



## SELECTING THE CORRECT HYDRAULIC FILTER

The purpose of this document is to provide the service technician a fundamental understanding of filter ratings. With this knowledge a service technician or parts ordering personnel will be able to understand the importance of choosing a quality filter. When it's time for replacing the hydraulic filter on Whiteman STX/HTX trowel a technician has many options. However, the ultimate choice of the filter selected should be based on its Beta Ratio or its efficiency, not the filters "nominal" rating and cost.

Different tests on various types of fluid power systems has proven that effective filtering of oil to remove particles from the fluid results in extended life of the hydraulic components. Bear in mind that the overall cost of a quality filter and filtration system is not expensive. For expensive hydraulic system components the cost of a quality filter is returned in component life and reliability.

MQ Whiteman STX/HTX hydraulic trowels utilize a single suction filter located between the fluid reservoir and the charge pump. As this serves as the systems only fluid filter; this makes replacement of the filter with the correct rating and filter media very important.

### FILTER RATINGS

Filter ratings are used to define the ability of a filter to remove particles from the upstream fluid supply. A micron rating of a filter is a general method to indicate the ability of the filter's media to remove contaminants by particle size. The micron rating does not properly describe filters efficiency or the contaminant holding capacity.

Micron is another term for micrometer, or 1 millionth of a meter. A micrometer, in the metric system, is a unit of linear measurement used to measure distance from one point to another. Some comparative sizes for reference are as follows:

- Diameter of average human hair – 70 microns
- Lower limit of visibility to the naked eye – 40 microns
- Talcum powder – 10 microns
- Red blood cells – 8 microns
- Bacteria – 2 microns
- Tobacco smoke – 0.5 microns

A filter that is marked "10 micron" will has some capability to capture particles as small as 10 micrometers. However, when a filter is marked "10 micron" you do not know exactly what this means. It is necessary to know the test methods and standards used to determine this rating.



**NOMIAL FILTRATION RATING** – This is an arbitrary micrometer value indicated by the filter manufacturer. The nominal rating usually mean the filter’s media can capture a given percentage of the particles stated. This percentage is normally 50% but is solely determined by the manufacturer. In other words, the filter is capable of capturing a particle size of its “nominal rating” for only half the time.

**ABSOLUTE FILTRATION RATING** – The diameter of the largest hard spherical particle that will pass through a filter under specified test conditions. It is an indication of the largest opening in the filter element. An absolute rating is determined by a single or multi-pass test and is obtained by passing a test fluid containing particles of a known size through a flat sheet of filter media. This rating can also be expressed in the form of a percentage of the particle size captured.

**NOMIAL AND ABSOLUTE MICRON RATING** - is a generalized approach to determine the ability of a filter media to remove contaminants by the particle size it’s exposed to. These two micron ratings do not describe the filters efficiency or the contaminant holding capacity.

In the past, there had not been one universally accepted test method to correctly and consistently determine these filter ratings. Depending on test methods and various manufacturers the same filter media could be labeled with different nominal or absolute micron ratings. It’s for these reasons that a filter should not be judged or chosen by its nominal or absolute filter ratings. Fortunately, there now is a universally accepted testing method to provide accurate and comparable results, this is known as the filters Beta ratio.

**MULTI-PASS OR BETA RATIO TESTING** – The ISO 16889 standard of multi-pass testing has been established to determine the Beta ratio. Multi-pass testing uses a specified contaminant of known sizes, added regularly in known quantities to the test fluid which is pumped continuously through the filter. Measured samples of fluid are taken at timed intervals from the upstream and downstream sides of the filter. The contaminants in the samples are measured for particle size and quantities of each size or range of sizes. From these upstream and downstream measurements, a Beta ratio is calculated by dividing the number of particles of a particular size in the upstream flow by the number of particles of the same size in the downstream flow.

### THIS CAN BE FORMULATED:

$$bx = \text{number of particles upstream} / \text{Number of particles downstream}$$

Example:  $b_5 = 1000/100$  or  $b_5 = 10$

In this example, it was determined that 1000 particles sized 5-micron or above were passed through a filter media from the upstream side and 100 particles sized 5-micron or above were received on the downstream of the filter media. Using the formula, it’s seen that the Beta ratio is  $b_5 = 10$ .



## ADVANTAGES OF FIBERGLASS FILTER MEDIA

Made with smooth, rounded fibers of consistent shape allows control of fiber size and even distribution pattern throughout the media

- Consistent fiber shape allows for the maximum amount of contaminant-catching surface area and pore size control.
- Low resistance to fluid flow reduces pressure drop.
- Media with predictable filtration efficiencies of specified contaminants.

Now that we have an understanding of how filters are rated we can look closer at the filter chosen for the Whiteman hydraulic drive trowels. The suction filter used on Whiteman model STX/HTX trowels in both production and as service parts recommended is a Zinga filter element number ZSE-10, or **MQ PART# 21107**.

## ZINGA ZSE-10 FILTER SPECIFICATION

The Beta ratio for this filter is  $B4/10/12=2/20/75$

- Particles of 4-microns are captured at 50% efficiency (Nominal Rating).
- Particles of 10-microns are captured at 95% efficiency.
- Particles of 12-microns are captured at 98.7% efficiency (Absolute Rating)
- Uses a “Z-Glass” media, or a Zinga synthetic filtering media.
- Maximum Operating Pressure: 200 PSI
- Operating Temperature: -65 to +250 degrees F.
- For use with Petroleum based fluids only

Before replacing the Zinga ZSE-10 element ensure that any replacement filter meets these Beta ratios and uses a synthetic fiberglass media.

It is MULTIQUIP'S recommendation that whenever replacing the hydraulic filter on the Whiteman STX/HTX trowels that it's replaced with the OEM filter, Zinga ZSE-10, or **MQ PART# 21107**.