TORO®

Commercial Products

Hydraulic Filters

OEM Vs. Will-Fit

PART NO. 99051SL

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Use of This Manual

The information contained in this manual is supplementary to material found in other sources, it is not a replacement for them. You should always consult Service Manuals, Service Bulletins, Operator's Manuals and Parts Books when necessary.

Service Manual Updates and Service Bulletins can be found on the internet at:
www.toro.com/golf/custsvc.html

This Manual and the training program, which it supports, are both designed to help you gain knowledge of the product, and to inform you of when and why to make the necessary repairs. We have also included tips for performing those repairs.

This program is designed for you. Your input and participation is appreciated.

There is plenty of space in this manual for you to add your own notes and observations

Hydraulic Filters

OEM vs. Will Fit

There are a lot of filter suppliers currently manufacturing and selling filters for turf mowing equipment. Through this program we will try to explain the differences between "will-fit" filters and genuine OEM filters.

Contamination Causes Most Hydraulic System Failures

- Over 75% of all Hydraulic System failures are a direct result of contamination.
- Increased repair cost resulting from:
  - Loss of Production (down time)
  - Component Replacement Costs
  - More Frequent Fluid Replacement (And Disposal)

First lets look at hydraulic system failures. It is believed that over 75% of all hydraulic system failures are caused by contamination.

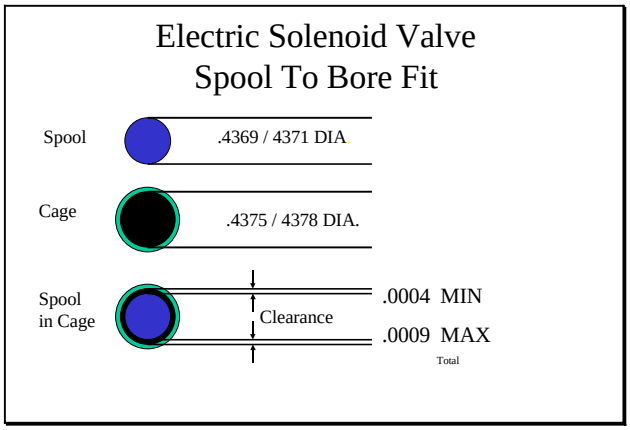
These failures cost your business money through lost production, the unit is down.
There is cost associated with replacing the failed component.
And if the oil is contaminated to the point that it needs to be replaced early, that to will add additional operating costs.
All of these costs can be avoided by properly maintaining the equipment and keeping the hydraulic oil clean.

How Contamination Damages Hydraulic Systems

- Contamination interferes with the four main functions of the Hydraulic Fluid.
  - To Act as an Energy Transmission Medium.
  - To Lubricate Moving Parts.
  - To Act as a Heat Transfer.
  - To Seal Small Clearances.

Contamination in the oil can inhibit the four main function of the oil.
The oil is what actually transmits the energy (work) through the system.
The oil also has to lubricate the system.
The heat in a hydraulic system is carried away and dissipated by the oil. And the oil will seal up the small clearances in the hydraulic system.

Contamination, be it water or dirt and metal, will limit the oils ability to perform these functions.



To give an example of some of the clearances in a hydraulic system, If we look at the spool section of an electric solenoid valve we can see that we will have a clearance of .0004 to .0009. These tight clearances will not accept contamination from the oil with out experiencing a problem. It is therefore important that the oil remains clean.

Particulate Contamination

Relative Sizes of Particles

Sizes of Familiar Objects

Substance	Micron	Inch
Grain of Table Salt	100	.0039
Human Hair	70	.0027
Lower Limit of Visibility	40	.00158
White Blood Cells	25	.001
Talcum Powder	10	.00039
Red Blood Cells	8	.0003
Bacteria (Average)	2	.000078

This is a comparison chart of come common particles and their micron size.

We can see that talcum powder is larger then we will let through our normal hydraulic filter

Spool scored by contamination

Here we see a solenoid valve spool that has been scored by contamination.

The marks on this spool can not be felt but they are deep enough to cause problems with this valve

Toro Hydraulic Filters

- Filter Mounting Base
  - Rigid Cast Base
- Filter Element Seal
  - Positive Rubber seal
  - Captive in the Filter Element
- Bypass Valve
  - None for Hydraulic Filter
  - Needs Complete Filtration
- Filter Element
  - Steel Ends
  - Glued on Ends
  - Proper Micron Rating
- Spring (coil)
  - Resists heat related Deformation

A typical quality hydraulic filter will have a rigid cast base.

The filter seal will be a rubber seal, which is captive in the end of the filter.

Most Toro hydraulic filters will not have a bypass. The bypass will allow unfiltered oil to flow past the filter and back into the reservoir.

The filter element will have steel ends and it will be fully glued on the ends.

The paper will also be the proper micron rating.

And the spring will usually be a coil spring. This type of spring resists heat deformation

"Will Fitter" Hydraulic Filters

- Filter Mounting Base
  - Stamped Steel
  - Can Flex
- Filter Element Seal
  - Rubber seal
  - Non-Captive
  - Not a positive seal
- Bypass Valve
  - Some have Bypass valves
  - Allows unfiltered oil to bypass
- Filter Element
  - Glued on Ends
  - Uneven Gluing
  - Proper Micron Rating ?
- Spring (Wafer)
  - Susceptible to heat related Deformation

Some cheaper filters may have a stamped steel base. This type of base can flex and leak.

The filter element seal may be a non-captive seal. Under higher pressure situations this type of seal may leak.

The filter may have a bypass valve. This may be because this filter is used in several applications, some that require a bypass valve.

The filter element may or may not be glued on the ends. The gluing may be uneven.

The micron rating of the filter element may not be correct.

The filter may even be equipped with a wafer type spring. This type spring can change tension greatly under different temperatures

Micron Rating vs Beta Rating

- Rating of the Particle Size Stopped by the Filter
  - Nominal rating
    - Removes Approx. 80 % of particles larger than rating.
  - Absolute
    - Removes all particles larger then rating.
  - Based on media hole size. Can vary widely
  - Not Based on Actual Filter Performance
- Based on actual filter Efficiency.
- Rates the Filters Ability to Capture Various Size Particles.

There are two ways to rate filters.
Micron ratings and Beta ratings.

With Micron ratings there are two sub ratings.

A nominal rating captures approximately 80% of the particles larger then the rating.

A filter with an absolute rating removes all the particles larger then the rating.

Micron ratings are based on the hole size of the media. It is not based on the actual filter performance.

Beta Ratings are based ion the actual filter performance.

What Beta Numbers Mean

- First number
  - Filtration Ratio
- Second Number
  - Particle Size (Micron)
- Example of Beta Rating
  - 2/2 = 50% of 2 Micron particles
  - 20/3 = 95% of 3 Micron particles
  - 75/5 = 98.6% of 5 Micron particles

The Beta rating will consists of two numbers.

The first number is the filtration ratio.

The second number is the particle size, in microns.

An example of a typical Beta Rating is:

2/2, That equals 50% of the 2 micron particles
20/3 That equals 95% of the 3 micron particles
75/5 That equals 98.6% of the 5 micron particles

Filtration Ratio

Filtration Ratio / Efficiency Table

1.01	1.0%
1.1	9.0%
1.5	33.3%
2.0	50.0%
5.0	80.0%
10.0	90.0%
20.0	95.0%
75.0	98.6%
100	99.0%
1000	99.9%

This chart shows the filtration number and the percentage of particles stopped.

Filter Comparison

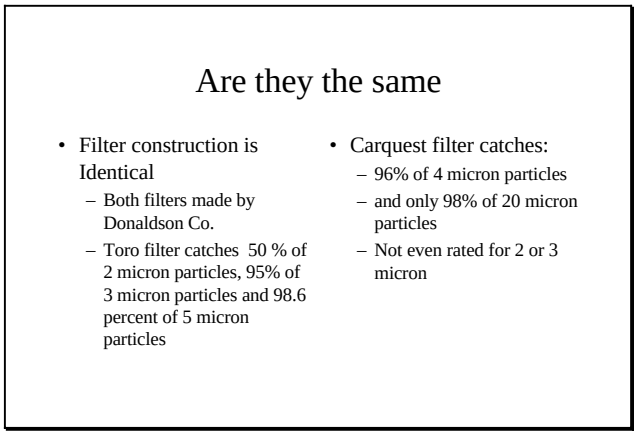
- Toro Filter
  - Beta Rating
  - 2/2
  - 20/3
  - 75/5

- Carquest Filter
  - Beta Rating
  - 25/4
  - 50/20

This slide shows the Beta rating for a Toro Hydraulic filter.

We can see that this filter captures 98.6 percent of the 5-micron particles.

The competitive filter is not even an absolute 20-micron filter.



These filters are not the same.

They may look the same and are manufactured by the same company. However, the beta ratings are not the same.

These are not the same filters. Even though the parts house substitution book says they are the same.

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