Product Brochure | Global Chemicals

Chemicals

THERMAX

PFAS Removal using Tulsion® Ion Exchange Resins

LET'S AVOID PRINTING TO REDUCE OUR CARBON FOOTPRINT

Responsible Care® OUR COMMITMENT TO SUSTAINABILITY

DUN & BRADSTREET ESG REGISTERED™

Conserving Resources, Preserving the Future.

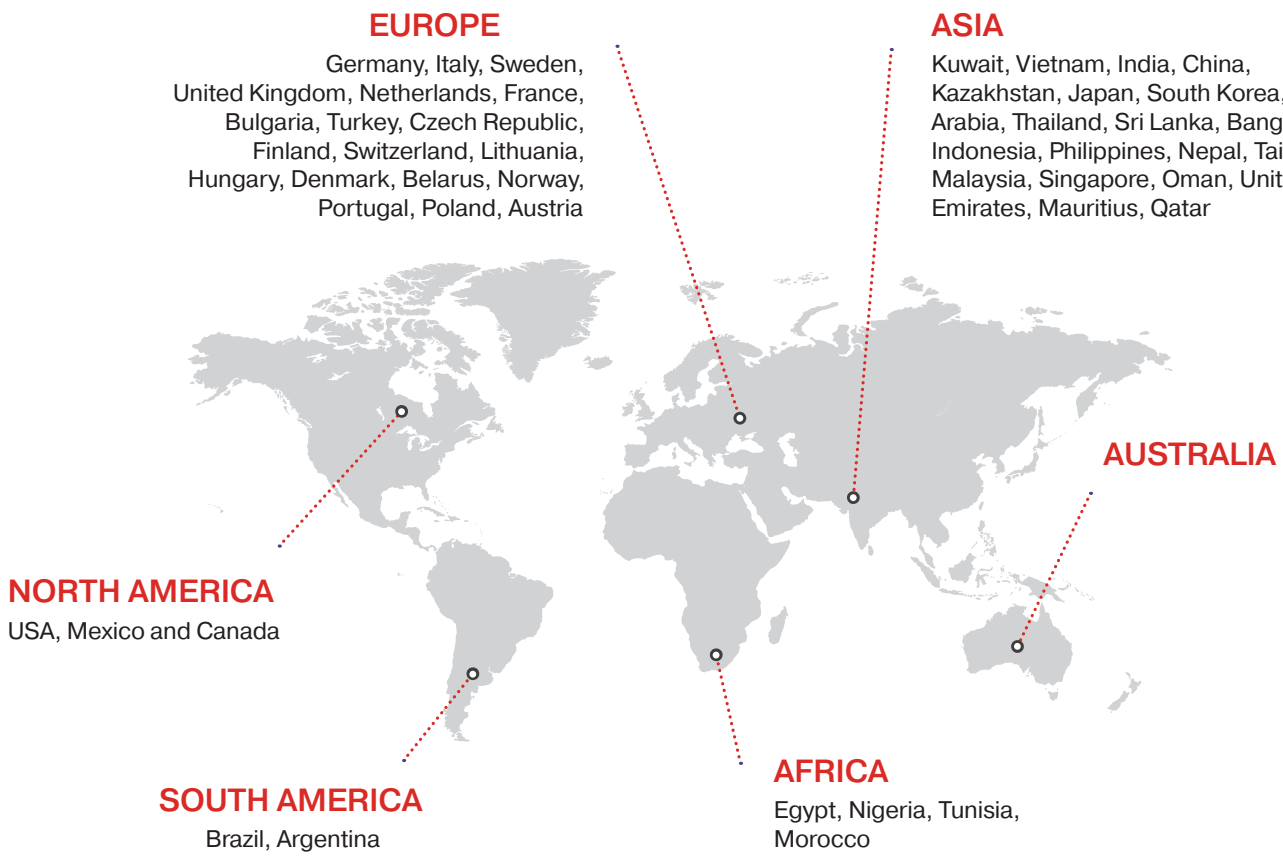
Thermax is a leading conglomerate in the energy and environment space and a trusted partner in energy transition. Thermax's extensive portfolio includes clean air, clean energy, clean water and chemical solutions. Backed by its longstanding industry partnerships across multiple sectors, Thermax has cultivated strong expertise in audit, consulting, execution, and maintenance coupled with digital solutions, ensuring a unified energy-management experience. Leveraging its distinctive engineering capabilities, Thermax converts costs to profits while protecting the environment – a win-win for the industry and society at large.

Chemical Division

Thermax Chemical Division manufactures and markets a wide range of specialty chemicals that help improve processes and product performance across various industries. As Asia's leading manufacturer and exporter of TULSION® brand ion exchange resins and a pioneer in the field of fuel and water treatment chemicals, Thermax also supplies paper chemicals, oilfield chemicals, and construction chemicals. Powered by technological expertise and capabilities honed over four decades and backed by a strong dealer network, the Chemical Division serves customers across the globe and supports the entire range of Thermax's energy and environment businesses.

Backed by extensive R&D experience and equipped with modern research and state-of-the-art manufacturing facilities, the business has built a client base in the USA, Japan, Southeast Asia, India, and the Middle East. Our business is about providing effective customer solutions through innovation, development, service, and cooperation. Our dynamic teams focus their energy and resources on offering the very best solutions to customer needs.

Customer Reach



Why Choose Us?

Value Added Services

At Thermax, we offer free-of-cost plant audits, design proposals, post-sales technical support, and a very efficient and experienced research and development team that understands customer requirements to the last detail.

Manufacturing Excellence

Our resin manufacturing plant at Dahej, Gujarat, India is a fully automated plant with a state-of-the-art DCS system and the latest digital technologies. We use clean fuel and modern air scrubbing units that are environmentally friendly. Every batch of Tulsion® ion exchange resins is manufactured under carefully controlled process parameters and follows a rigorous quality assurance protocol. We have already commenced Phase II of our Dahej facility to cater to the growing global market demand.

Thermax has two other manufacturing facilities at Paudh, Maharashtra, India, and Jhagadia, Gujarat, India for ion exchange resins and performance chemicals, respectively.

Product Customisation

Our research and development team consists of highly experienced professionals in the field of ion exchange resins and specialty polymers who can understand the depth of customer requirements and provide customised solutions in complete accordance with customer expectations.

On-Time Technical Support

Our technical support team ensures quick response time to our customers and connects them to our product management team, who can understand their problems, troubleshoot, and provide optimal solutions.

Other Certifications and Memberships

Halal Certification

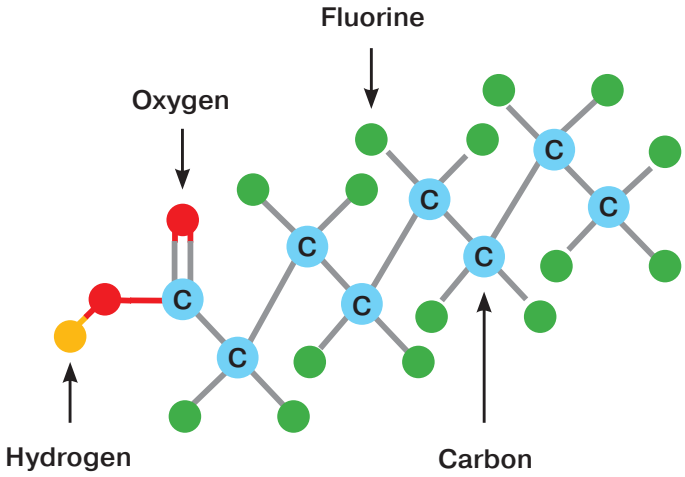
KOSHER Certification

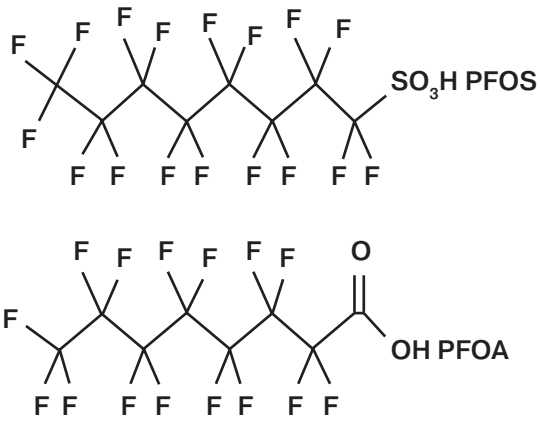
ISO 14001 : 2015,
ISO 45001 : 2018
ISO 9001 : 2015

REACH Accreditation

Overview

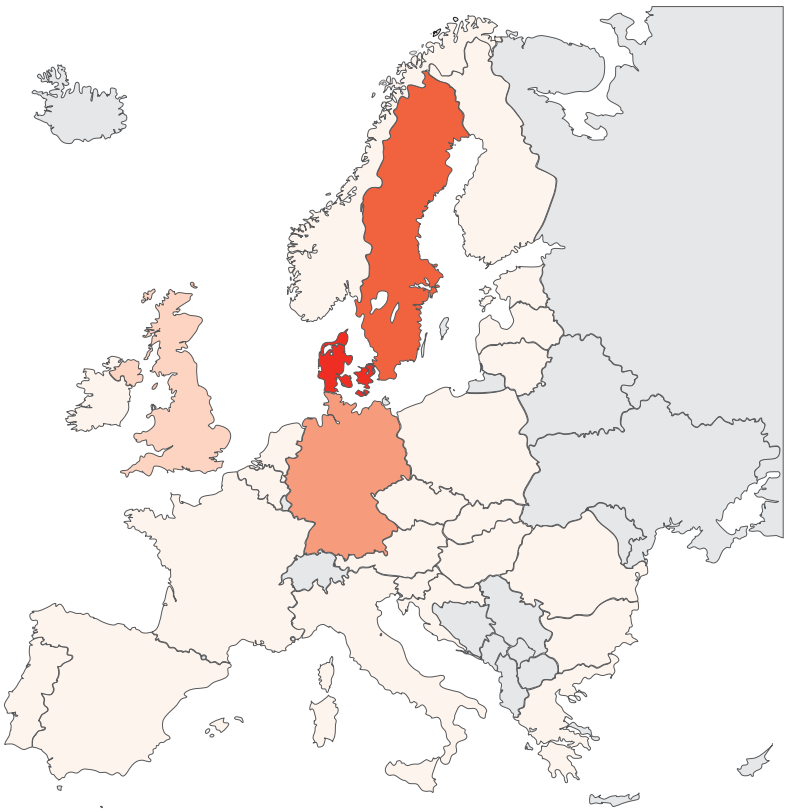
Per-fluoro alkyl substances (PFAS) refer to the group of more than 4000 chemicals that consist of strong carbon-fluorine bonds with either carboxylic or sulphonate group with 4 to 12 carbon atoms in the chain. These compounds typically have a molecular weight ranging from 100 to 700 g/mole. Perfluorooctanoic acid (PFOA) and perfluorooctane sulphonate (PFOS), are the most important degradation products of PFAS. These two substances are known to be persistent, bioaccumulative and toxic (PBT). PFAS are extensively used in industrial, commercial, consumer products and household applications, with a diverse mixture of PFAS in varying concentrations depending on the product. It can be found in paints, shampoo, and nonstick cookware; some firefighting foams and in a wide range of products from fast-food packaging to photographic imaging, semiconductor, automotive, and aviation industries.





Numerical PFAS Limits in Europe

- PFAS-4 total: 2 ppt
- PFAS-4 total: 4 ppt
- PFAS-4 total: 20 ppt
- PFAS-20 total: 100 ppt
- PFAS-47 total: 100 ppt per PFAS
- No regulations



1 ppt = 1ng/l
Source: Roland Berger

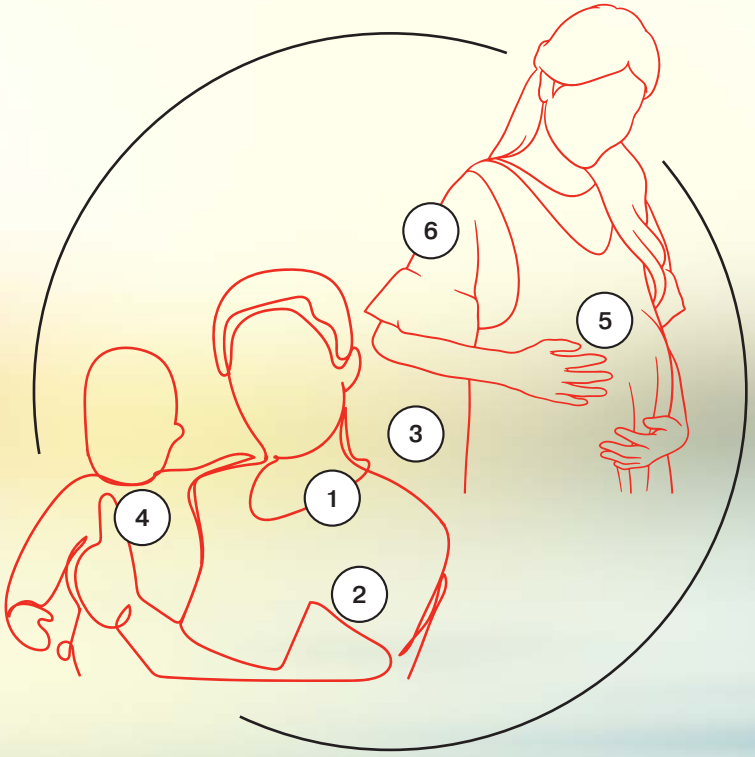
Health Hazards

The widespread use of PFAS in industrial and consumer products has contaminated the air, soil and water (groundwater and surface water) to that level can cause potential health hazards. People are most likely exposed to these forever chemicals by consuming PFAS-contaminated water or food, using products made with PFAS, or breathing air containing PFAS.

PFAS are found at parts per billion in water. If they are not removed from the human body, they can cause adverse health effects including developmental effects on foetus in pregnancy, liver damage, cancer, reduced immunity and thyroid effect.

PFAS Exposure May Lead

1. Increased risk of thyroid disease
2. Increased blood cholesterol levels
3. Decreased body's response to vaccines
4. Lower infant birth weight
5. Reduced fertility in women
6. Increased risk of high blood pressure and preeclampsia

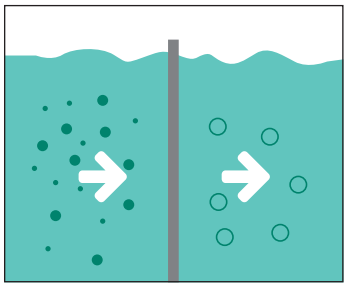


Technologies to Remove PFAS

PFAS removal from water can be accomplished using one of three technologies: reverse osmosis, activated carbon and ion exchange treatment. Activated carbon treatment can be referred as the most studied treatment for PFAS removal while reverse osmosis has been found extremely effective at removing PFAS. The ion exchange process for PFAS removal is more effective in eliminating short-chain PFAS which do not get removed during carbon-based adsorption processes.

In industrial applications, depending upon the use and purpose, the desired quality of the demineralised water changes. Further depending on the desired quality, ion exchange resin columns can be configured and an optimum scheme can be designed to suit the quality of water required. The various schemes along with the expected output quality, benefits, and disadvantages are mentioned below for your reference:

Reverse Osmosis



High capex/operating cost

High energy consumption

Block the membrane pores

Large wastage of effluent

Activated Carbon

Low media cost

Activation required high energy

Fouling rate is very fast

Less selectivity

Long EBCT so required large in quantity

Ion Exchange

Less capital cost

Can be regenerable

Reduce fouling due to robust structure

High selectivity and operating capacity

Less EBCT so required less in quantity

Easy to change and dispose of by incineration

Tulsion® Ion Exchange Resins for PFAS Removal

Tulsion® PFR-630 N

Product Features	Chemical Characteristics
Highly selective resin for short-chain compounds	Cellular, quaternary ammonium functionalised matrix
Provide the lowest residual leakage	Highly selective functionality for PFAS family
Used for final polishing	Reduce interference of sulphate and other anionic species
High operating capacity	High operating capacity

Effectiveness of Tulsion® Ion Exchange Resins in PFAS Removal

Tulsion® PFR-630 N has been extensively studied to verify the PFAS removal from water with contamination varying from 10 to 32 PPT. Figure 1 illustrates the PFAS breakthrough as a function of the effluent concentration (C) over the influent concentration (Co). A value of ~1.0 subsequently indicates that a complete breakthrough has been reached. In examining figure 1, the efficiency of PFAS removal follows a clear trend. The sulfonic acid species are better retained than the carboxylic acid species, and the longer chain species are better retained than the shorter chain analogues. By 40,000 bed volumes, all of the carboxylic acid species (including PFOA) had effectively reached a complete breakthrough. The sulfonic acid species continued to be removed at varying degrees out to 100,000 bed volumes. PFOS, in particular, was still being removed at a rate of about 80% by 100,000 bed volumes.

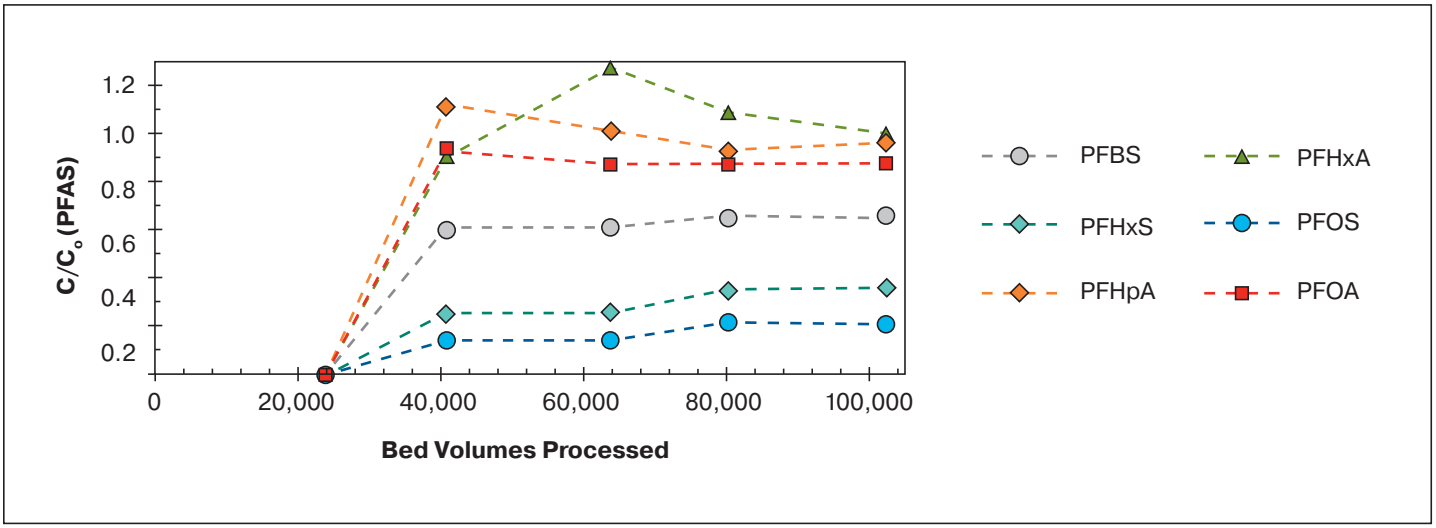


Figure 1. Profile of PFAS Breakthrough with TULSION® PFR-630 N

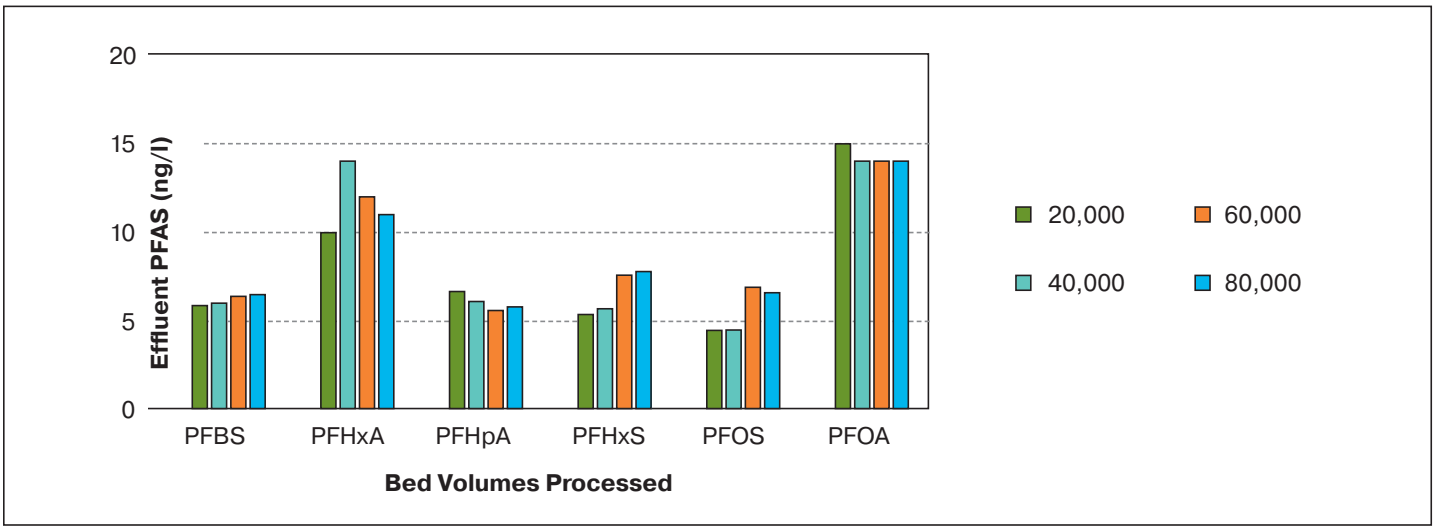


Figure 2. Profile of PFAS in column effluent with Tulsion® PFR-630 N resin

Tulsion® PFR-630 N resin was shown to be effective at removal of sulfonic acid species of PFAS out to 1,00,000 bed volumes and has been also proved suitable though less effective for removing carboxylic acid species with all 3 carboxylic acid species reaching complete breakthrough by about 40,000 bed volumes.

Conserving Resources,
Preserving the Future.

THERMAX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Cooling


Projects and Energy Solutions


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Water and Waste Solutions

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The photographs used in the brochure are indicative and may not match the actual product images.

For further details, please contact Thermax's technical expert.

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Europe

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