

HIGH-CAPACITY | PRECISION | RELIABILITY

Plasser American

Filter Technology as a Productivity Factor

The OEM Filter Technology for Optimum Hydraulic Performance



Importance of Filter Technology | Quality Criteria | Recommended Hydraulic Oils | Package Solutions

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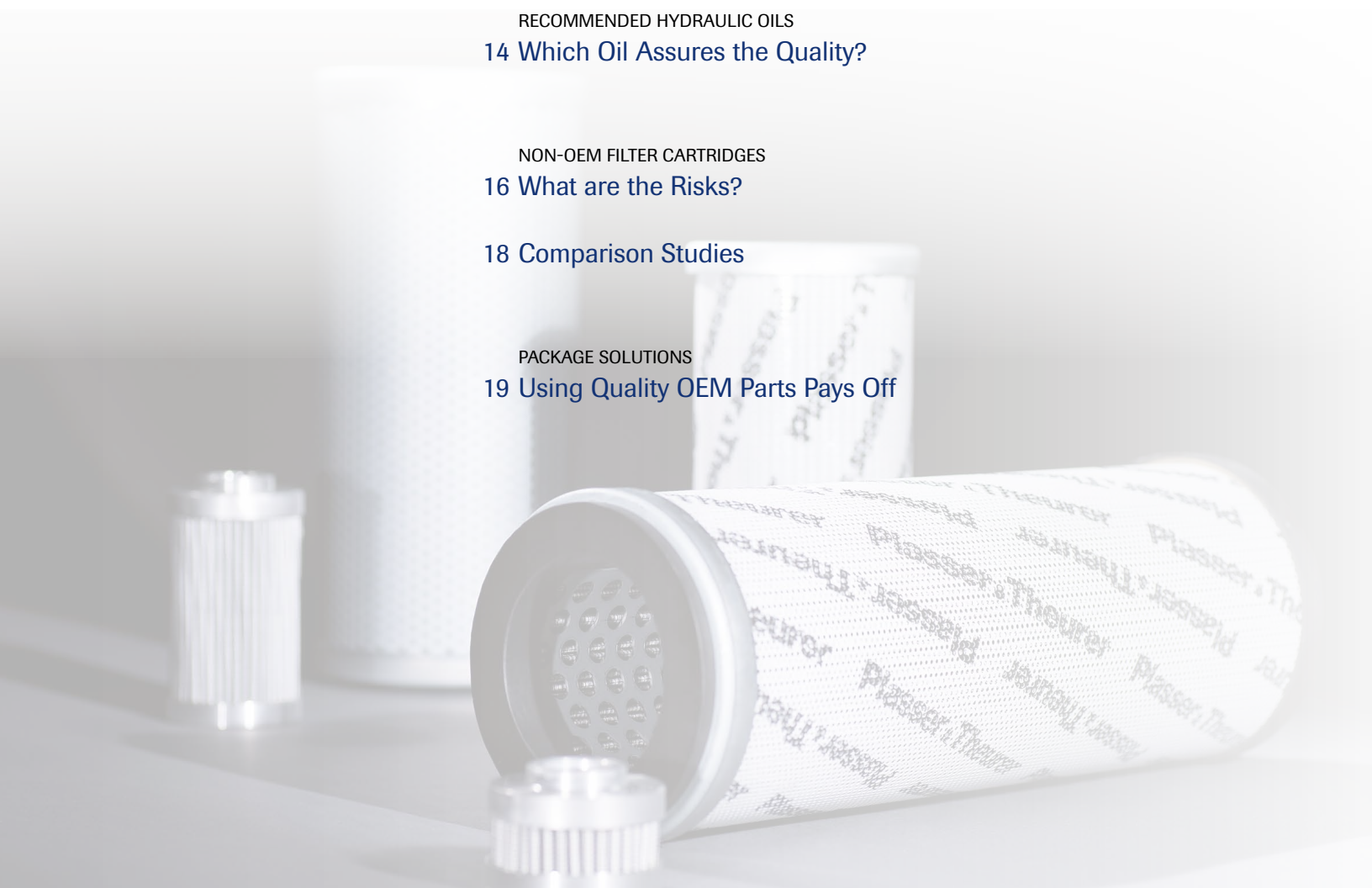
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Why Filtration?

Performance, safety and lifespan of a machine depend quite decisively on the good functioning of the filter technology. Filter cartridges play an important role here.

When considering the productivity of a track maintenance machine, the first thought is for the work units. However, these work units can only give full performance when the hydraulic system is functioning perfectly.

The smooth functioning of this system depends greatly on the filter technology used. Perfectly suited filters help to prevent unplanned standstills and avoid subsequent serious damage. They are essential for a long service life of the machine.

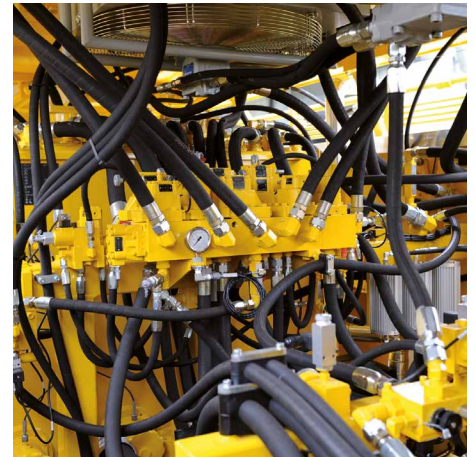
Unsuitable filters are a risk factor that is always underestimated.

The chief designer of hydraulic systems at Plasser & Theurer says:

“Perfectly functioning filter cartridges are essential for productivity and safety. That applies to machines of all sizes, from compact tamping machines to ballast regulating machines, right up to large ballast cleaning machines.”

top: The hydraulic system forms the backbone of our track maintenance machines.

bottom: The matching filter technology contributes decisively toward the smooth functioning.



Why use OEM Filter Cartridges?

OEM filter cartridges are reliable because they fulfill all requirements demanded by Plasser American machines in operation.

ALL ADVANTAGES OF THE OEM FILTER CARTRIDGES

Comparison studies and examples from practical operation show: if non-OEM filter cartridges are used, there is a risk of incalculable subsequent damage. OEM filter cartridges offer tested safety and make a major contribution toward maintaining the performance of the machines over the entire life cycle.

OEM filter cartridges guarantee:

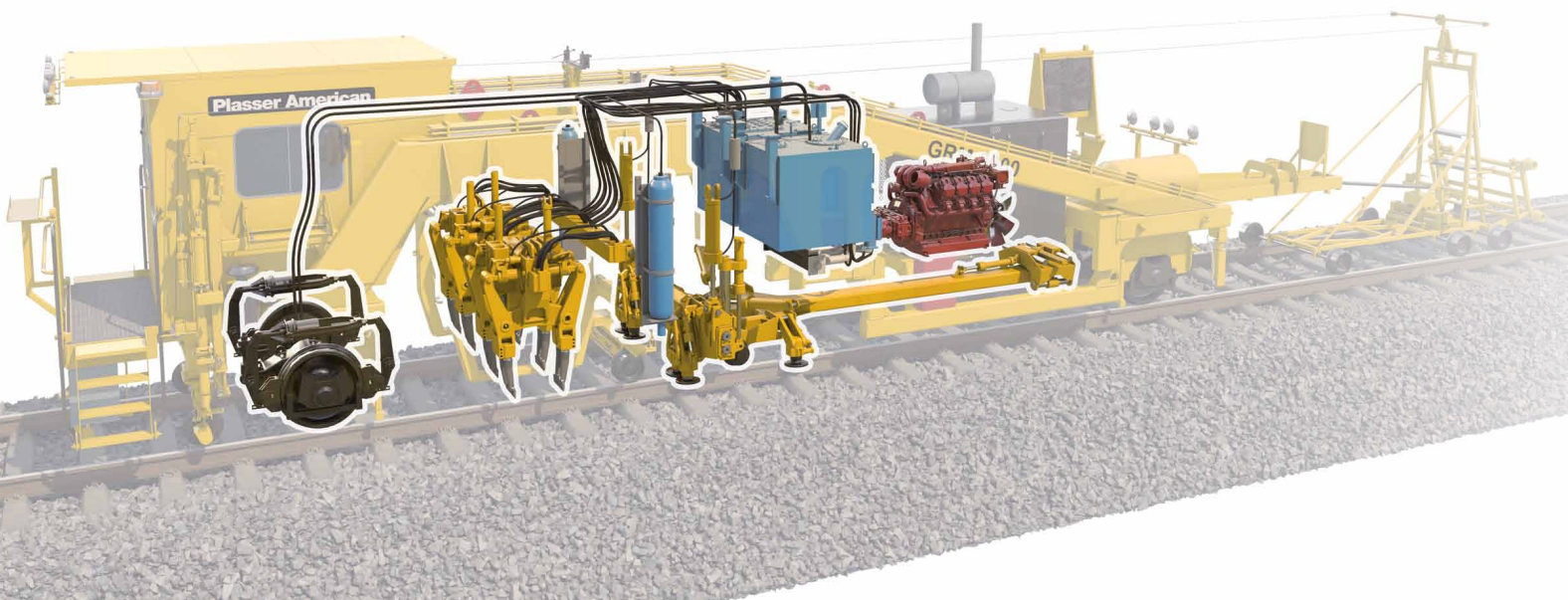
- reliable function
- precise dimensioning of the filter area and the filter efficiency
- optimum filter materials according to function and load
- professional packaging

At least 20 filters are installed in a compact tamping machine built by Plasser American. In each of these filters, the OEM filter cartridges perform the important work. They keep the hydraulic circuit clean and the water content to a minimum.

All technical parameters of these OEM filter cartridges – from the dimensions of the filter surfaces to the materials used – correspond exactly to our design-based performance specification. Even the smallest deviations can mean that the required filter performance is no longer assured.

Filter cartridges are wear parts, so this filter performance can only be guaranteed for a certain period of time. Afterward, the filter cartridges have to be replaced.

The hydraulic circuit of a compact tamping machine shows the importance of filter technology.



This is what is needed

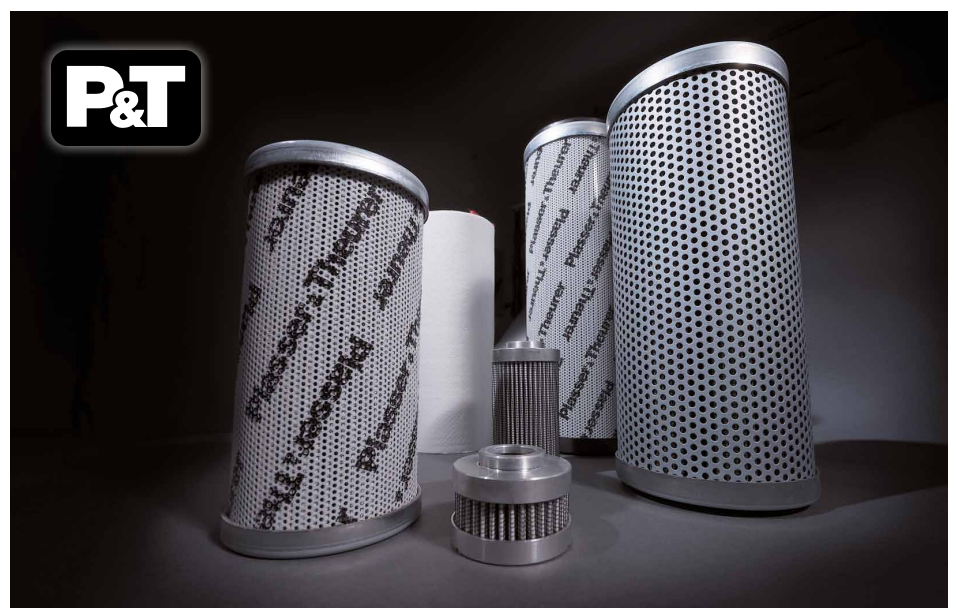
EVERY DETAIL OF THE OEM PART IS JUST RIGHT

Our OEM filter cartridges can vary from non-OEM filter cartridges in many respects. Most cannot be seen at first glance. Some require sound engineering knowledge to be recognized.

What is for sure is our OEM filter cartridges meet the high demands in terms of quality and precision.

DIFFERENCES IN QUALITY ARE POSSIBLE HERE

- filter materials (paper, fiberglass, fabric, etc.)
 - support materials (important for corrosion protection, flow rate assurance, safety against collapse, etc.)
 - composition of the filter layers
 - compatibility of the adhesives with original oils
 - dimensioning of the filter surfaces (filter performance optimum or too low)
- test certificates for materials and processing
 - packaging (sufficient dust protection)
 - part description (clear and lasting identification)
 - quality control



Our filter cartridges offer the security of the OEM part.

What is not Allowed in the Hydraulic System?

Dirt and water are the main disruptive factors for perfect operation of the hydraulic system. The consequences of insufficient filtering can lead to serious damage.

Hydraulic systems function perfectly when they are free of dirt particles and water. OEM filters and filter cartridges ensure exactly that.

How contamination occurs and what consequences this has can be seen here. Many types of contamination cannot be seen by the naked eye!

SOURCES OF CONTAMINATION

Production

- dust
- production residues
- anti-corrosive agents
- cleaning agent residues

Machine operation

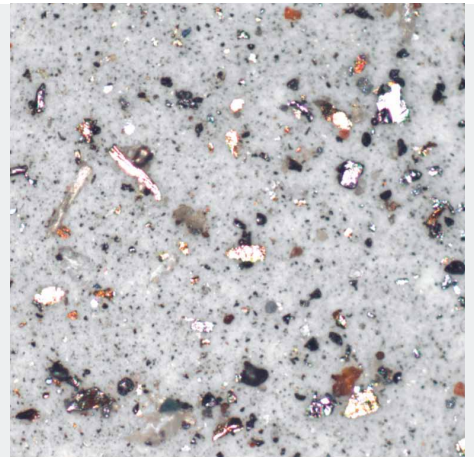
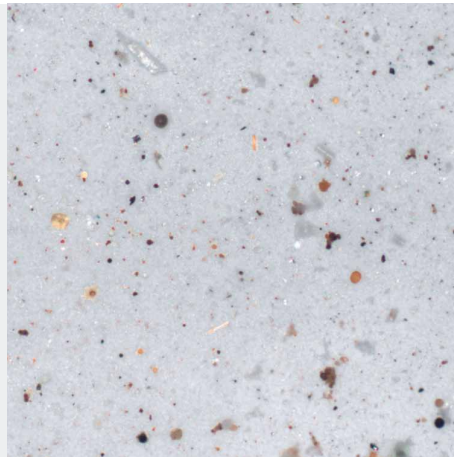
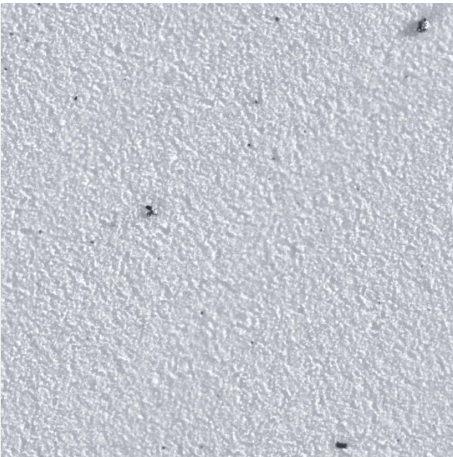
- dust in the working environment
- metallic wear

- seal abrasion
- chemical corrosion
- oil aging products
- oil-insoluble substances due to oil mixing

Surrounding air at

- piston rods
- labyrinth seals
- ventilation

Re-filled oil



Top from left to right:
Clean hydraulic oil,
Fine particles in the hydraulic oil,
Coarse particles in the hydraulic oil

Due to filtering, the hydraulic system is protected from dangerous contamination.

EFFECTS OF CONTAMINATION

Solid particles are the cause of

- wear of components
- failure of components
- limited availability

Fluid contamination (usually free or dissolved water) is the cause of

- corrosion, wear
- impedance of the viscosity
- chemical reaction with fluid
- influence on lubrication properties
- oil aging, oil oxidation

- poorer filterability
- diesel effect (cavitation), acceleration of oil aging due to formation of steam bubbles

Gaseous contamination (air) is the cause of

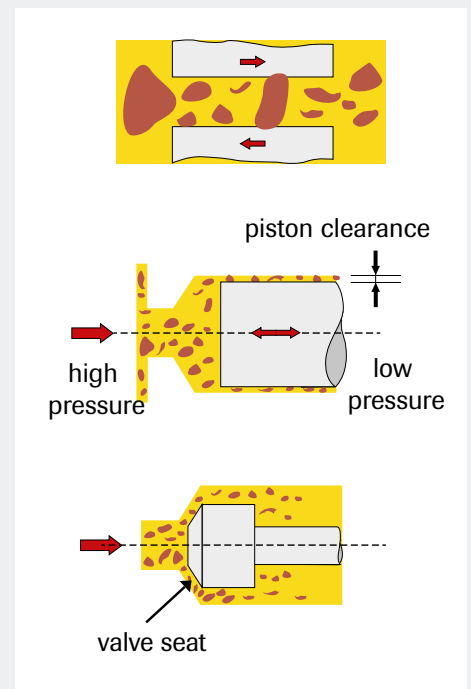
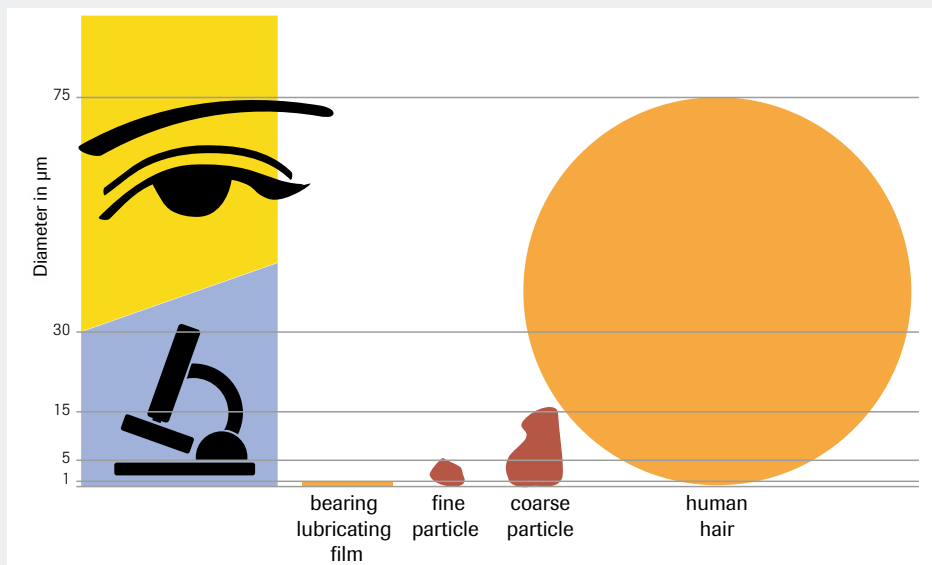
- inaccurate response behavior of valves
- energy losses
- pump damage
- foaming
- chemical reaction with fluid
- oxidation

OUR KNOWLEDGE FOR YOUR COST-EFFICIENT OPERATION

Our OEM filter cartridges provide safety and they are worth their cost. This is easy to understand as soon as you know the most important factors surrounding our filter technology.

That is the reason we offer you this brochure. To illustrate the technical background and then you can recognize for yourself why it pays off to use OEM filter cartridges.

Contamination particles increase the wear of components



Some types of contamination cannot be seen by the naked eye!

What Types of Filters are Required?

To remove all kinds of contamination effectively, Plasser American machines are equipped with numerous different filters.

A great number of special filters are installed in the hydraulic, diesel and air systems of machines made by Plasser American.

In combination, they ensure that any possible contamination is prevented and eliminated. On the following pages we will show you the different kinds of filter elements in the hydraulic system.

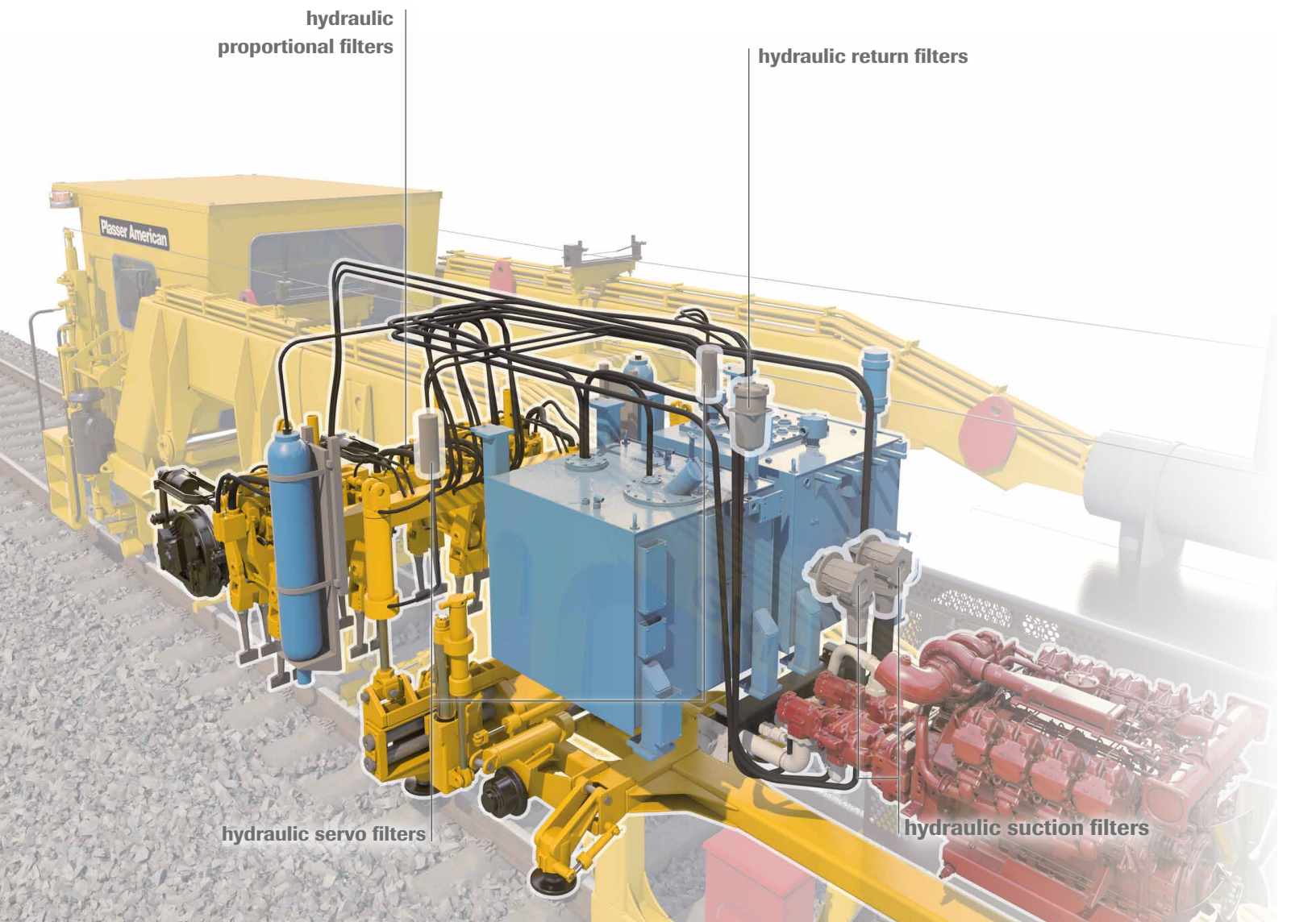
The different kinds of filters in the hydraulic circuit provide crucial support for the working function.

hydraulic proportional filters

hydraulic return filters

hydraulic servo filters

hydraulic suction filters



Typical filters in the hydraulic system

The left column shows our OEM filter cartridges. On the right, you can see a typical situation where the filter element is mounted in the machine.

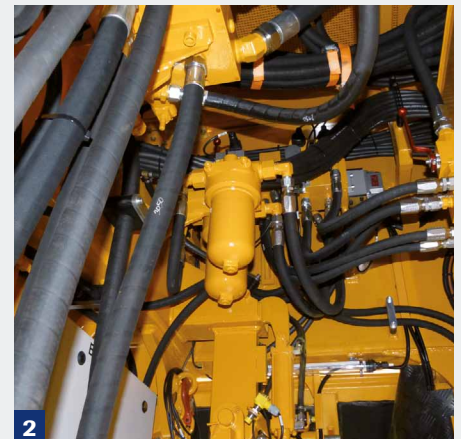
HYDRAULIC SUCTION FILTERS (1)

are mounted in the hydraulic tank and protect the pump.



HYDRAULIC SERVO FILTERS (2)

protect the servo valves with high precision.



HYDRAULIC PROPORTIONAL FILTERS (3)

are located in the vicinity of the tamping units and work very accurately.



Typical filters in the hydraulic system

HYDRAULIC RETURN FILTERS (4)

are extremely fine filters. They ensure that soiling from the work process does not enter the hydraulic tank.



HYDRAULIC ULTRA-FINE FILTERS (5)

remove water from the hydraulic oil. They are also called bypass filters and perform a function similar to filtration through the kidney in the human body.



**PUMP FILTERS
AT THE HYDRAULIC TANK (6)**

assure the cleanness of the oil being added.

You have the choice between a standard filter cartridge or an Aquasorb cartridge for reducing the water content in the hydraulic circuit.

**VENTILATION FILTERS
FOR THE HYDRAULIC TANK (7)**

During operation, track maintenance machines are in a very dusty environment. This aggressive dust should not enter the hydraulic circuit under any circumstances.

If oil is pumped from the hydraulic tank into the hydraulic system, air must flow into the

tank. If the oil flows back again, this air must escape again.

During the operation of cylinders, this happens abruptly. This is called the “breathing” of the tank. These ventilation filters ensure that during this “breathing” no contamination can enter the hydraulic system.



What Materials are Used?

The specific function of a filter also requires the right filter material. A number of criteria must be observed for this. Fineness is only one of them.

Safety due to the quality of the material used by Plasser American

FABRIC

- mainly for surface filters such as suction filters
- fineness: 25 µm to 2000 µm

PAPER

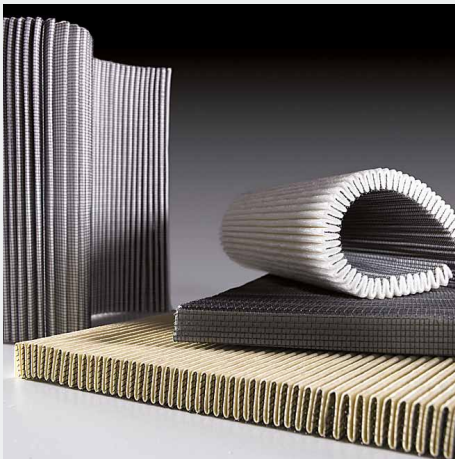
- mainly for depth filters for ventilation
- fineness: 5, 10, 25 µm nominal
- cannot be cleaned, disposable element

FIBREGLASS PAPER

- mainly for finest filters with high compressive load
- fineness: 1, 3, 6, 10, 20 µ absolute as per ISO 16889
- oil purity as per ISO 4406 to 12/8/2
- high absorption of dirt due to two-layer technology
- cannot be cleaned, disposable element

AQUASORB

- mainly for bypass filters
- water absorbent
- combined with fiberglass fleece
- cannot be cleaned, disposable element



The choice of the most suitable filter material and the correct processing determines the filter effect decisively.

THE IDEAL FILTER ELEMENT

Three main criteria determine the quality of a filter element: Fineness, dirt absorption and differential pressure. In ideal filter elements, these criteria are in an optimum ratio to each other.

Our OEM filter cartridges offer the highest filter effect with maximum dirt absorption and lowest differential pressure.

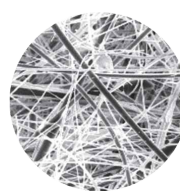
CHARACTERISTICS FOR FILTER EFFICIENCY TEST

α
Dirt absorption

- as per ISO 16869
- test dust ACFTD (old)
- test dust ISOMTD (new)

Filter fineness

- nominal (depending on manufacturer)
- "absolute" as per ISO 16889
- mesh size for woven wire fabric

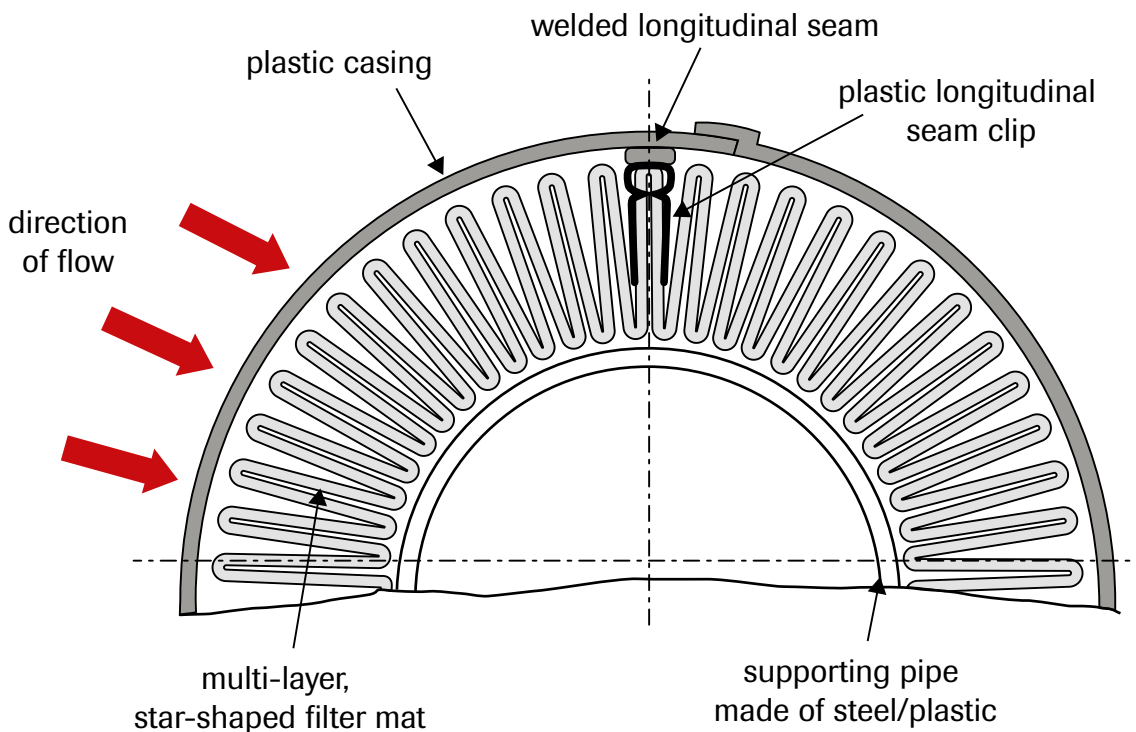


Δp
Differential pressure

- as per ISO 3968
- referring to 30 cSt
- referring to 25 μm

All three characteristics depend directly on each other. Therefore, a good filter element will have an ideal ratio of these characteristics. That means: highest filtering effect with maximum dirt absorption and lowest delta-p.

CROSS-SECTION AND COMPOSITION OF A FILTER CARTRIDGE



Which Oil Assures the Quality?

Two selected hydraulic oils meet the high requirements placed by Plasser American. The use of other oils involves considerable risks.

THE CORRECT HYDRAULIC OILS ASSURE SMOOTH FUNCTIONING OF THE HYDRAULIC SYSTEM

OEM filters and filter cartridges are essential for smooth functioning of a hydraulic system. Furthermore, it is necessary to use the recommended hydraulic oils.

In view of the high demands, Plasser American uses only the following two hydraulic oils:

- High performance SHELL TELLUS OIL T-46 and
- Bio-hydraulic PANOLIN HLP SYNTH 46

ASSURING THE WARRANTY

As our specific requirements are fulfilled by these two oils, Plasser American can only assure the warranty on function, safety, sealing and service life when one of these two oils is used. The addition of other oils can lead to the hydraulic oil being unusable and will result in the loss of any warranty obligations.

HIGH-QUALITY OILS REQUIRE HIGH-QUALITY FILTRATION

The two recommended hydraulic oils are absolutely high-grade products. This level of quality is essential because the outputs of modern work units have risen greatly, particularly over the past years.

The high quality of the oils also results in a longer service life. Today, up to 20,000 operating hours are achieved. The proper care and filtering of these oils is all the more important.

Typical characteristics of SHELL TELLUS OIL T-46

Viscosity class			46
Kinematic viscosity at 40 °C	mm ² /s	ASTM D 445	46
Kinematic viscosity at 100 °C	mm ² /s	ASTM D 445	7.9
Density at 15 °C	kg/m ³	ISO 12185	872
Flash point according to Cleveland	°C	ISO 2592	225
Viscosity index		ISO 2909	>143
Pour point	°C	ISO 3016	-39

We reserve the right to modify data due to the further development of product and production.

OIL ANALYSES PROVIDE CERTAINTY

Due to the high quality, today hydraulic oils are used far longer than years ago. Within this long period of time, it is all the more important to keep an eye on the current state of the oil. Therefore, we absolutely recommend that the testing intervals are observed and that the test is performed in a certified laboratory.

Particular attention should be given to the following threshold values:

- **Viscosity:** 90 % of the original value
- **Water content:** basically as low as possible, maximum permissible concentration at 1000 ppm. (equivalent to 0.10 percent by volume)
- **Acid content in fresh oil:** TAN (Total Acid Number) 0.05 mg KOH/g
- **Acid content in used oil:** between 0.05 and 1 mg KOH/g
- **Cleanness of the plant:** cleanliness as per ISO 4406: 19/16/13/-20/17/14/ and/or as per NAS 1638: 7-8

Typical characteristics of PANOLIN HLP SYNTH 46

Viscosity class			46
Kinematic viscosity at 40 °C	mm ² /s		47
Kinematic viscosity at 100 °C	mm ² /s		8.1
Density at 15 °C	kg/m ³		918
Flash point i. o. T	°C		240
Viscosity index			146
Pour point	°C		-57

Panolin HLP SYNTH is a biologically degradable, fully synthetic, high-performance hydraulic fluid. As per VDMA 24568 and ISO 15380, it falls in the category HEES.

Panolin HLP SYNTH was awarded with environmental labels in Croatia, Czech Republic, Germany, Italy, Japan, Korea and Sweden.

Water hazard classes: VwVwS; nwg (35020-35040), WGK-1 (35050-35070).



The high quality of modern hydraulic oils offers a far longer service life. However, it is imperative to perform regular tests in a certified laboratory.

What are the Risks?

OEM filter cartridges versus non-OEM filters: the differences are sometimes not visible at first glance, but they are there. As practical operation shows, they lead repeatedly to serious damage.

Skilled maintenance on the basis of the Plasser American service instructions and the use of OEM filter cartridges offer the best protection against damage in hydraulic, diesel and air systems. Therefore, even for customers following a tight budget, there is no doubt that on the bottom line, it pays off to purchase OEM spare parts directly from Plasser American.

We show you here what defects can occur due to improper maintenance and non-OEM filter cartridges.

VENTILATION FILTERS NOT REPLACED: MACHINE DAMAGE CANNOT BE RULED OUT (1)

Ventilation filters assure the “breathing” of the hydraulic tank. If filter cartridges are not replaced regularly, suspended solids and abrasive dust can penetrate. In the long run, machine damage cannot be ruled out.

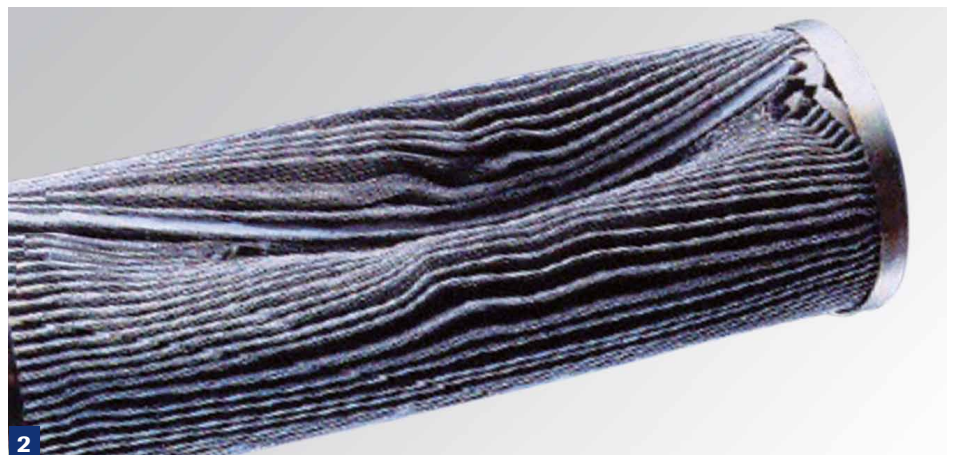
If filter cartridges are not replaced in good time, contamination in the hydraulic tank and in the hydraulic oil will be the consequence.

IF THE DIFFERENTIAL PRESSURE IS TOO HIGH IT WILL CRUSH THE FILTER ELEMENT (2)

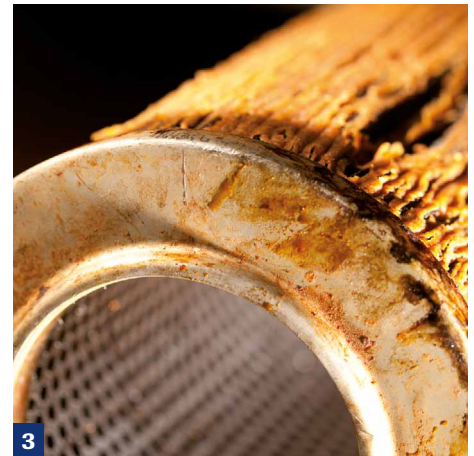
If oil that is too cold and too contaminated hits a filter cartridge without a bypass, it can destroy the filter. One possibility of preventing this is to use filter cartridges that are resistant to differential pressure.



1



2



3

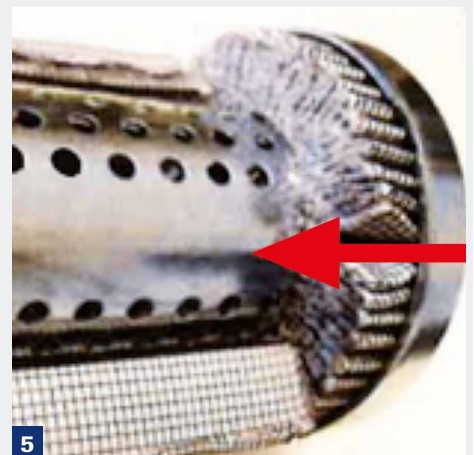
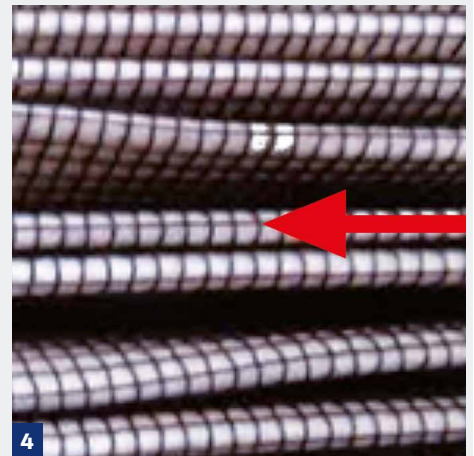
IF THE INNER PRESSURE IS TOO HIGH IT WILL BURST THE FILTER CARTRIDGE (3)

Due to oil return caused by incorrect installation or wrong direction of flow, the inner operating pressure can rise too high. It is highly recommended to inspect the plant and use filter cartridges with an additional outer support casing.

Typical defects on non-OEM parts

A range of defects were already discovered on non-OEM filter cartridges. Only one fault is sufficient to risk considerable damage.

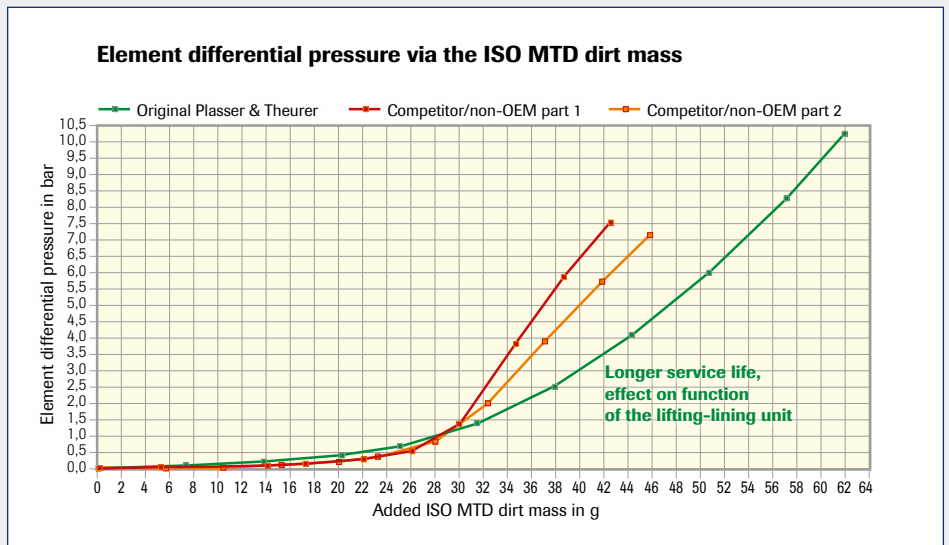
- wrong filter materials
 - incorrect composition of the filter layers
 - defective adhesives
 - filter surfaces too small or too large
 - inferior packaging
 - inadequate part descriptions
 - no details on water absorption
 - lack of quality controls
- glued longitudinal seams reduce the filter surface and; therefore, the filter efficiency (4)
 - incomplete perforated support cage reduces the filter surface (5)



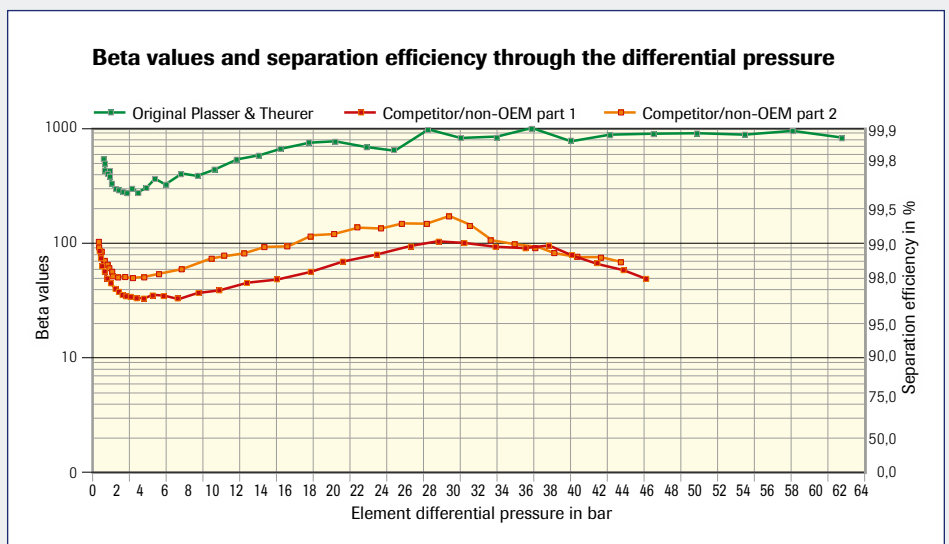
Comparison Studies

Test of OEM filter cartridges and non-OEM filter cartridges

The pressure filter cartridge type DL 40.60.3E, which is used before servo valves, was tested extensively. Here it shows that OEM filter cartridges offered by Plasser American have considerable advantages in respect of filtering effect, service life and the most suitable design.



The beta value gives information about the performance of the filter and; therefore, about the efficiency for filtration. This figure is determined according to the ISO Standard 16889, the so-called multi-pass test.



Using Quality OEM Parts Pays Off

It is possible to reduce the purchasing costs without having to do without the OEM filter cartridges. Plasser American offers two options to save money when purchasing OEM filter cartridges.

In view of the rising pressure of costs, it is clear that every option for reducing costs must be utilized. Meanwhile, it is also the small parts, such as filter cartridges, where savings can be made.

Recent investigations and recurring cases in practical operation show that seemingly lower-cost solutions can lead to considerable damage to the machines.

OEM FILTER CARTRIDGES FOR ALL TYPES OF FILTERS

This brochure focuses mainly on the filters for the hydraulic system. That does not mean we offer OEM filter cartridges only for hydraulic filters. The following offers also include OEM filter cartridges for all types of filters used in our machines.

TWO NEW OPTIONS TO SAVE ON OEM FILTER CARTRIDGES OFFERED BY PLASSER AMERICAN

To reduce costs for the procurement and well-functioning management of wear parts, Plasser American has two attractive offers: the 1000 HOUR FILTER CARTRIDGE PACKAGE and the bulk discount for collective orders.

1000 HOUR FILTER CARTRIDGE PACKAGE: ALL FILTER CARTRIDGES FOR 1,000 OPERATING HOURS

The 1000 HOUR FILTER CARTRIDGE PACKAGE contains all OEM filter cartridges for hydraulic system, pneumatic system and power system of one machine that have to be replaced within 1,000 operating hours. We put together every package individually to suit your machine!

OEM FILTER CARTRIDGES AS A BULK ORDER

For customers with larger fleets of machines we also offer an alternative to the 1000 HOUR FILTER CARTRIDGE PACKAGE. Large quantities can also be ordered at a special price as bulk orders. Price reductions may apply depending on quantities ordered. Further information can be obtained by contacting our Parts Department **Hotline (757) 494-3643**, via email at **PartsDept@plausa.com**, or our new online Spare Parts Inquiry at **www.plasseramerican.com**.



Filter Technology as a Productivity Factor

ILLUSTRATIONS AND DESCRIPTIONS MAY CONTAIN OPTIONAL EQUIPMENT. WE RESERVE THE RIGHT TO MAKE ALTERATIONS IN LINE WITH FURTHER TECHNICAL DEVELOPMENTS. "PLASSER & THEURER" AND "PLASSER" ARE INTERNATIONALLY REGISTERED TRADEMARKS.