other hand, you could have very clean fluid with just one giant particle (1 mm or greater). That one big particle can ruin a piece of machinery, like your \$10,000 servo valve. When particle size is important, you need ISO 4405 for testing.

### Additional contamination protection

Industry professionals are also adopting contamination prevention techniques. One such prevention method is the use of screen fittings. Screen fittings protect critical components and precision orifices by trapping metal flakes and particles that enter the system during installation. While not intended to replace normal filtration equipment, screen fittings are a “last-chance” protection method in numerous hydraulic and pneumatic applications.

Have you experienced any applications using alternative contamination prevention methods? If so, leave your thoughts in the comments. If you have any additional questions or comments, please post them and I’ll respond if warranted. If you want to talk to me directly, I can be reached at Parker Tube Fittings Division, **614.279.7070**.

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