



Water Processing

Pall Disc-Tube®
Filter Technology



Filtration. Separation. Solution.SM

Pall Disc-Tube® Filter Technology



A world leader - Pall Corporation

Pall Corporation, a global innovator for over half a century, now boasts the broadest-based filtration and separation product lines in the world. With annual sales of over one billion dollars and 9,000 employees in 27 countries, Pall has established itself as an international company providing world class solutions.

Pall's philosophy is simple and clear: to adhere to the very highest international quality and environmental standards, globalizing all efforts to better support customers.

Investment in all areas is the key to galvanizing those efforts - and with their reputation for innovation, technical excellence, total quality and, above all, dedication to customer satisfaction, Pall Corporation's future is both assured and limitless.



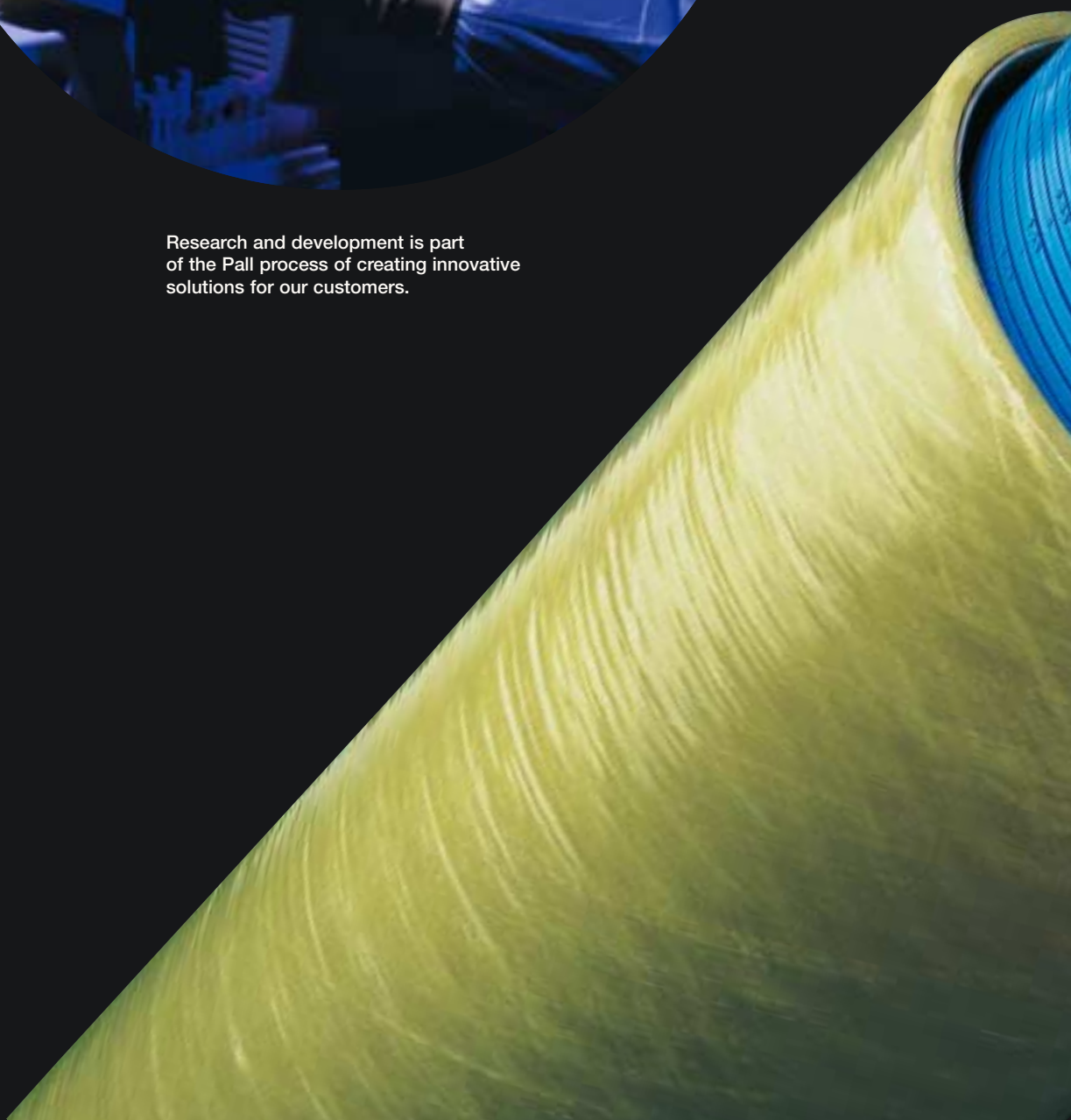
Section of wastewater treatment system at Ihlenberg, Germany



Trailer mount leachate processing system



Research and development is part of the Pall process of creating innovative solutions for our customers.



Investing for the future - Research and Development



Research and Development

Pall's dedication to R & D is second to none. At major Pall research centers in the USA, Great Britain, and Japan, scientists are developing innovative filtration solutions which will advance liquid/solid separation technologies. Pall Corporation has also invested heavily in product development which resulted in a state-of-the-art Disc-Tube® Filter Module that offers outstanding filter performance, reliability and economy.

Investing for the future - Scientific and Laboratory Services

Scientific and Laboratory Services

A principal element in Pall's customer support operations is its Scientific & Laboratory Services (SLS) department, which places Pall's own technical resources at the disposal of its customers, thus providing a vital service link between Pall and the users of its filtration products. Scientists at SLS work closely with top-level scientists in all areas of industry, assessing and developing filtration systems and solutions for the future. The sole objective in providing this service is to ensure that customers who select Pall filtration equipment are completely satisfied with its performance and that the engineered solution ensures Pall's highly-prized reputation for consistent quality and economy of operation.

A wide range of applications for DT Technology

Applications for Pall filtration equipment fall into the following categories:

- The remediation and softening of groundwater, particularly at hazardous waste sites.
- The desalination of seawater on board ships, at resorts - or offshore oil/gas production platforms.
- The filtering and cleaning of leachate at solid waste landfills.
- The filtering and softening of surface water
- The treatment of industrial wastes to permit safe discharge and water reuse.
- The treatment of cooling tower boiler blowdown.



Pall SLS specialists are available for on-site testing and analysis.

Applications Technology

Advanced Filtration Processes

Pall uses reverse osmosis, ultrafiltration and nanofiltration processes in its filtration equipment - and these are considered to be state-of-the-art procedures in leachate filtration, water purification, desalination and food technology.

Typical reverse osmosis membranes achieve over 98% salt retention and can completely separate contents with a molecular weight over 100. However, salt retention in ultrafiltration is minimal. Due to limits imposed by using large pore size membranes, molecules above a molecular weight of approximately 1000 are retained. To address this matter, nanofiltration processes have recently been developed, allowing for the manufacture of new nanofiltration membranes which have retention capabilities between molecular weights of 100-1000.

The transmembrane pressure difference applied is between 75 and 450 PSI, which is less than needed to

achieve similar flow with reverse osmosis membranes. Typically, the output per module is 2 times higher than that obtained with reverse osmosis membranes.

Ion-selectivity is a significant feature of nanofiltration; salts with monovalent anions - such as chlorides - are able to pass through the membrane. However, salts with polyvalent anions - such as sulfates - are retained. This ion-selectivity takes place because negatively charged groups in the membrane prevent large polyvalent anions from reaching the pure water permeate.

For these reasons, nanofilters are often used to enhance wastewater recovery, as when concentrate from a reverse osmosis upstream filtration process is then passed through a nanofilter to further dewater the waste.

Nanofilters also process municipal water supplies to remove organic matter without the need to introduce additives such as coagulants or activated carbon.

DT Module

Specifications of the DT Module

Hydraulic disc material: ABS

Membrane area per (1) meter module: $7.65\text{m}^2 / 82.3\text{ ft}^2$

Module Length: 1m / 3.3ft

Operating pressure, up to: 120 Bar* / 1800 psi

Feed flow range: 250-1,500 l/h** / 13.2-396 gph

Inside diameter pressure vessel: 202 mm / 8 inches

Operating temperature, up to: 45°C / 113°F

* Operating pressure: 70 Bar - fiberglass housing
120 bar - stainless steel housing

** The standard DT Module with an output of 5,000 l/24h (1,320 GPD) permeate from seawater feed operates at p=60 Bar (870 PSI) and with a feedwater flow of Q=870 l/h / (185 GPH).

Breaking new ground in filtration technology - Reverse Osmosis

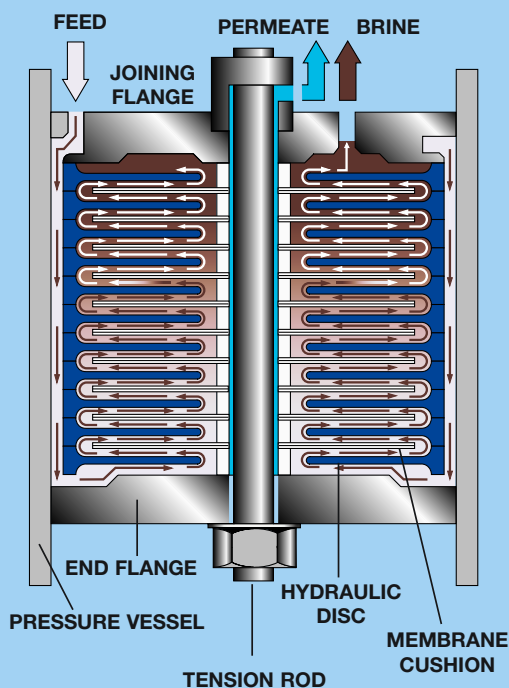
The DT Module (Reverse Osmosis)

The Pall Disc-Tube (DT) Module uses the principle of Reverse Osmosis (R/O) for the molecular separation, desalination and purification of liquids. Its success is due to its unique cross flow construction of its stacked membrane discs, which enhance membrane performance. It operates effectively and economically at high particulate loadings (up to 2500 ppm), providing high recovery rates without the degree of fouling or scaling that is typically associated

with other R/O configurations. It

removes organic and inorganic pollutants, including heavy metals and ammonia, and even hazardous substances are reduced to the very low levels required by the most stringent regulatory criteria.

Applications include ground water remediation, particularly at hazardous waste sites, treating industrial wastes to permit safe discharge and water reuse, processing leachate at solid waste landfills, and the desalination of seawater.



Construction Profile of the DT Module

The Disc Membrane Stack is housed in an 8-inch pressure vessel and assembled on a center tension rod using stainless steel end flanges. A membrane spacer (which forms the open feed water channel) and a permeate manifold are designed as an integral part of the hydraulic disc. A standard hydraulic disc is molded in ABS, covering the membrane cushion without putting the pressure on the surface of the membrane. An O-ring seals off the pure water manifold in the center of the disc from the feed water. The extremely short feed water path across the membrane surface, followed by a 180° flow reversal, greatly reduces polarization concentration and biofouling, while minimizing static fouling and scaling. The permeate drains from the cushion's intermediate layer into the manifold, encountering minimal resistance.



Reliable operation, simple maintenance, great economy

Simple Maintenance and Operational Reliability

The patented Pall Disc-Tube Filter Module requires less maintenance, fewer changeouts/cleaning over other reverse osmosis systems. The membrane inside the Disc-Tube filter assembly has a long lifespan for wastewater applications such as leachate treatment, and design capacity is maintained by use of *in situ* cleaning. Lifespan for desalination applications is greater than 5 years. The DT module operates at pressures up to 1800 psi. Continuous system operation and constant product quality is maintained and monitored by an electronic control system, which can detect any problem and initiate an automatic response. Availability and economy of operation are assured at all times.



Pall Desalination System

DTF Module



Specifications of the DTF Module

Hydraulic disc material: ABS

Membrane area per module: 5m²/53.8 ft²

Module length: 2.25m/7.4 ft

Operating pressure, up to: 40 Bar/580 psi

Feed flow, up to: 15000 l/h/3960 gph

Inside diameter pressure vessel: 123 mm/4.9 inches

Innovative solutions for liquid and solid separations - Nanofiltration



The DTF Module (Nanofiltration)

The Pall Disc-Tube Filter (DTF) Assembly has many of the design features of the DTM Module. However, it is a rectangular open-channel membrane module, with membranes held firmly and safely in place by hydraulic spacers, while the membrane cushions are ultrasonically welded with an internal permeate carrier.

The membranes and hydraulic spacers are enclosed between two half-cylinders to form a segment, and the complete DTF Module is formed by the joining of several segments. The open channel hydraulics result in a very small pressure loss, while maintaining a high liquid velocity across the membrane surfaces to minimize fouling or scaling. The open channel DTF Module is selected when using high flux membranes such as nanofiltration or ultrafiltration media.



DTF Nanofiltration System

Domestic Reply Card

If you would like more information on the Pall Corporation range of filtration equipment, please complete this card and mail it to us, or fax it to the following number: (001) 516. 484. 3637.

1. What best describes the way in which you would use our products?
- Groundwater remediation
 Desalination (shipboard/offshore/resorts)
 Leachate (municipal or industrial)
 Surface water purification
2. What type of contamination do you wish to remove?
- NOM/TOC Pesticides
 Color Heavy metals
 Odor CBOD
 Turbidity COD
 Fe and/or Mn TSS
 Virus TDS
 VOC
 Cysts & oocysts
 N Compounds
3. Please indicate your application flow range.
- 3000 - 25,000 gpd
 25,000 - 50,000 gpd
 50,000 - 100,000 gpd
 100,000 - 300,000 gpd
4. Would you like an application engineer to call you?
 YES NO
5. Would you like to be added to our mailing list?
 YES NO

Please provide us with your mailing information.

Your name: _____
Title: _____
Company: _____
Address: _____
City: _____ State, district or county: _____
Postal code: _____ Country: _____
Fax: _____ E-mail address: _____
Telephone: _____ The best time to call is: _____

Code: DT 100b

International Reply Card

If you would like more information on the Pall Corporation range of filtration equipment, please complete this card and mail it to us, or fax it to the following number: (001) 516. 484. 3637.

1. What best describes the way in which you would use our products?
- Groundwater remediation
 Desalination (shipboard/offshore/resorts)
 Leachate (municipal or industrial)
 Surface water purification
2. What type of contamination do you wish to remove?
- NOM/TOC Pesticides
 Color Heavy metals
 Odor CBOD
 Turbidity COD
 Fe and/or Mn TSS
 Virus TDS
 VOC
 Cysts & oocysts
 N Compounds
3. Please indicate your application flow range.
- 3000 - 25,000 gpd
 25,000 - 50,000 gpd
 50,000 - 100,000 gpd
 100,000 - 300,000 gpd
4. Would you like an application engineer to call you?
 YES NO
5. Would you like to be added to our mailing list?
 YES NO

Please provide us with your mailing information.

Your name: _____
Title: _____
Company: _____
Address: _____
City: _____ State, district or county: _____
Postal code: _____ Country: _____
Fax: _____ E-mail address: _____
Telephone: _____ The best time to call is: _____

Code: DT 100b



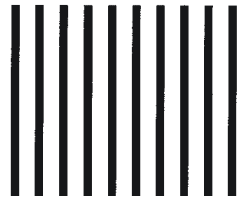
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PORT WASHINGTON NY 11050-9827



Water Processing

Pall Corporation

2200 Northern Boulevard
East Hills, New York 11548-1289

888.873.7255 toll free
516.484.5400 phone
516.484.3696 fax

FRANCE

Pall France

3 Rue des Gaudines
BP 5253
F 78 175
St Germain en Laye Cedex

(33) (0)1 30 61 38 00 phone
(33) (0)1 30 61 38 98 fax

GERMANY

Pall Wassertechnik GmbH

Stenzelring 14A
D-21107 Hamburg

(49) 040 752 794 0 phone
(49) 040 752 794 42 fax

Pall GmbH

Philipp-Reis Strasse 6
D-63303 Dreieich

(49) 06 103 3070 phone
(49) 06 103 34037 fax

UNITED KINGDOM

Pall Europe Ltd.

Europa House
Havant Street, Portsmouth
Hampshire, England PO13PD


(44) 023 9230 3303 phone
(44) 023 9230 2506 fax

Visit us on the Web at www.pall.com/water

Select-A-FAX* 1.516.942.0523

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