National Separations (Pty) Ltd

Vat Reg. No: 4590181071
Company Registration No: 2000/021418/07
P O Box 2062, Halfway House, 1685

Johannesburg Office
Telephone: (011) 315-5456/6037
Fax: (011) 312-2009
E-mail: salesjhb@natsep.co.za

Cape Town Office
Telephone: (021) 886 9157
Fax: (021) 886-9078
E-mail: salesct@natsep.co.za

Durban Office
Telephone: 082-413-0369
Fax:031 562 8386
E-mail: salesdbn@natsep.co.za

Thank you for the opportunity of allowing us to introduce our company.

National Separations (Pty) Ltd is a wholly owned South African company that seeks to offer and provide value added filtration solutions in critical market applications. The company currently has three Sales offices, one in the Western Cape and one in Gauteng and one in Durban. The collective filtration experience is over 50 years in markets such as Food & Beverage and Pharmaceuticals, as well as many industrial applications.

National Separations has formed alliances with Global Separation Technology companies in order to provide you the client, the most cost effective filtration solution. By combining excellent products with years of filtration expertise and an exceptional service ethic, National Separations seeks to become your first choice for filtration and separation. National Separations has supplied general filtrations consumables as well as various turnkey water and fluid purification systems- locally in SA as well many international locations.

Our main range of filtration products will come from Sartorius AG in Germany and Amazon Filters in the UK for whom we are the sole distributors in sub-Saharan Africa. These products complete include filter cartridge systems generally used in the clarification and purification of liquids, process fluids in any manufacturing process as well as a range of products used in laboratories pertaining to filtration and microbial control and testing.

In the Pharmaceutical industry these will

- The prefitration and final sterile filtration of any parenteral and non-parenteral product
- The clarification and filtration of oral products
- The filtration and sterilisation of process gasses used in the process and a variety of other product types.
- Laboratory consumables and equipment for sterility testing and microbial testing
- Air samplers for microbial testing

In the Food and Beverage industry the typical products filtered are

- Filtration and sterile filtration of water for both bottled mineral water and CSD production
- Sterile filtration of wine, beer and mineral and bottled water.
- Prefiltration and final filtration of simple syrup and final product
- The sterilisation and purification of process gasses such as air, carbon dioxide as well as nitrogen

- Filtration of process fluids for cooling water, lubricants and wash water, spray nozzle protections and other general filtration applications.
- Laboratory consumables and equipment for sterility testing and microbial testing
- Air samplers for microbial testing

Sartorius utilize the most advanced computerized production facilities for evaporation and quenching processes as well as surface-modifications for a wide spectrum of our membranes - and we meet the extremely stringent German environmental regulations.Together with our focused application know-how, this is the basis for our wide state-of-the-art product line ranging from ready-to-use articles to customized problem solutions in separation technology

Over and above the supply of general filtration products and the affiliated products that are used in both manufacturing and laboratory scale developments Sartorius has 4 other programs which are offered to customers

1. The “EXPAND” program which incorporated the training of customers in the correct use and testing of filters and products. General training is also covered in this program. These also include Symposias, presentations, and discussions on topics relevant for customers. Training covering general Biotechnology, Mechatronics and Environmental Technology for customers and employees is also carried out under this program.

2. The “INCREASE” program is a service in which specialists form both Sartorius and customers are utilised to optimise manufacturing and validation programs

3. The” GO GLOBAL” program is a program for worldwide key account management in which the large international corporates are linked by one key account manager

4. The “CONFIDENCE “program is utilises the Sartorius laboratory and technical support to help customers with validation of products, processes and testing equipment.

Some of the mutual benefits which can be derived from these programs can be summarised as follows

Feature	**Customer benefit**	**Supplier benefit**
Process Optimisation	High yields, lower costs	Increase in business
Validation services	Avoid problems with regulatory approval-2nd supplier –lower risk	Manage regulatory limits
Sophisticated training programs	Staff aware of latest technologies and regulations	Assures correct handling and performance of products
Global Account Management	Preferential treatment and services	Primary supplier classification
Plant and process surveys	Continuous process optimisation	Best solution provider and increase business
Direct access to R & D	Customised solutions	Innovative products

With regards to **Amazon Filters Ltd** they are specialists in liquid filtration equipment for process industries. They design and manufacture one of the most extensive ranges of liquid filtration equipment on the market, including a large range of high quality filter housings, spun bonded depth filter cartridges and pleated filter cartridges. We are also a leading stockist of many other types of liquid filtration equipment, from bag filter media to rolled medias, hydraulic filters and carbon filters. Amazons expertise in the field of high specification liquid filtration equipment is extensive and they supply some of worlds leading companies from the pharmaceutical, automotive, petrochemical, water treatment and other process industries as our customers and partners.

Supporting these activities, Amazon have superbly equipped design facilities including full 3D modelling capacity, finite element analysis and vessel design calculation packages, a well stocked technical library including the major pressure vessel design codes such as ASME VIII and PD 5500 and many International Standards. Most importantly of all, they have the experience that comes from people who have been working on filter vessel design for many years.

Amazons manufacturing and engineering team are on hand to support production and are continually engaged in developing new and innovative products, and production processes for the future.

National Separations and Amazons customers include the likes of Pfizer, Glaxo SmithKline, Novartis, Roche, Esso, Coca-Cola, Plessey, Proctor & Gamble, Warner Lambert, EMI, Ford, and Daimler-Chrysler.

To compliment the company's premium quality filters and filtration systems, we offer a large range of water purification technologies. on a turnkey basis, to the food and beverage, dairy, pharmaceutical and industrial market sectors. All systems are custom built to suit our customer's specific requirements. These include Microfiltration, Ultrafiltration, Nanofiltration, Reverse Osmosis and Distillation. technologies

The following section covers some detail on the technologies which we offer, and often combine, to the aforementioned industries.

Microfiltration

Microfiltration (MF) is a cross flow membrane filtration process, capable of removing a large range of particulate matter from a water source, these include silt, bacteria, colloidal matter and, with the proper chemistry, metals such as iron and manganese. Micro-filtration operates through a fixed membrane pore size, basically particulate larger than the pore size rating of the membrane, will be retained by the membrane.

Hollow fibre MF membranes can be backwashed, air scrubbed and chemically cleaned to allow for long-term efficient operation at high water recovery rates.

Ultrafiltration

Ultrafiltration (UF) is also a cross flow membrane filtration process, with the major difference between MF an UF, being the removal rating of the membrane. Whilst MF has a removal rating based on the rated pore size of the specific membrane, the UF membrane has a molecular weight cut-off (MWCO)

meaning that all impurities with a molecular weight greater than the membrane's rated molecular weight cut-off will be retained by the membrane.

Ultra-filtration is used for the removal of suspended solids, bacteria, viruses, organics and endotoxins. Hollow fibre UF membranes can also be backwashed, air scrubbed and chemically cleaned to allow for extended membrane life and efficient operation at high water recovery rates.

National Separations make use of the Dizzer® MF and UF membranes supplied by Inge AG. These membranes are selected for their unique membrane cluster configuration. Most hollow fibre MF and UF membranes will have a number of single hollow fibres responsible for the removal of suspended matter, the Dizzer® membrane on the other hand makes use of a more robust Multibore™ configuration, thereby eliminating capillary breakage.

The Dizzer® hollow fibre UF membrane is rated at 150,000 Daltons molecular weight cut-off, with a large surface area for filtration. For instance, the 225mm diameter Dizzer module will have approximately 1800 Multibore™ capillaries, with each Multibore containing seven 0,8mm hollow fibres.

The fibre composition is polyethersulfone with special additives (PESM), a hydrophilic material that resists organic fouling.

The flow pattern is inside-out, in other words, the feed water flows through the inside of the fibres and filtrate passes radially outward trough the membrane walls. Due to the very small pore size of the UF membrane, all suspended matter, including microorganisms, are removed effectively with this technology. Because particles build up a layer on the membrane surface, the water flow direction is periodically reversed to remove this particulate matter, this process is called backwash.

Another major advantage of the Dizzer® UF and MF modules, over other types of hollow fibre modules, is the capability of changing the direction of the feed water into the module. In other words, the membrane is fed from the top for a certain pre-determined time period, and then fed from the bottom, this alternating flow allows for more effective operation of the module, as it is in essence a self cleaning step built-in to the normal forward filtration mode of the membrane. Backwash is an additional step in the process, using filtrate to remove solids from the surface by flowing in the reverse direction through the membrane.

The bacteria and virus removal capabilities of the Dizzer technology makes it the ideal choice for treating surface water and well water for potable purposes. Furthermore, the Dizzer system is also most effective at removing colloidal matter, therefore makes an excellent pre-treatment process for Nanofiltration and Reverse Osmosis systems.

The selection between Microfiltration and Ultrafiltration will be application specific, as it would be a function of the final requirement and the composition of the feed water for that application.

National Separations supplies MF and UF technology into the following industries. The specific applications are also shown in the table below:

Industry	**Application (MF/ UF)**	**Capacity Range**
Food and beverage	• Bottled Mineral Water • Pre-treatment to NF and RO • Carbonated Soft Drinks production • Fruit juice production • Secondary Effluent recovery • Microbiologically pure water for CIP/ rinsing in dairies	From 1000l/hr Filtrate upwards

Pharmaceutical	• Endotoxin Removal (UF Only) • Protein concentration • Virus removal/ concentration (UF Only) • Pre-treatment to RO and other technologies	From 1000l/hr Filtrate upwards
Wine	• Solids removal from process water for bottle/ rinsing • Microbiologically pure water for CIP • Effluent water recovery	From 1000l/hr Filtrate upwards
Industrial	• Solids removal from process water • Pre-treatment to RO systems • Mine water recovery (Gold and Coal Mining) • Effluent water recovery • Drinking water from river, borehole and other surface waters	From 1000l/hr Filtrate upwards

Nanofiltration

Nanofiltration (NF) is a membrane process capable of removing dissolved salts from a water source. The removal capability of the NF membrane is based on a molecular weight cut-off, of approximately 200 Daltons. The feed pressure required to the NF system is normally substantially lower than that for RO, for the same water source, due to the membrane not being as “tight” as the RO membrane.

The NF membrane is very effective in removing divalent ions such as calcium and magnesium, and is often referred to as a softening membrane. In most cases, the configuration of the Nanofiltration membrane is spirally wound, therefore it requires more extensive pre-treatment than a typical MF or UF membrane plant.

Nanofiltration has become a very popular technology in the food and beverage industry as the permeate water will contain a larger percentage of the original composition of the feed water, when compared to reverse osmosis for instance. Therefore the NF membrane will have a lesser effect on the taste of permeate produced. Another reason for the increased popularity of NF for the food and beverage industry, is the efficient removal of micro organisms and organics from the source water. Furthermore, high water recovery rates are obtainable with Nanofiltration, and in many cases systems will be designed and operated at a recovery of approximately 90%.

Due to the lower rejection rates of monovalent ions, such as nitrate and fluoride, Nanofiltration will normally not be selected as the preferred technology for the removal of these ions. The selection of NF as technology, and of course the design thereof, will therefore always be a function of the source to be treated and the required specification of treated water.

National Separations supplies NF technology into the following industries, the specific applications are also shown in the table below:

Industry	Application (NF)	Capacity Range
Food and Beverage	• Product water for carbonated soft drinks • Product water for fruit juice production • Bottled drinking water • Softening of process water • Drinking water production	From 1000l/hr permeate produced
Industrial	• Softening of process water • Selective removal of divalent ions • Boiler feed water	From 1000l/hr permeate produced

Reverse Osmosis

Reverse Osmosis (RO), like Nanofiltration, is a membrane process capable of removing dissolved salts, bacteria and organics, from a water source. The removal capability of the RO membrane is based on a molecular weight cut-off, of approximately 100 Daltons.

The RO membrane is very effective in removing monovalent ions such as fluoride and nitrate. In most cases, when the removal of high levels of fluoride and/ or nitrate is required, then RO would normally be selected as the preferred technology. The configuration of the RO membrane is spirally wound, therefore it requires more extensive pre-treatment than a typical MF or UF membrane plant.

Reverse Osmosis membranes are capable of removing dissolved salts, at an average rate of approximately 99%. RO systems can be designed for a number of different configurations, such as twin array, twin stage, etc., the configuration of the system will be a function of the feed water quality and the purified water specification required.

Twin stage Reverse Osmosis systems are widely used for the production of purified water (PW) and water for injection (WFI) in the pharmaceutical industry, in accordance with the United States Pharmacopoeia specifications.

Due to the higher rejection rate of the RO membranes, the RO system will often have a reduced recovery rate when compared to NF. Most systems, again depending on the feed water analysis, will operate at between 75% and 80% recovery. The selection of RO as technology, and of course the design thereof, will therefore always be a function of the source to be treated and the required specification of treated water.

National Separations supplies RO technology into the following industries, the specific applications are also shown in the table below:

Industry	Application (RO)	Capacity Range
Pharmaceutical	• Water for injection (WFI) in accordance with USP (United States pharmacopoeia) specifications • Purified water (PW) in accordance with USP specifications • Purified water (PW) in accordance with BP (British • Pharmacopoeia) specifications	From 250l/hr permeate produced
Food and Beverage	• Product water for carbonated soft drinks • Product water for fruit juice production • Bottled drinking water • Process water • Drinking water production • Boiler feed water	From 1000l/hr permeate produced

Industrial	• Boiler feed water • Secondary and Tertiary Effluent recovery Purified process water	From 1000l/hr permeate produced

Distillation

National Separations also supplies distillation equipment, mostly into the pharmaceutical industry. Pharmaceutical companies producing water for injection (WFI) under the British Pharmacopoeia Specifications (BP) are required to use distillation technology for manufacturing for their products.

Distillation equipment is used for the production of pure steam and water for injection, a large number of configurations are used to optimize the process and efficiency. The distillation or pure steam generation plants are normally fed through an RO plant, this is to ensure that the evaporator system can operate at maximum recovery, with a reduced potential of hardness scaling in the evaporator.

National Separations supplies distillation equipment into the pharmaceutical industry for the following applications:

Industry	**Application**	**Capacity Range**
Pharmaceutical	• Pure steam generation • Water for injection (WFI) in accordance with BP	From 100l/hr distillate, or 100kg/hr pure steam produced

In summary National Separations as well as Sartorius, Amazon and all our Technology partners are very focussed on industry types and like us will strive to uphold a commitment of overall customer satisfaction whilst maintaining a culture that is focussed on transparency, integrity and humanity. We are committed to maintaining high standards of service and professionalism and look forward to being of service to your company and look forward to a continuing good relationship.