

HYDAC INTERNATIONAL

HYDAC Marine, Diesel & Power

Hydac AutoFilt® RF9
Servo-, Fuel- and Lub. Oil

Dipl.-Ing. Carsten Springfeld
18.09.2018

NAUTISCH-TECHNISCHER INSPEKTOREN-KREIS HAMBURG e.V.
NTIK



INTERNATIONAL

Hydac Sulzbach / Saar

Hydac International

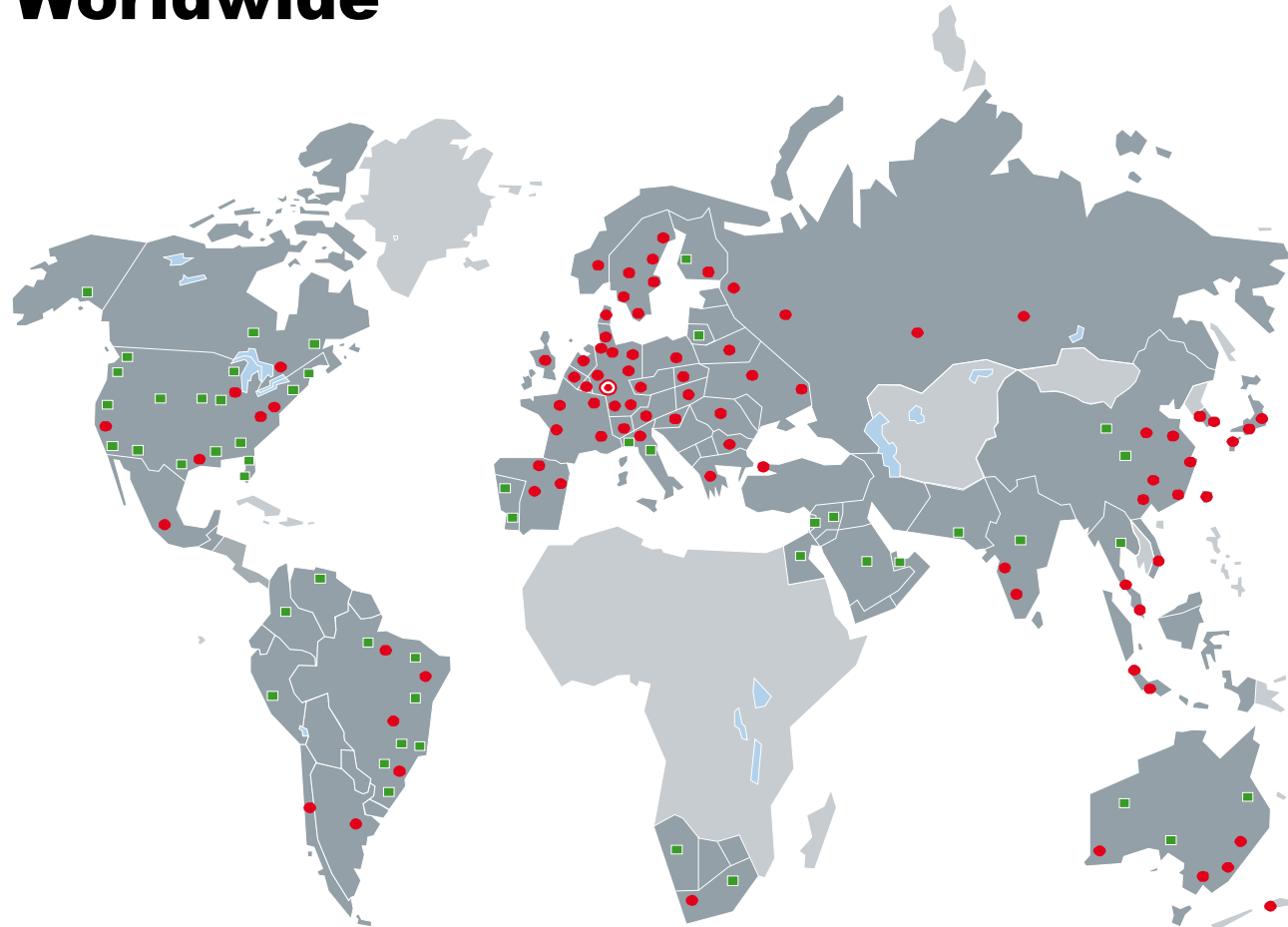
- Gegründet 1963
- 100% Familienunternehmen
- Umsatz 2017: 1,5 Mrd. €
- Angestellte weltweit >9.000
- Angestellte Deutschland > 4.300
- 30 production plants in 11 countries



HYDAC INTERNATIONAL

Technology, Sales and Service Worldwide

- 🎯 HYDAC Headquarters
- HYDAC Companies
- HYDAC Subsidiaries

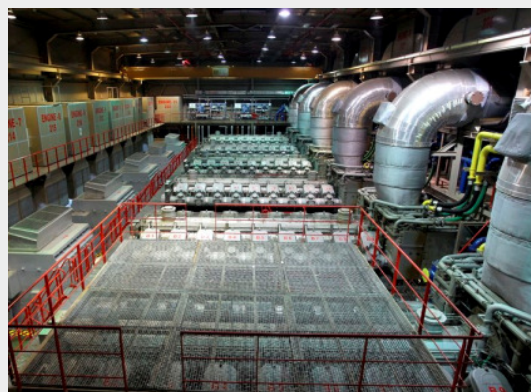


Marine & Diesel Power

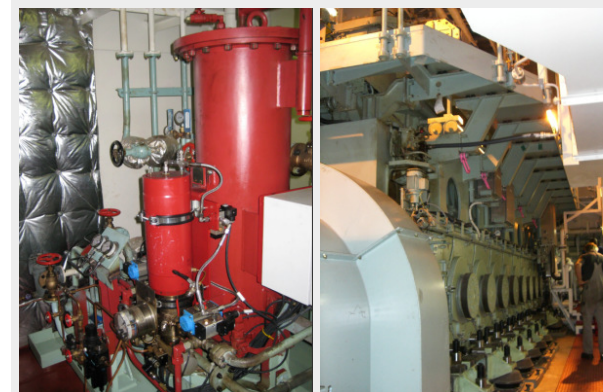
Power Plants



Power Barges



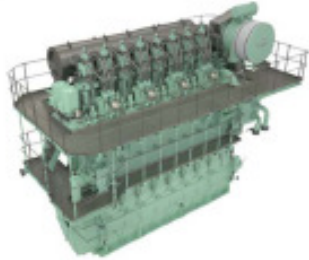


Ships

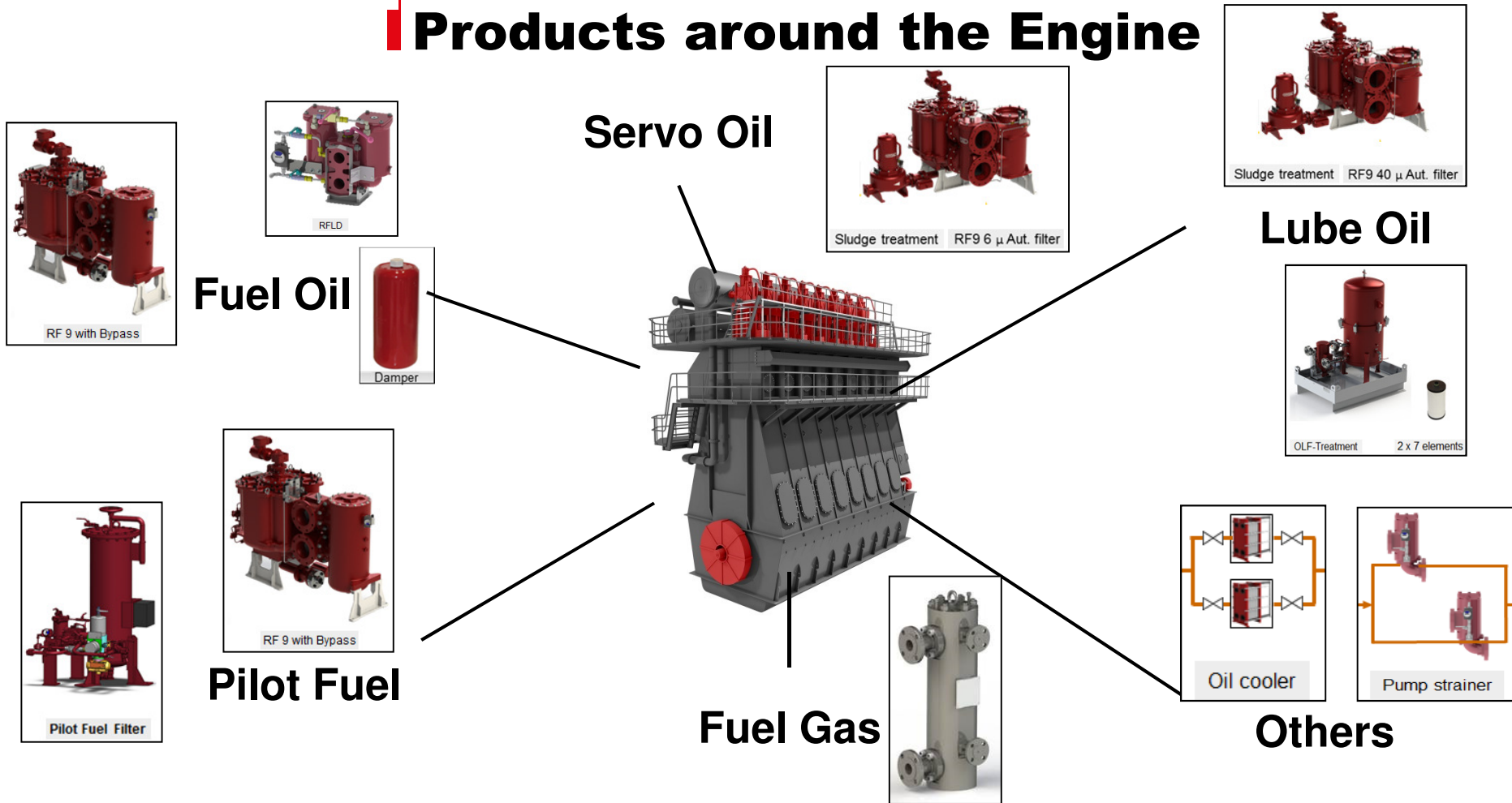


Marine & Power für Großmotoren

Improve your protection !

	High Speed	Medium Speed	Low Speed
Engine Type			
Fuel	4-stroke Diesel	4-stroke Diesel, HFO, Gas, Dual Fuel (Diesel, Gas, HFO)	2-stroke Diesel, HFO, Dual Fuel (Diesel, Gas, HFO)
Performance	1,500 - 2,800 r/min	500 - 1,200 r/min	50 - 200 r/min
	100 - 4,000 kW	500 - 18,000 kW	3,200 - 82,400 kW

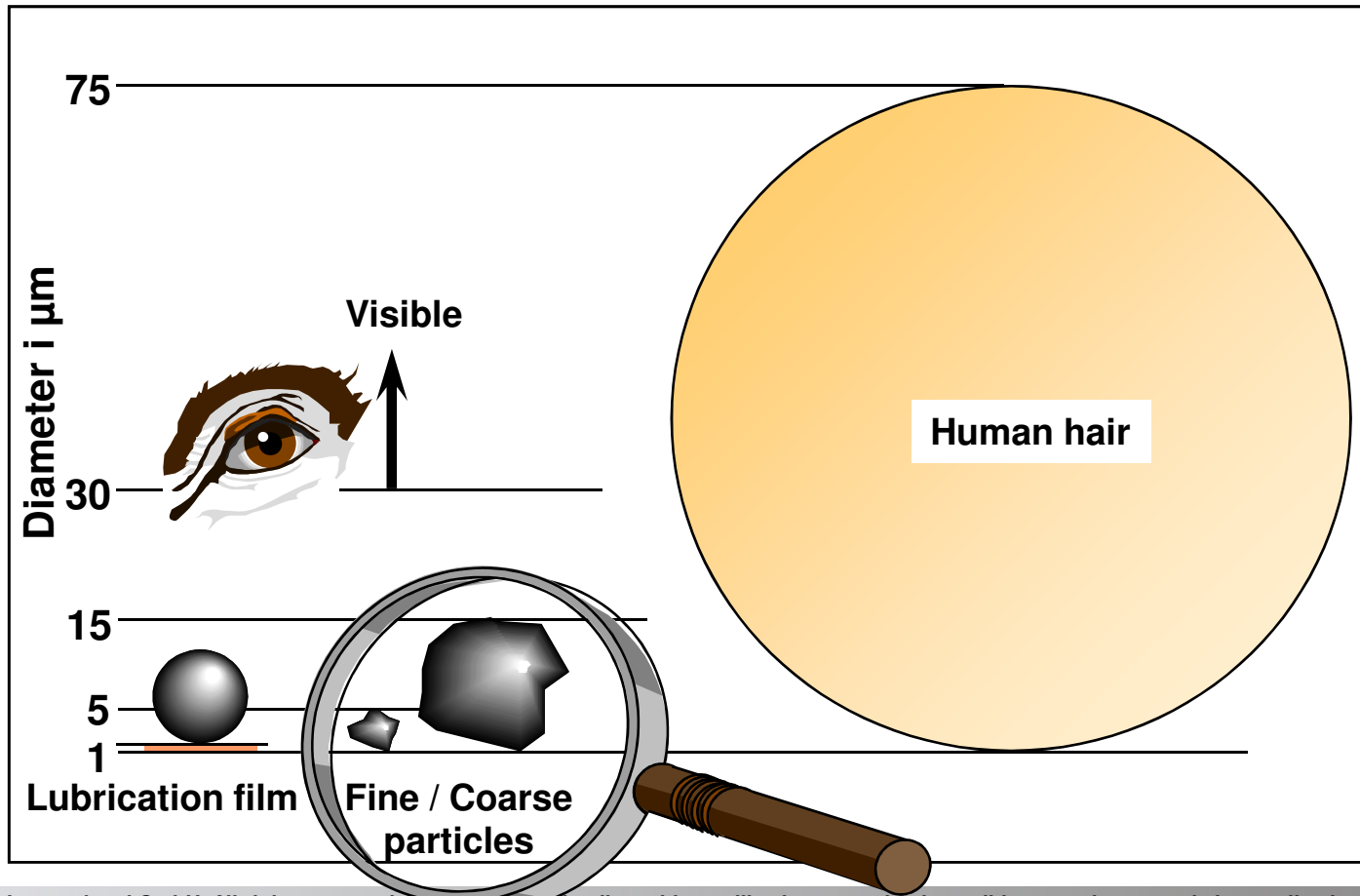
Products around the Engine



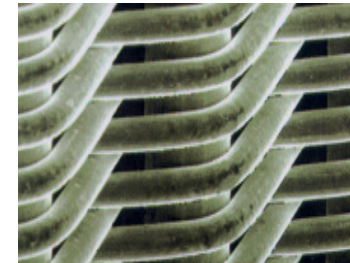
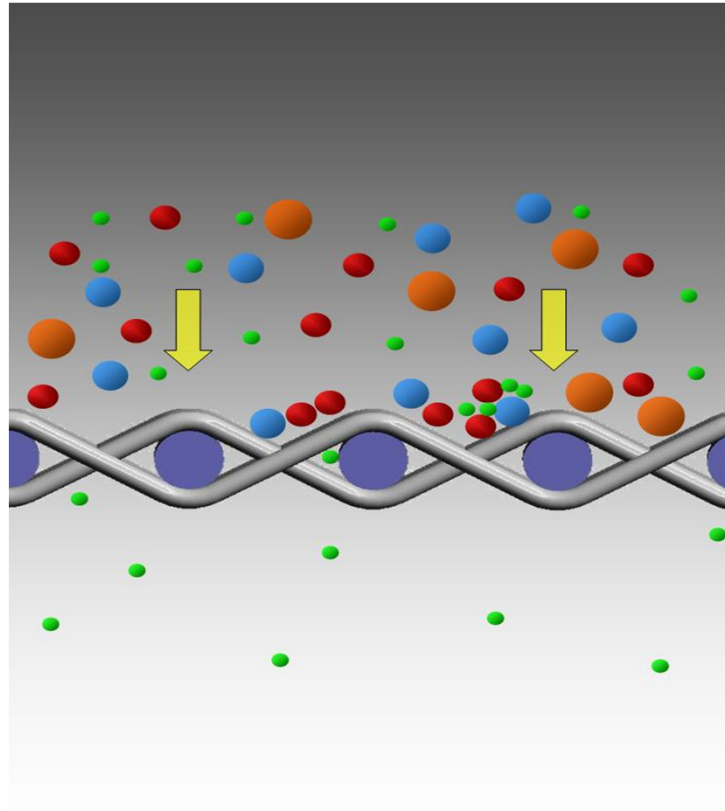
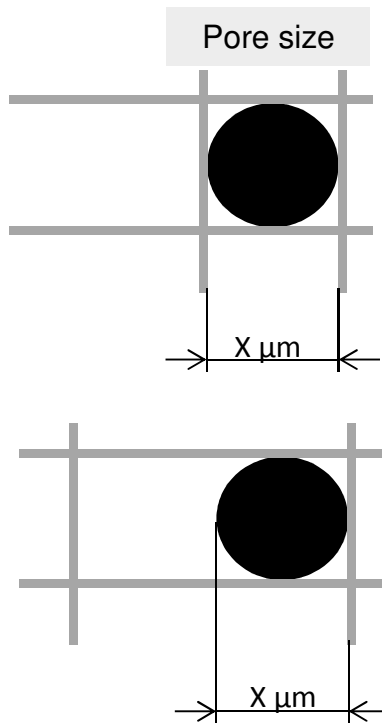
Definition of Filtration



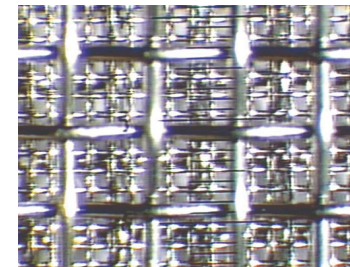
Understanding Filtration



Surface filtration



Mesh dutch weave



Mesh square weave



Slotted tube

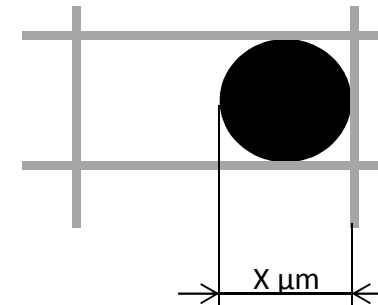
Slotted tube



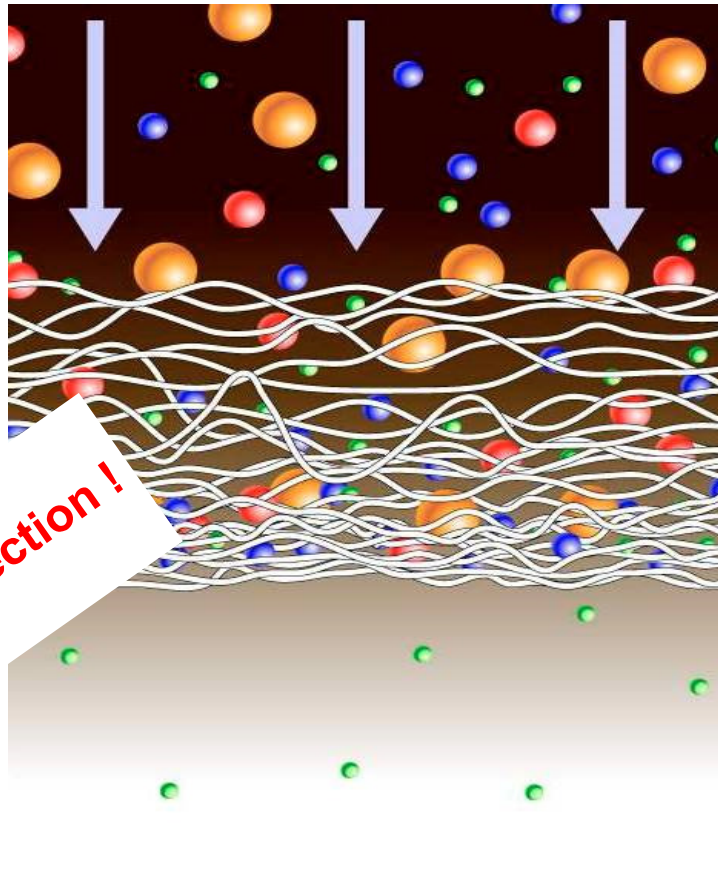
Beispiel:

Notch wire mit $10\mu\text{m}$ ($\beta = 1,4$)

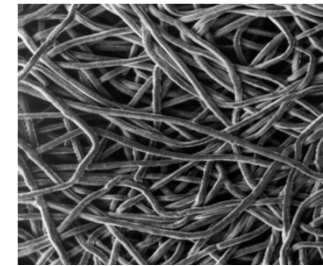
$\beta=1,4 \Rightarrow$ Separation 29%



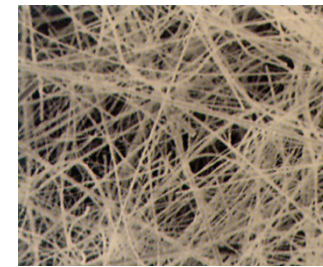
Depth filtration



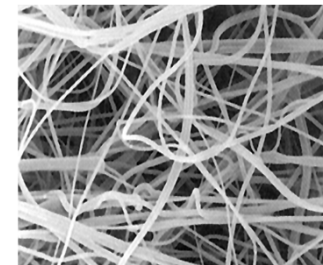
Improve your protection !



Metal fleece

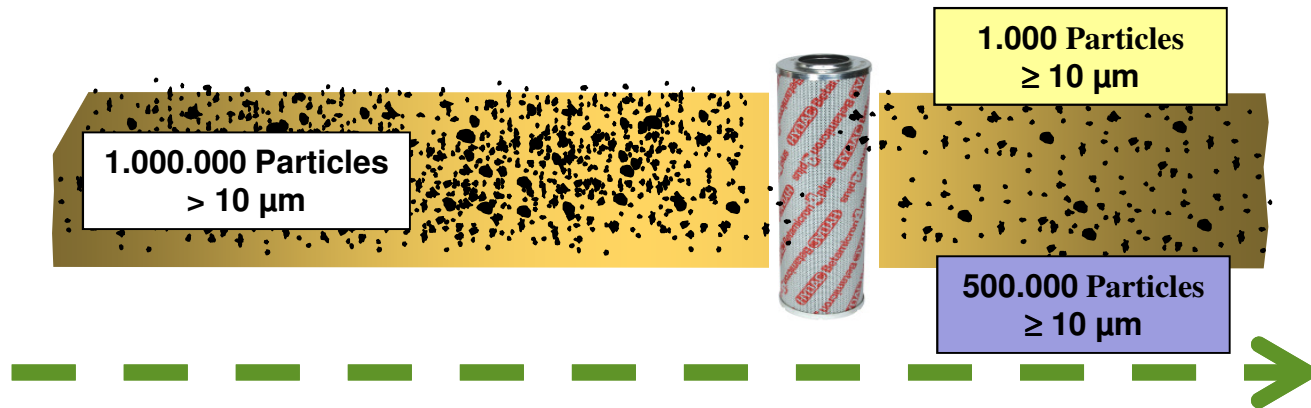


Fiberglass



Polyester

Separation degree $\beta_{x(c)}$



$$\beta_{10(c)} = \frac{1.000.000}{1.000} = 1000$$

$$\beta_{10(c)} = \frac{1.000.000}{500.000} = 2 \text{ (absolute ?!)}$$

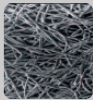



**Separation degree $\beta_{x(c)}$
Absolute- or Nominal filtration**


„Absolute Marine“
Pore Size

n Upstream	n Downstream	Separation degree β	Separation x
1.000.000	500.000	2	50,000%
1.000.000	100.000	10	90,000%
1.000.000	50.000	20	95,000%
1.000.000	10.000	100	99,000%
1.000.000	5.000	200	99,500%
1.000.000	1.000	1.000	99,900%
1.000.000	200	5.000	99,980%
1.000.000	100	10.000	99,990%
1.000.000	50	20.000	99,995%

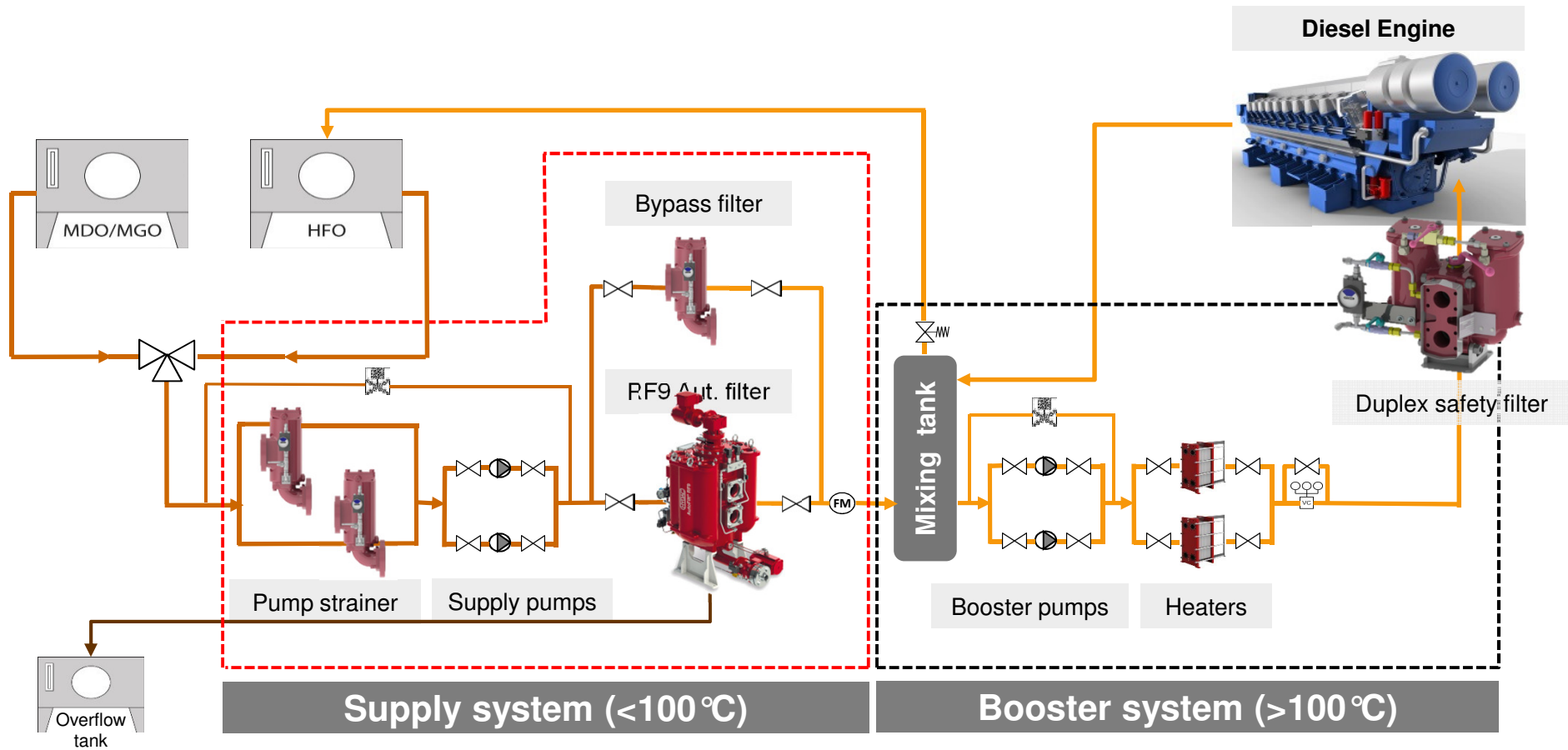
„Absolute“ Filtration (100%) does not exist

Filtration Media

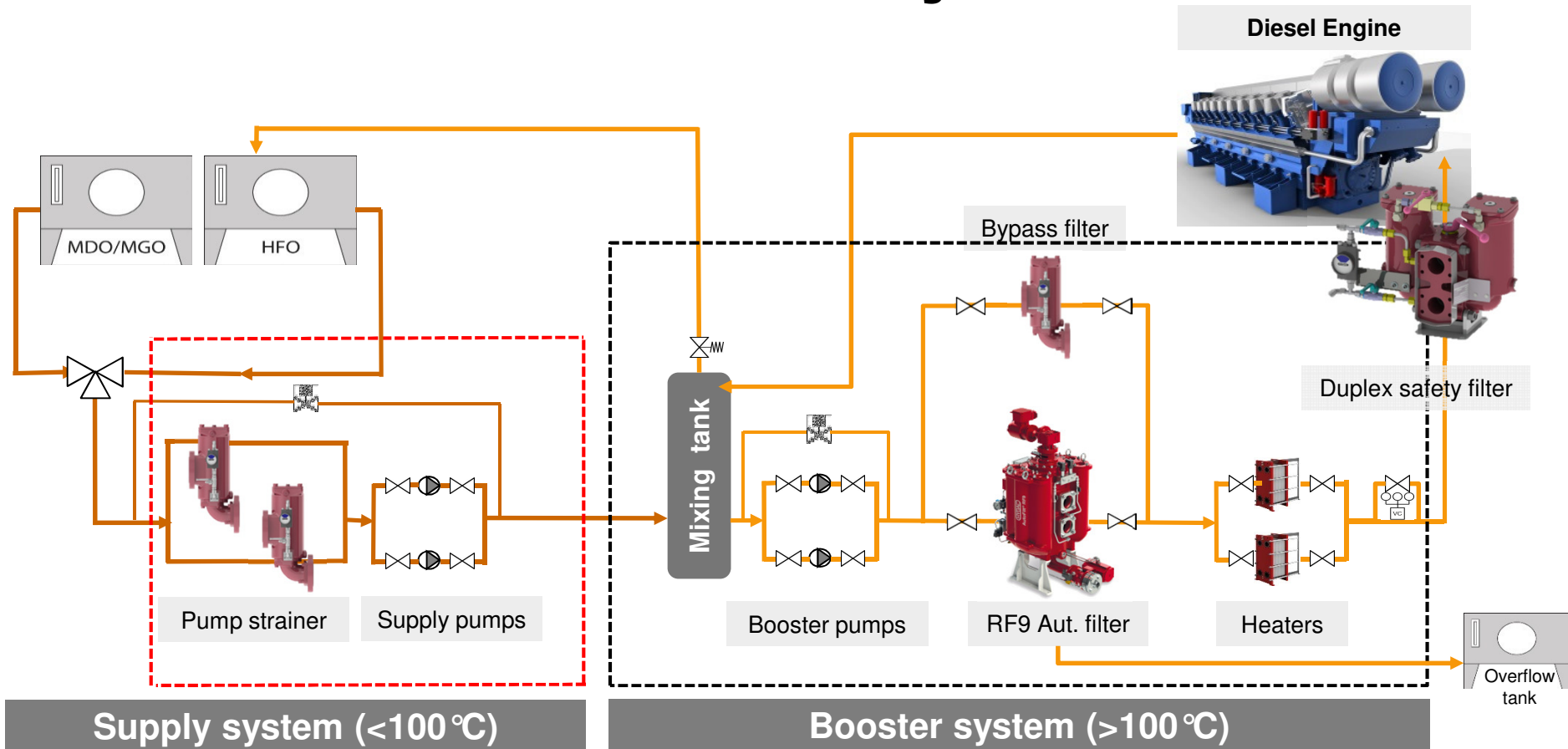
Diesel Fuel & Lub. Oil	Picture	Filter Material	Requirements
		Metal Fibre	1 - 10 µm absolute 5 - 25 µm ($\beta_{x(c)} \geq 75$)
		Dutch Weave	Micron Ratings: 10, 25, 34, 48, 60 µm; absolute (ball diameter)
		Mesh-Square Weave	Micron Ratings: 80 - 500 µm; absolute (ball diameter)
		Glass Fibre	Micron Ratings: 1, 3, 5, 10, 15, 20 µm; ($\beta_{x(c)} \geq 200$)

Pilot Fuel	Picture	Filter Material	Requirements
		Glass Fibre	$\beta_{4(c)} \geq 8.000$ ISO 11/8/7

RF9 in Supply System



RF9 in Booster System

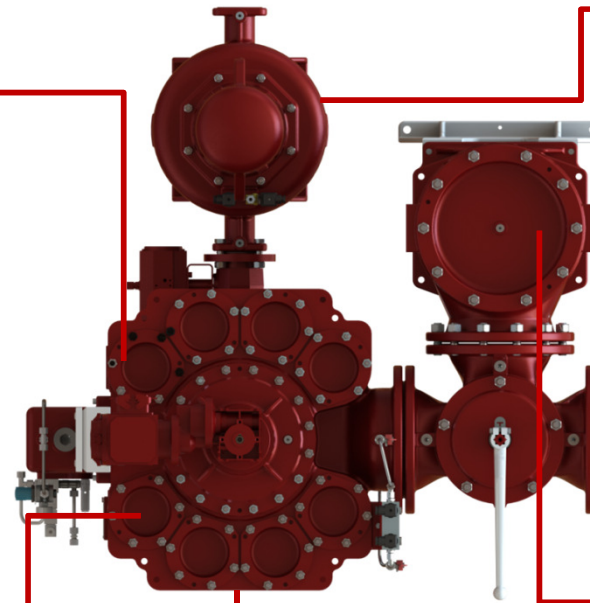
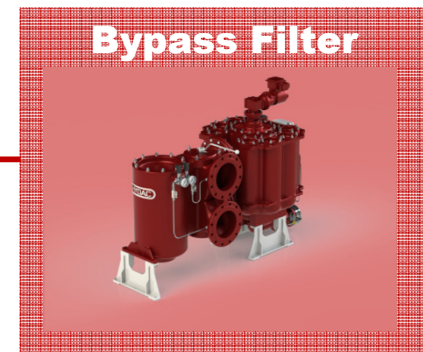
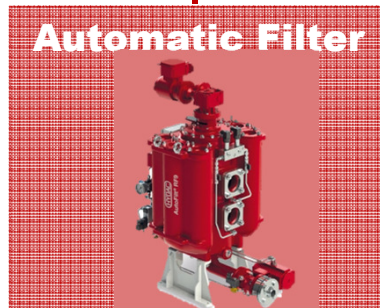


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AutoFilt® RF9



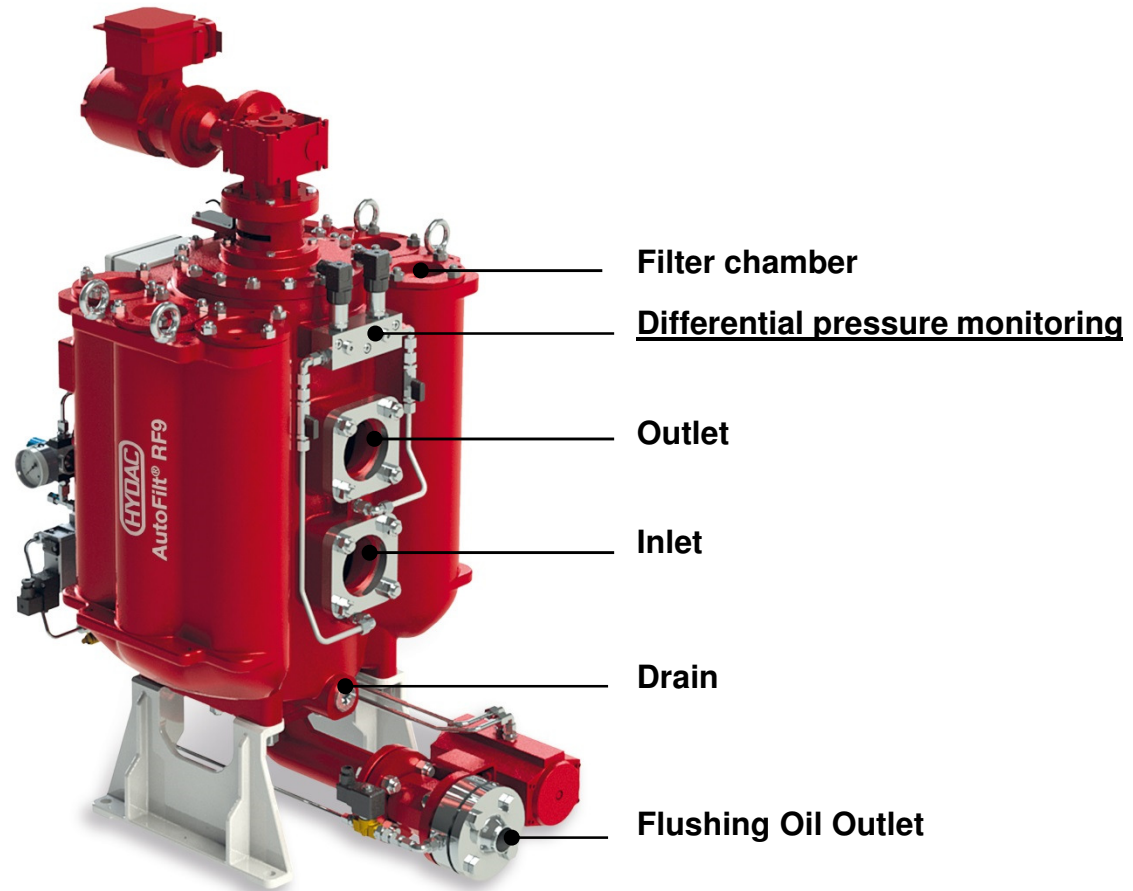
RF9 Concept



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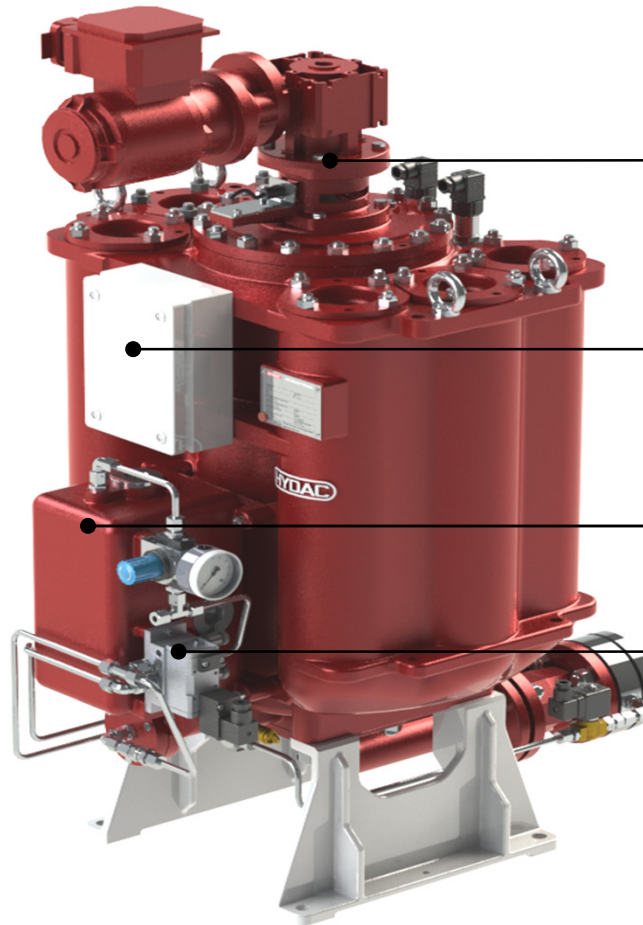
Hydac AutoFilt® RF9



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Hydac AutoFilt® RF9



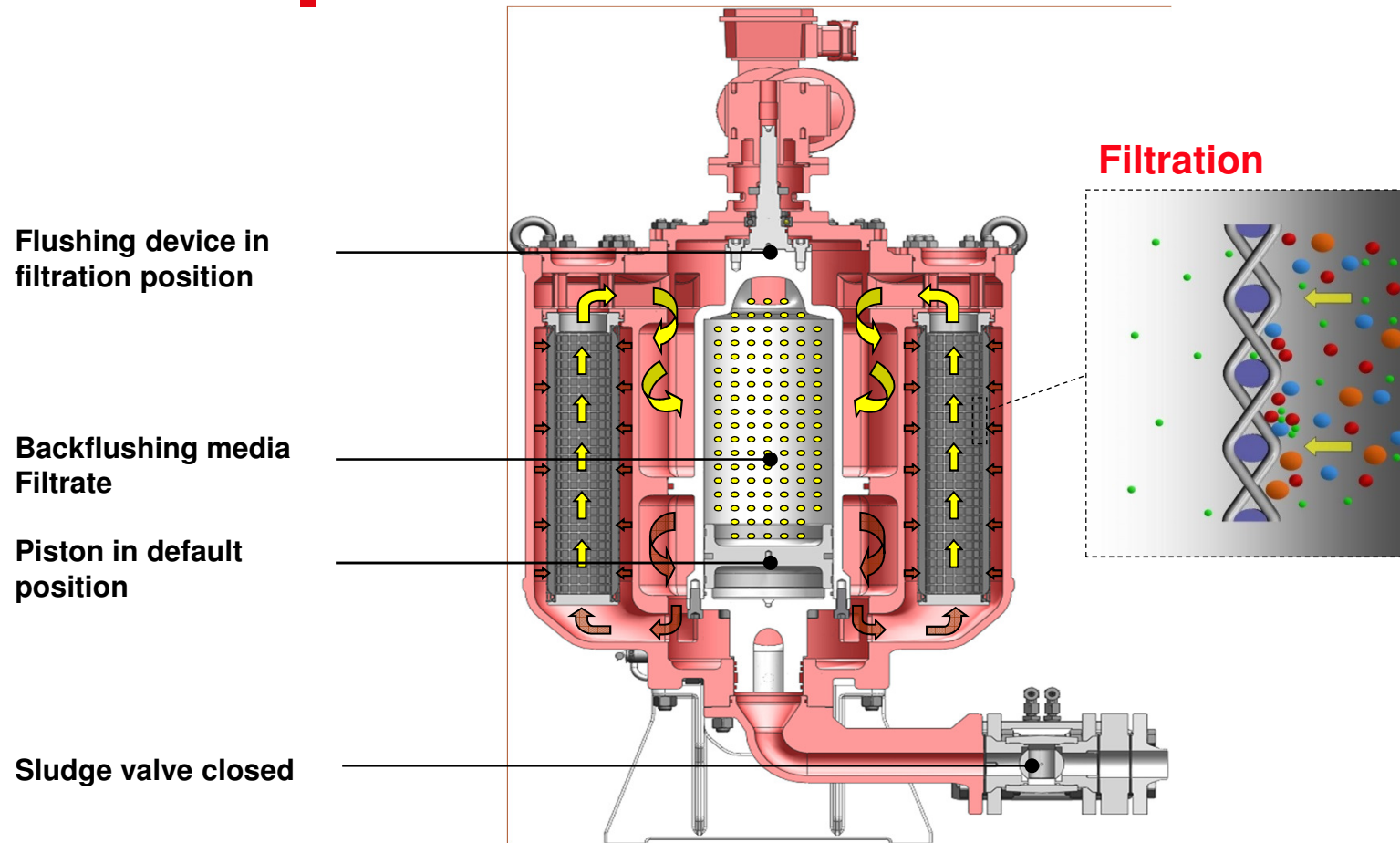
**Gear motor
with position monitoring**

Junction box

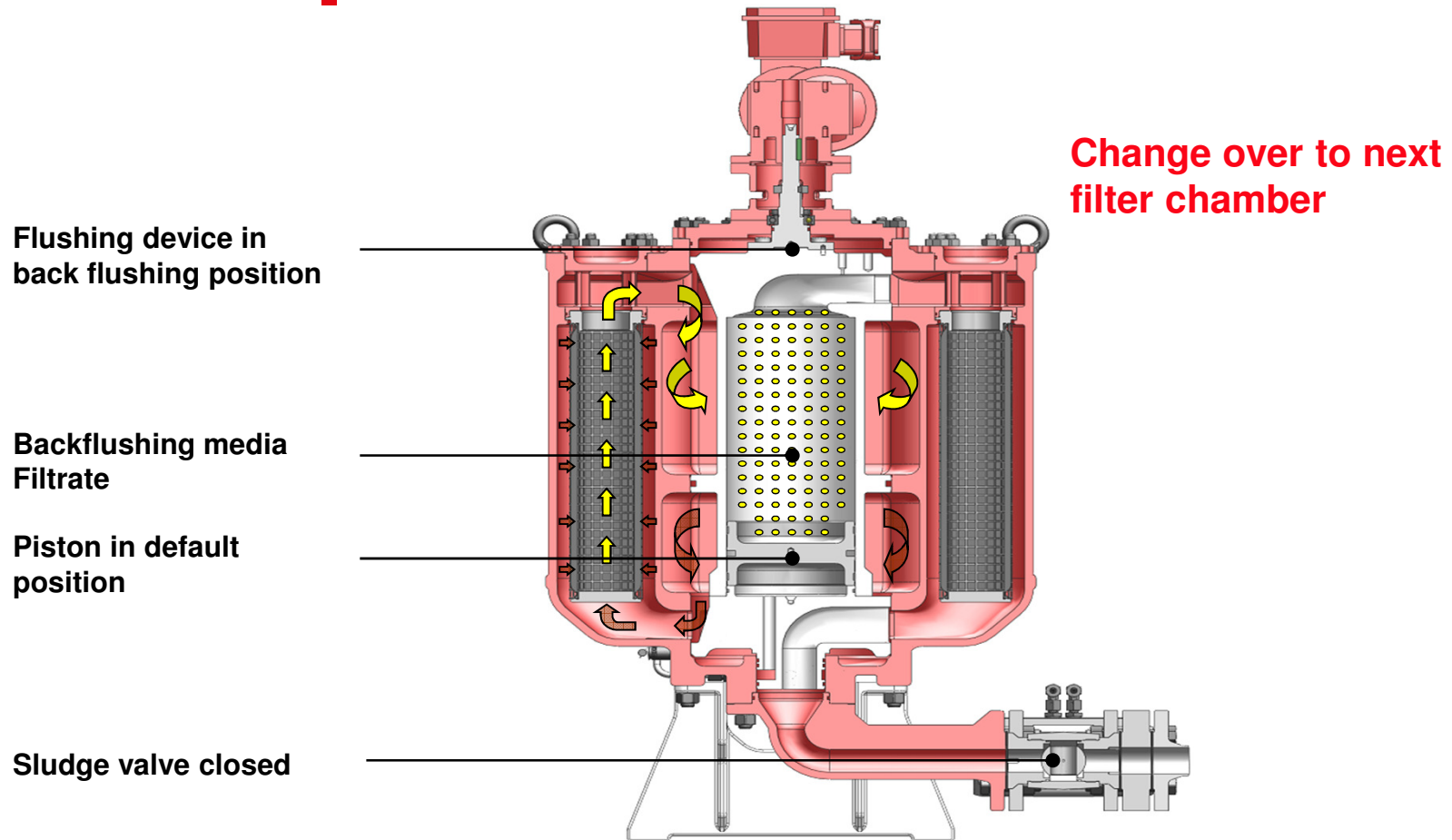
Gas Reservoir

Air supply and control valves

Hydac AutoFilt® RF9 - Function

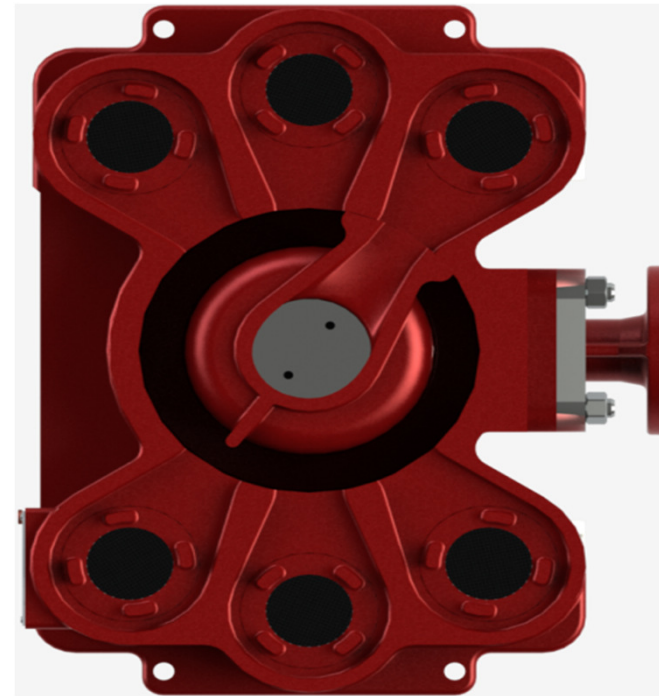
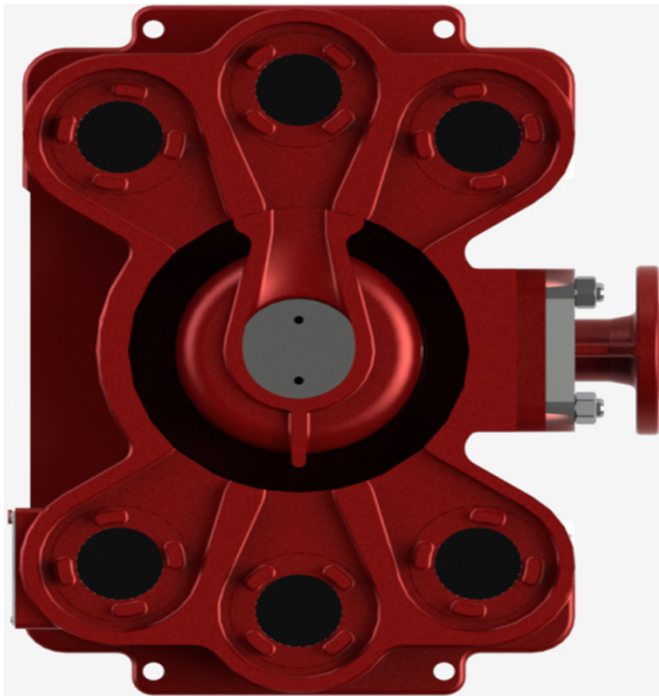


Hydac AutoFilt® RF9 - Function

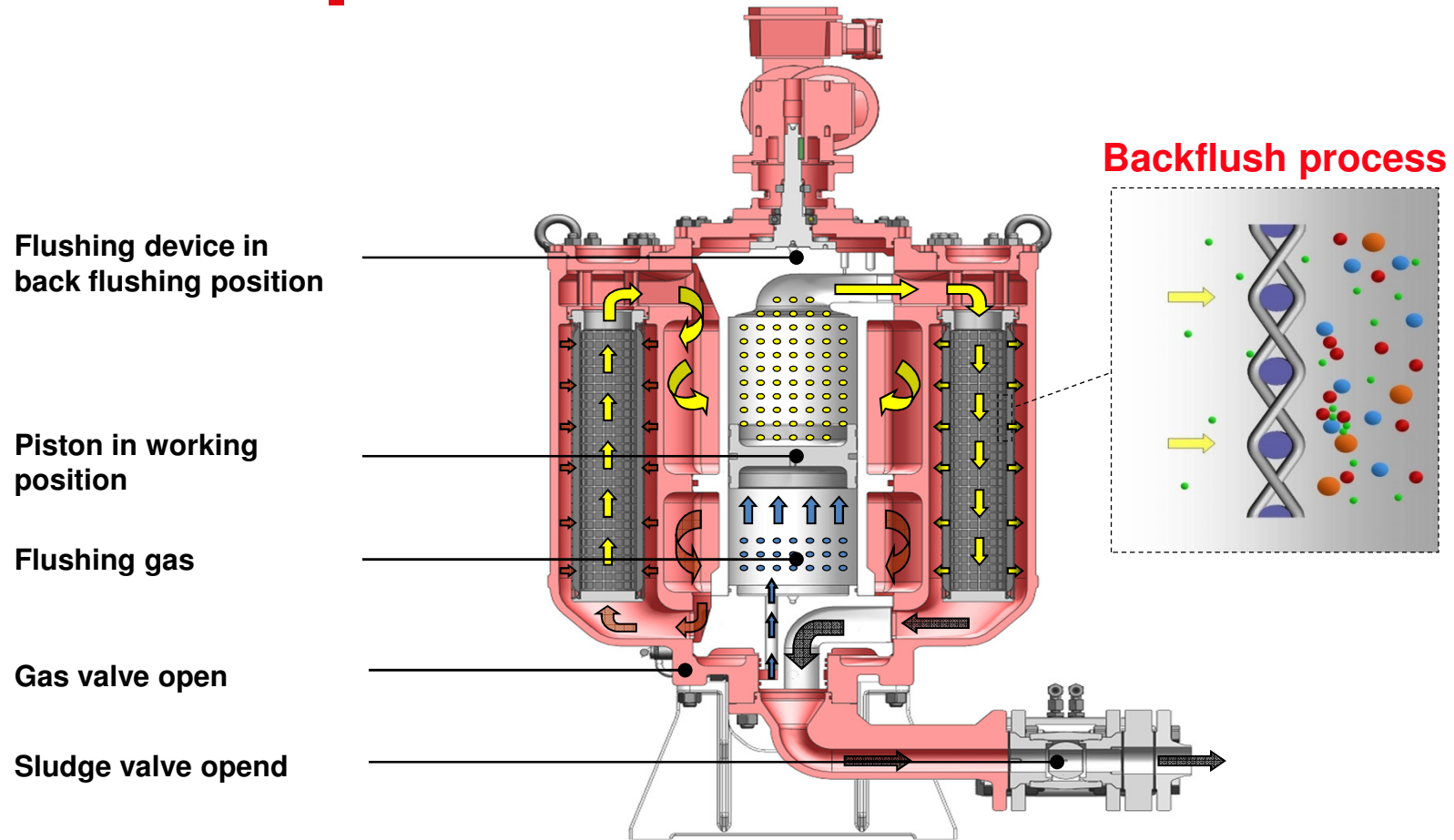


Hydac AutoFilt® RF9 - Function

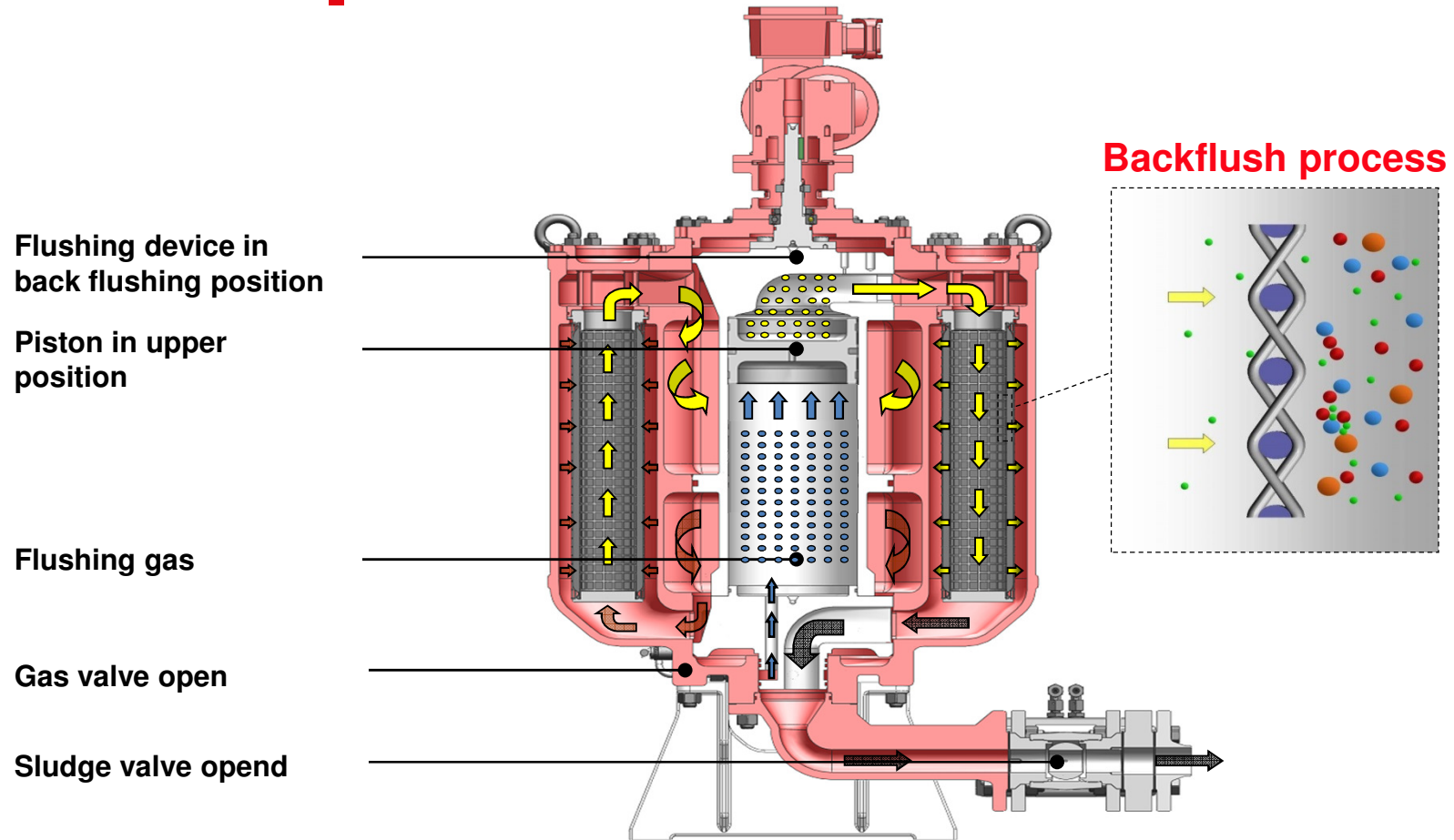
Change over to next
filter chamber



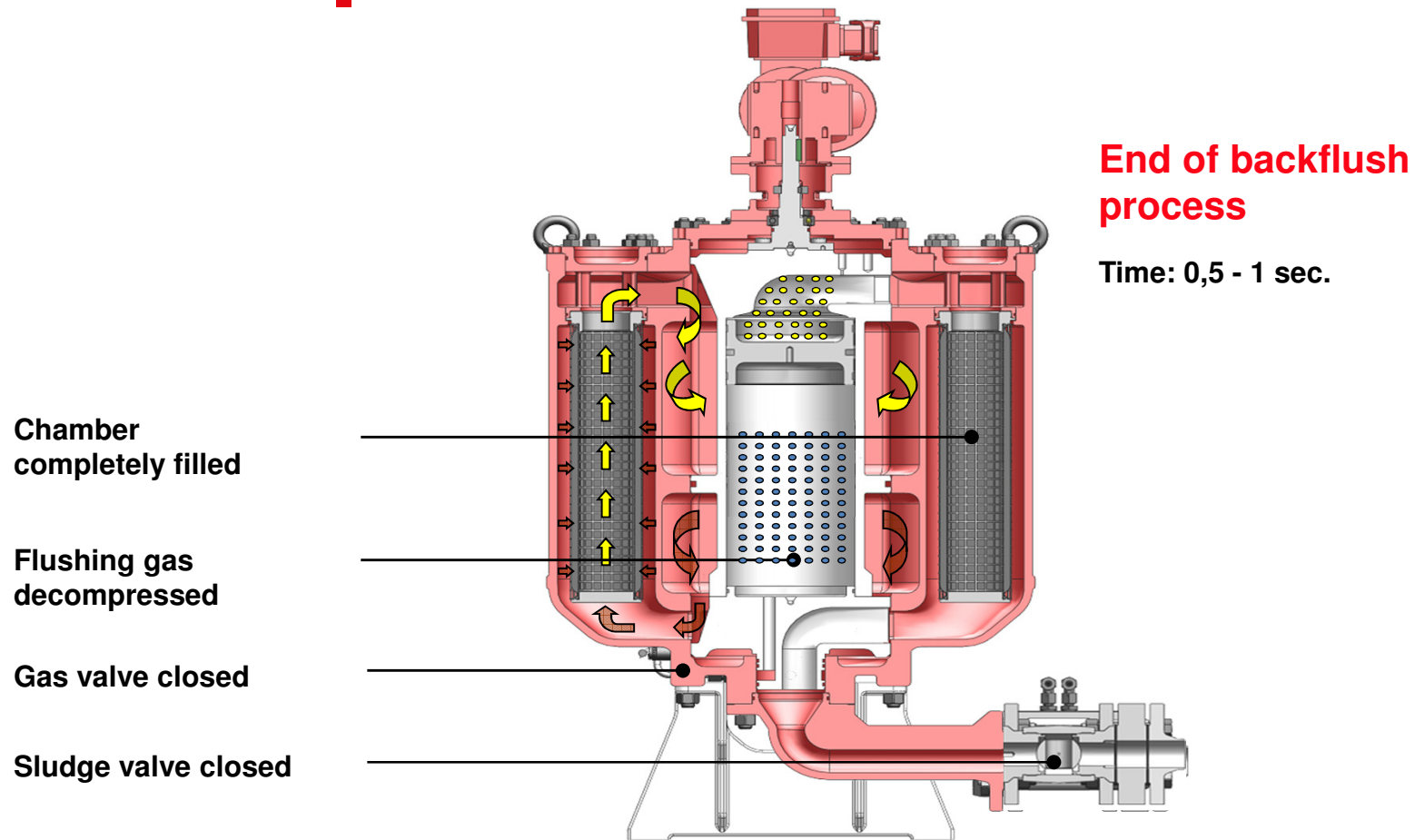
Hydac AutoFilt® RF9 - Function



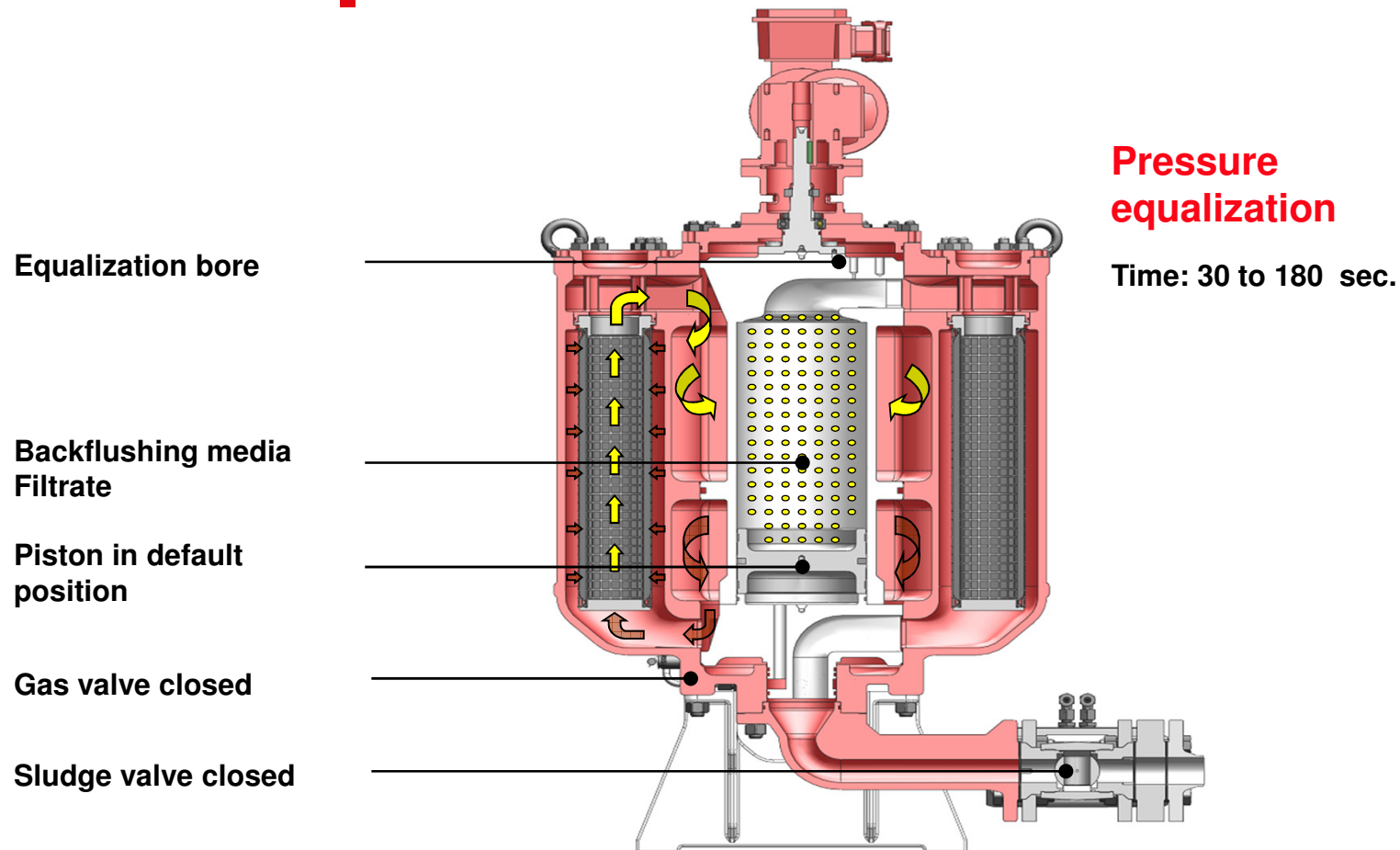
Hydac AutoFilt® RF9 - Function



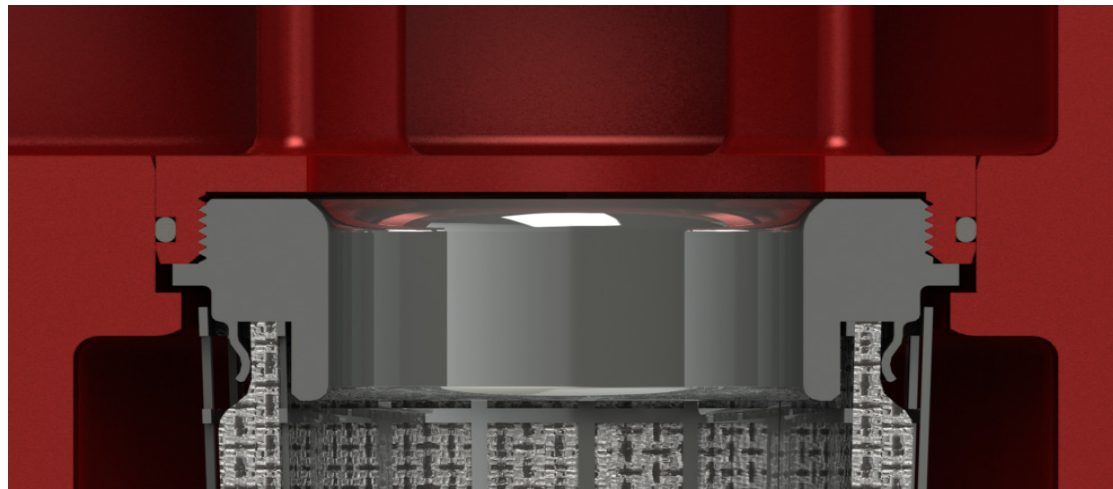
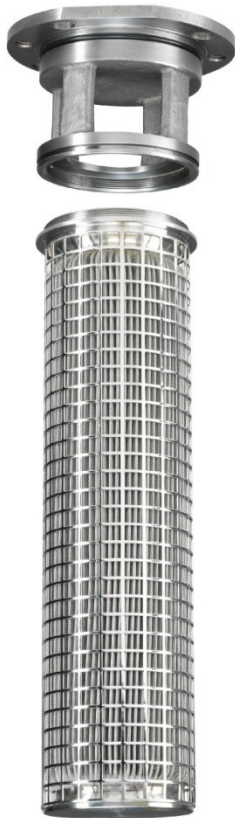
Hydac AutoFilt® RF9 - Function



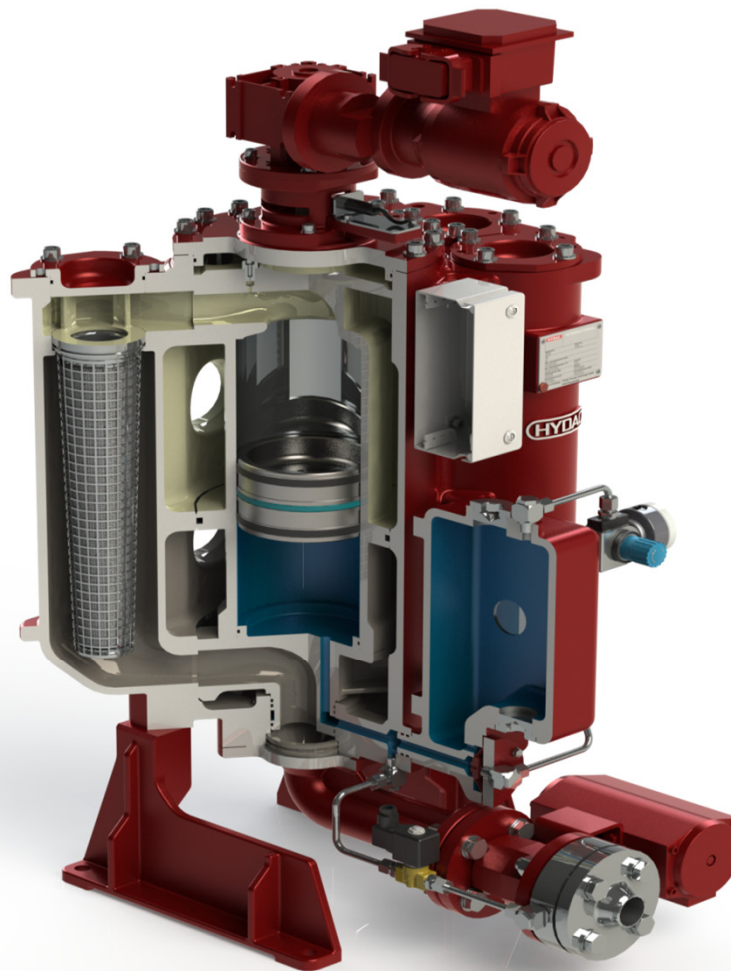
Hydac AutoFilt® RF9 - Function



Locking system for Filter Element

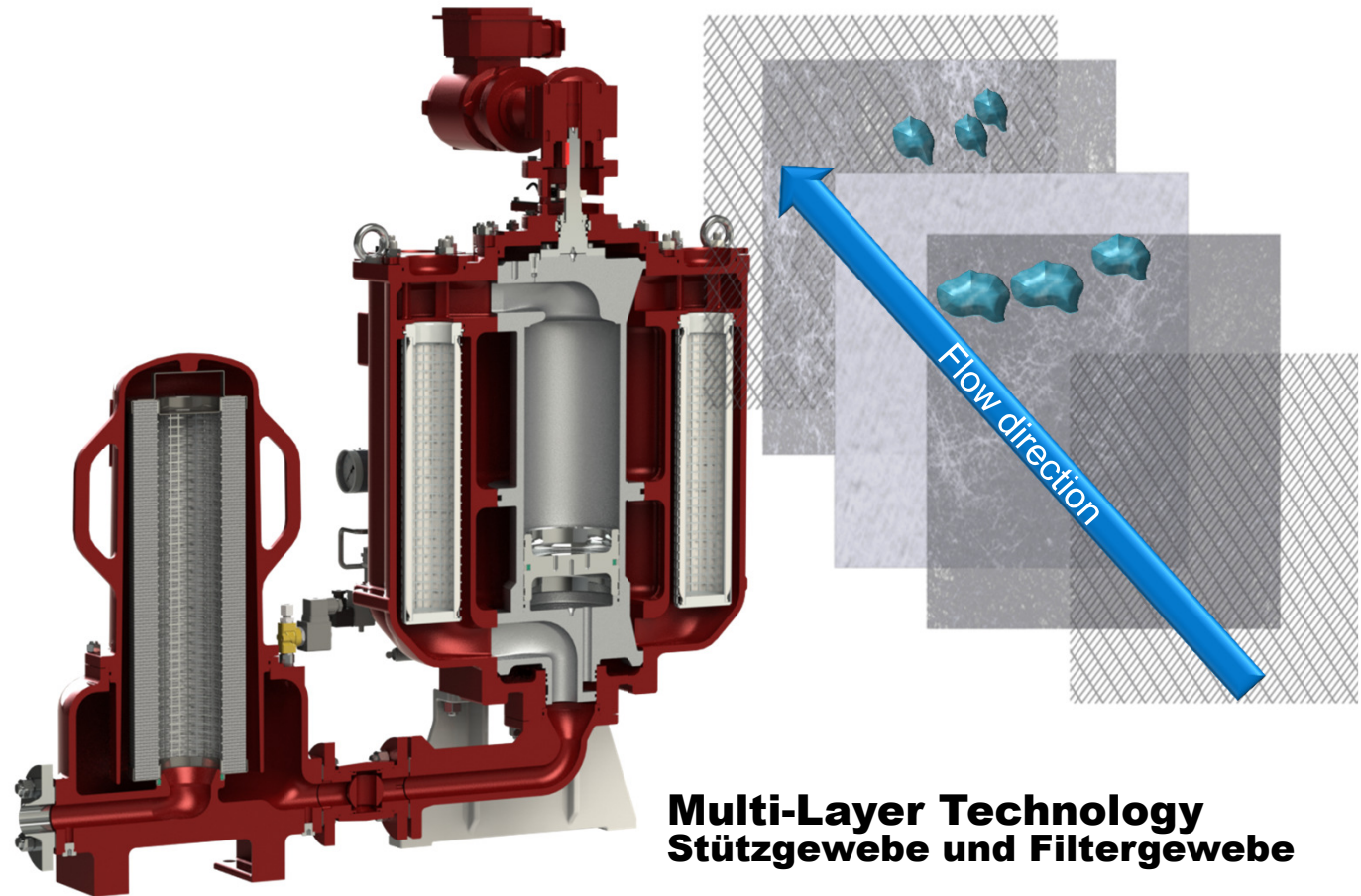


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Hydac AutoFilt® RF9

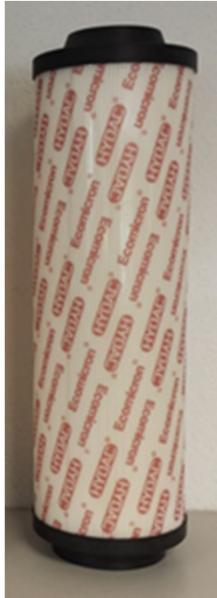


RF9 Sludge Treatment Unit (STU) for lube oil

- No counter pressure
- High utilization of Element
- Fine Filtration
- Easy handling
- Dirt holding capacity

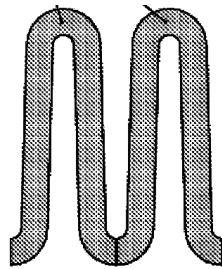


Multi-Layer Technology
Stützgewebe und Filtergewebe

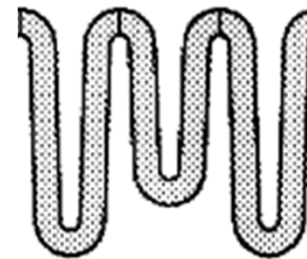


**RF9 STU Element,
HYDAC - Oil Care System**

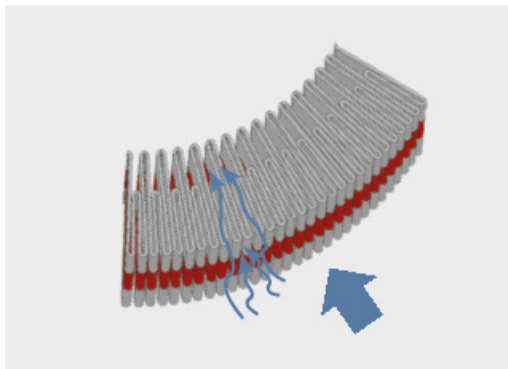
Standard



New PELF2
developments



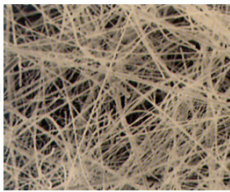
Optimierte , vergrößerte
Anströmfläche für hohe
Schmutzfrachten



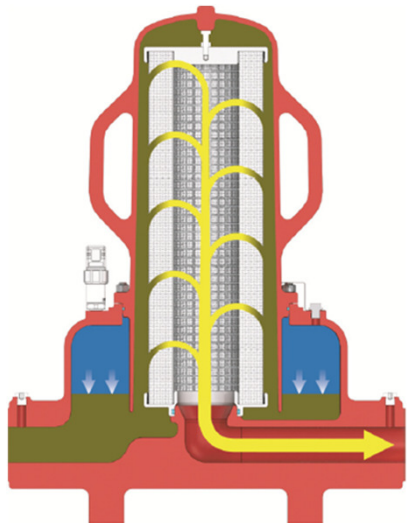


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HYDAC - Oil Care System, Mehrwert an Bord



Fiberglass



- **Schutz des Motors**
- **MAN Vorgabe $\beta_{6\mu}=2$ für Servo Öl Filtration**
- **Ölpflege => Verschmutzungsstufe xx/16/13 nach ISO 4406 möglich**
- **Verbesserte Abreinigung**
- **Längere Standzeiten der Filterelemente**
- **Große Filterfläche**
- **Hohe Schmutzaufnahmekapazität**

Feinstfiltration und Ölpflege

HYDAC **TECHNEWS**
AutoFit® RF9
Sludge Treatment Unit (STU) for Lube Oil



Areas of Application

- Main Lube Oil System
- Hydraulic Servo Oil
- 2 and 4 stroke Engines

Product Description

Full fine protection and oil treatment in one module. That is the RF9 & STU combination. The innovative element design together with the very small flushing volume of RF9 enables a highly efficient – all in one solution – for Lube Oil systems.

Product Advantages

- Very high dirt holding capacity
- High oil content of filter element
- Fine Filtration – Oil treatment
- Easy handling
- All in one module
- Overcoming or replacement of centrifuges
- Improve oil cleanliness significantly

Cost Cutting

- Extended Oil Service
- Extended Lifetime of Engine Components
- Extended Lifetime of Filter Components on MAN M/E Engines
- Replacement of Centrifuges
- Compact Module Design, no Pipework necessary

Cost

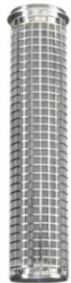
Multilayer technology with M-pleat

Graduated depth filtration

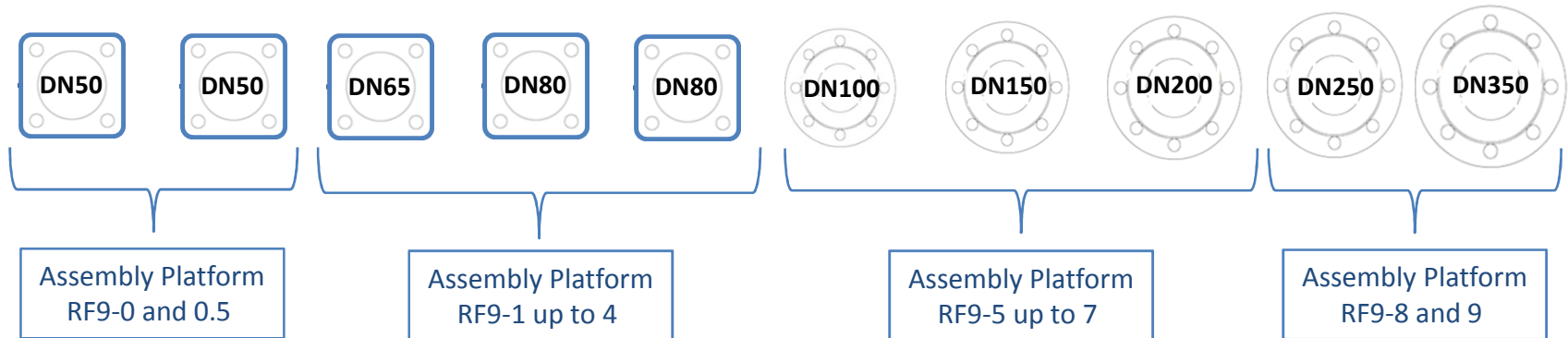
HYDAC Process Technology GmbH
Hindenburgstr. 266-268, 41224 Solingen, Germany
Tel. +49 (0)212 646-3333
Fax +49 (0)212 646-3330
E-Mail: process@hydac.com
www.hydac.com
2014-07-02

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RF9 Product Range

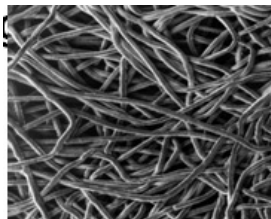
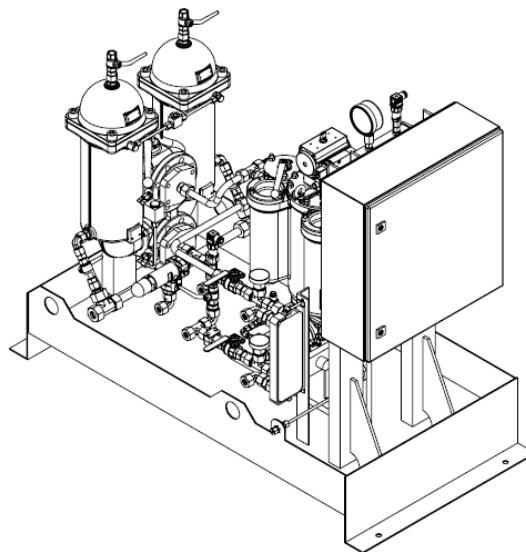


RF9-0 Chambers: 2	RF9-0.5 Chambers: 3	RF9-2 Chambers: 3	RF9-3 Chambers: 4	RF9-4 Chambers: 6	RF9-5 Chambers: 4	RF9-6 Chambers: 6	RF9-7 Chambers: 8	RF9-8 Chambers: 6	RF9-9 Chambers: 8
1x Element Ø85 x 200		1x Element Ø85 x 400			1x Element Ø125 x 400			4x Element Ø85 x 400	
2.384cm ² <i>in operation</i>	4.768cm ² <i>in operation</i>	9.536cm ² <i>in operation</i>	14.304cm ² <i>in operation</i>	23.840cm ² <i>in operation</i>	27.480cm ² <i>in operation</i>	45.800cm ² <i>in operation</i>	64.120cm ² <i>in operation</i>	95.360cm ² <i>in operation</i>	133.504cm ² <i>in operation</i>
4.768cm ² <i>total</i>	7.152cm ² <i>total</i>	14.304cm ² <i>total</i>	19.072cm ² <i>total</i>	28.608cm ² <i>total</i>	36.640cm ² <i>total</i>	54.960cm ² <i>total</i>	73.280cm ² <i>total</i>	114.432cm ² <i>total</i>	152.576cm ² <i>total</i>



Filtration Zündöl für DF Motoren mit 1 μ -3 μ m (absolut, β 2) Elementen

**Beispiele ausgeführter Zündölmodule.
Geforderte Verschmutzungsstufe 11/8/7 nach ISO 4406.**



Metal fleece

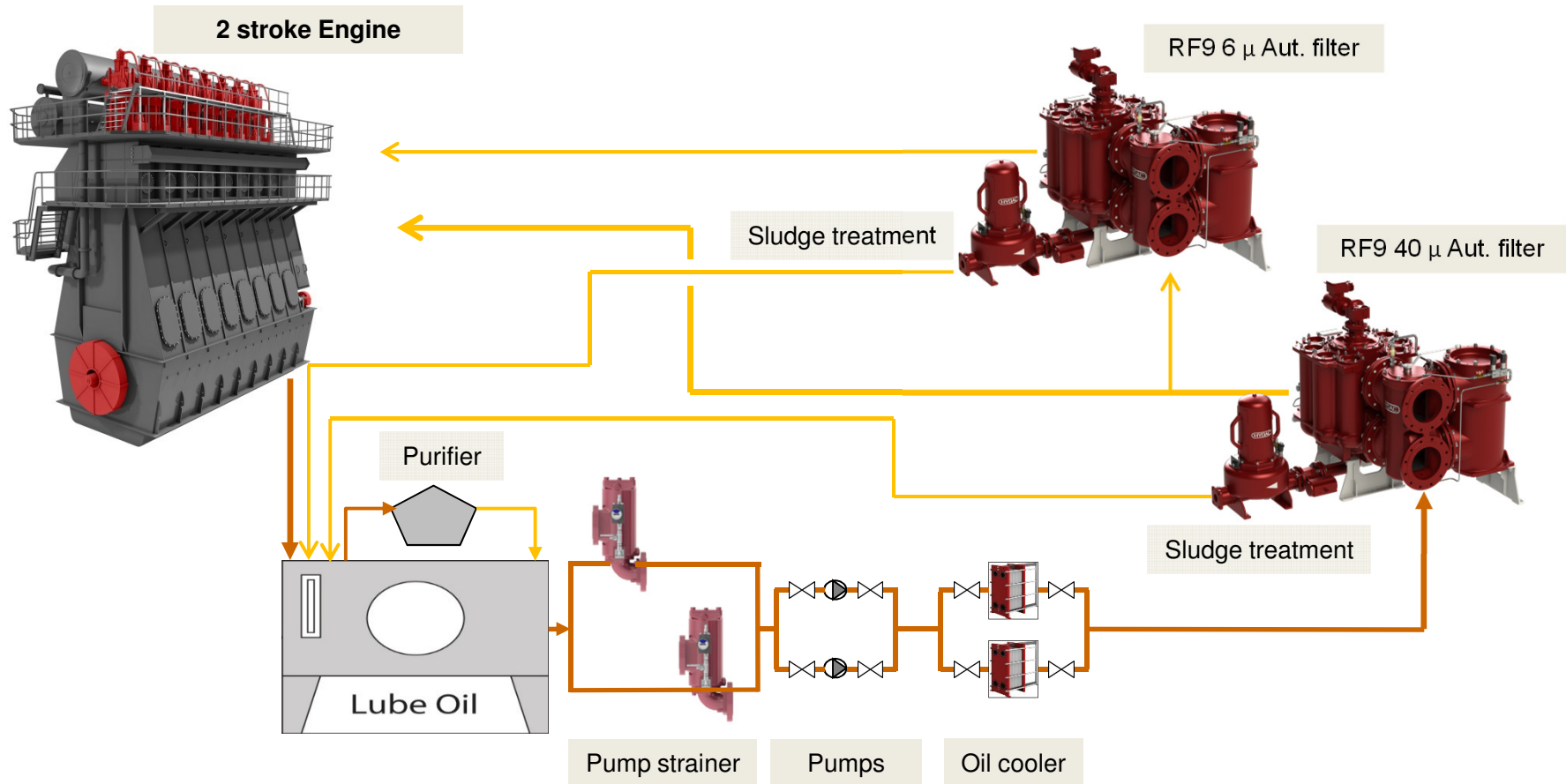
Feldtest auf Containerschiff mit MAN ME Motor

Filtration von Servo Öl am MAN 2 Takt Motor: RF9-7

- Phase 1: Einbau RF9 mit $\beta_{6\mu} = 2$
- Phase 2: Ölpflege über STU
- Phase 3: RF9 umrüsten von $\beta_{6\mu} = 2$ auf $\beta_{3\mu} = 2$
- Phase 4: MAN Approval

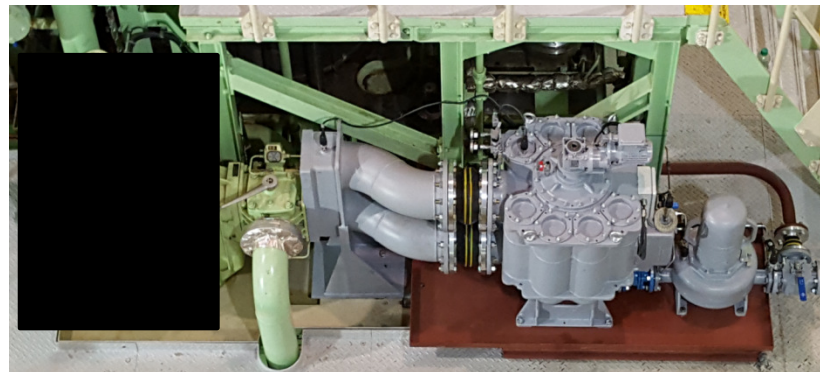


ME Engine and Hydraulic Oil Filter



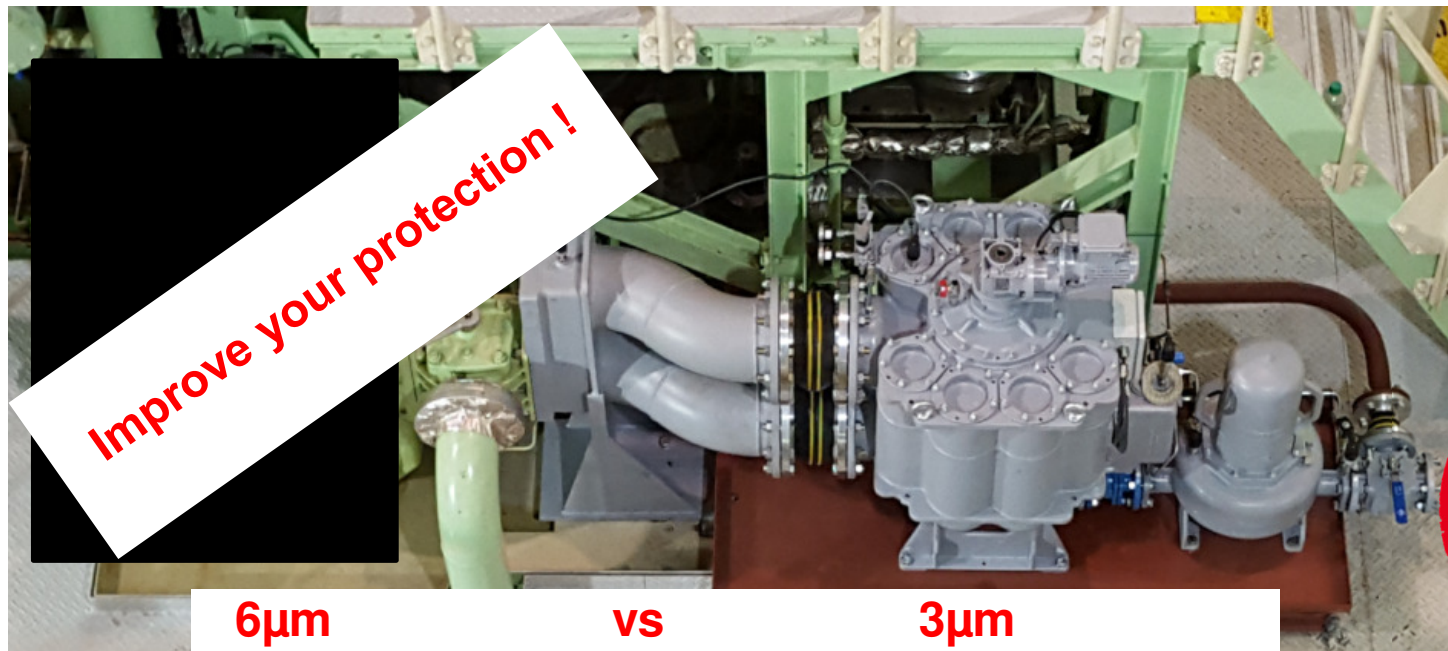
1. RF9 + STU – Installation für Servo Öl

- Installation 17. – 21.02.2017 während einer Werftliegezeit.
- Öl Probenentnahme: nach je 200h bis 1000h, danach alle 500h bis zum Testende
- Spezifikation:
 - RF9-7 DN200 mit $\beta_6=2$ Metallvlies Elemente
 - Sludge Treatment Unit (STU) mit PM 6 Element
 - Installiert direkt neben dem existierenden Automatikfilter
 - Reederei und HYDAC führen die Planung und Installation in Eigenregie durch
 - MAN, Reederei und Hydac analysieren alle Proben
 - Im Oktober 2017 Umbau auf $\beta_3=2$ Metallvlies Elemente



RF9 + STU – Installation für Servo Öl

- ISO 4406, Zulässige Verschmutzungsklasse xx/16/13 (MAN Vorgabe) wurde durch Einbau des RF 9 + STU – Filterkonzeptes erreicht.
- MAN Approval für den RF9 für Servo Öl Filtration von MAN ME Motoren im März 2018



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**MAN Approval
for HYDAC RF9 Auto Filter**

MAN Diesel & Turbo



Certificate of Approval

This is to certify that

Hydac Process Technology GmbH

Hirschbachstrasse 7, 66280 Sulzbach/Saar, Germany

is approved by MAN Diesel & Turbo for the design, manufacture and supply of:

**ME filter
Oil filter for ME Engines**

for MAN Diesel & Turbo two-stroke diesel engines in accordance with the Terms and Conditions stated in Appendix A.

issued on 2018-03-27

expires on 2023-03-27

Certificate no.: 2700-2018-637.0

MAN Diesel & Turbo


Svend Ørgreen


Jens Nørby Hansen

Improve your protection !



Mehrwert, additional benefit

Partikelanzahlung	Partikelgrößen (ISO-Nr.)		
Automatischer Partikelzähler	> 4 µm _{eq}	> 6 µm _{eq}	> 14 µm _{eq}
Mikroskopische Zählung	---	> 5 µm	> 15 µm

ISO Code (nach ISO 4406)	Partikelanzahl/100ml		Ermitteln mit...
	von	bis	
5	16	32	...elektronischem Partikelzähler 21 / 18 / 15 >4µm _e >6µm _e 14µm _e
6	32	64	
7	64	130	
8	130	250	
9	250	500	...mikroskopischer Auszählung - / 18 / 15 >5µm _e 15µm _e
10	500	1000	
11	1000	2000	
12	2000	4000	
13	4000	8000	
14	8000	16000	
15	16000	32000	
16	32000	64000	
17	64000	130000	
18	130000	260000	
19	260000	500000	
20	500000	1000000	
21	1000000	2000000	
22	2000000	4000000	
23	4000000	8000000	
24	8000000	16000000	
25	16000000	32000000	
26	32000000	64000000	
27	64000000	130000000	
28	130000000	250000000	

- **Einhaltung der von MAN vorgeschriebenen Verschmutzungsklassen xx/16/13.**
- **Geringere Ausfallwahrscheinlichkeit der Hydraulik-Komponenten**
=> **Erhöhte Betriebssicherheit (Motorstart, Umsteuern,)**
- **Verlängerte Standzeiten der Hydraulik-Komponenten (Hydraulikpumpen, FIVA, etc. => Kosteneinsparung**



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Thank you for your attention !

C.Springfeld

