

Assignment briefing

Introduction

For this assignment, you are challenged to find matching water treatment solutions for client requests using a large unstructured dataset containing webpages and pdf files.

Company

Lenntech, is a company based in Delft specialized in designing and manufacturing water treatment and liquid separation solutions, focusing on industrial applications. The company offers turnkey and customized systems across a broad range of technologies and sectors. With a strong commitment to research and development, Lenntech aims to provide innovative and sustainable solutions tailored to meet specific water quality requirements of various industries.



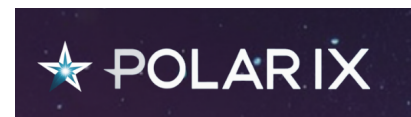
Water treatment solutions of different scales

Mentors

During the assignment, you can ask for assistance from employees of two companies that assist Lenntech in their technical innovations.

Polarix

Team of experts combining the precision of mathematics with the creativity of programming to provide customized AI solutions.



Sping

Digital lab helping individuals, organizations, and society advance with digital innovation and product development.



Dataset

The full dataset contains the public website of Lenntech and all its files. This contains the product descriptions and datasheets for their products with a total of around 9 gigabytes of data sheets.

The data will be available online and also be provided using a USB Hard drive.

The website contains, among other things:

- Product categories
- Product pages + Product Data sheet PDF files
- Catalogs of their products



ULTRA CLEAR® RO PURE WATER SYSTEM

HIGH QUALITY, LOW PRICE

The Ultra Clear® RO Series produces high-quality water with very low energy consumption. The use of "low energy" membranes provide very efficient and economical operation. High-quality material standards guarantee long service life. The Ultra Clear® RO Series uses the newest pump technology, which runs without the traditional e-motor, and operates nearly noiseless. Due to an integrated automatic membrane rinse cycle, in many cases, the systems can operate on untreated city water. Recovery rates up to 75 % are possible with optional water softening.

Product water recovery is up to 50 %, therefore Ultra Clear® RO Series also conserve water. Storage tanks help for the RO systems to provide additional water volume during times of high demand. The storage tank can also be used to supply water for other lab equipment. The storage tank allows higher volumes of water to be used for short periods that would otherwise be limited to the RO system production rate.

A storage tank basically guarantees that water is available when needed. The proper storage tank size and system configuration will be recommended based on application and water volume requirements to ensure optimum service from the equipment. Standard tanks are available in 30, 60 and 80 liter sizes. Optional tank sizes are also available up to 3.000 l.

All systems display inlet and product water quality. The salt reduction rate will be shown in percentage. Most systems on the market have less than 20 % recovery rate. Automatic, user-friendly maintenance alerts notify the operator when system service is required.

Benefits

- Simple change of modules due to quick-fit coupler
- Service/maintenance report
- Scope of supply includes consumables
- Made in Germany

Typical Applications

- Feed for laboratory ultrapure water systems
- General chemistry
- Laboratory washing machines including final rinse
- Feed for autoclaves and environmental chambers
- Buffer preparation

SPECIFICATIONS

	Ultra Clear® RO 30	Ultra Clear® RO 60	Ultra Clear® RO 80	Ultra Clear® RO 100
System Performance				
RO Production rate	1.5 l/h	2.5 l/h	3.0 l/h	4.0 l/h
Recovery rate (typ.)	50 %	60 %	60 %	60 %
Recovery rate for brackish	50 %	60 %	60 %	60 %
Recovery rate for tap water	50 %	60 %	60 %	60 %
Feed Water Specifications				
Pressure	bar	2 - 6	2 - 6	2 - 6
Conductivity	µS/cm	< 2000 ¹	< 2000 ¹	< 2000 ¹
Calcium (mg/l)	500	< 50 ¹	< 50 ¹	< 50 ¹
Total Chlorine	mg/l	< 0.1	< 0.1	< 0.1
Total Iron	mg/l	< 0.1	< 0.1	< 0.1
Phosphorus (mg/l)	5	0.1	0.1	0.1
Water temperature	°C	5	35	35
Power supply	V/Hz	240/50 - 480	240/50 - 480	240/50 - 480
Dimensions (mm/ft)	mm	180 x 180 x 420	180 x 180 x 420	180 x 180 x 420
Flow number		WTF09079	WTF09079	WTF09079

¹ = 100 µS/cm (max.) / °C = water at 10 °C

CONSUMABLES

Item Number	Description	Change Frequency
WTF09079	Pre-treatment module (RO)	3 - 6 months
WTF09080	Conditioning module	3 - 6 months
WTF09081	RO membrane (100%)	2 - 3 years
WTF09082	RO membrane (50%)	2 - 3 years
WTF09083	RO membrane (25%)	2 - 3 years
WTF09084	RO membrane (10%)	2 - 3 years
WTF09085	RO membrane (5%)	2 - 3 years
WTF09086	RO membrane (2.5%)	2 - 3 years
WTF09087	RO membrane (1.25%)	2 - 3 years
WTF09088	RO membrane (0.625%)	2 - 3 years
WTF09089	RO membrane (0.3125%)	2 - 3 years
WTF09090	RO membrane (0.15625%)	2 - 3 years
WTF09091	RO membrane (0.078125%)	2 - 3 years
WTF09092	RO membrane (0.0390625%)	2 - 3 years
WTF09093	RO membrane (0.01953125%)	2 - 3 years
WTF09094	RO membrane (0.009765625%)	2 - 3 years
WTF09095	RO membrane (0.0048828125%)	2 - 3 years
WTF09096	RO membrane (0.00244140625%)	2 - 3 years
WTF09097	RO membrane (0.001220703125%)	2 - 3 years
WTF09098	RO membrane (0.0006103515625%)	2 - 3 years
WTF09099	RO membrane (0.00030517578125%)	2 - 3 years
WTF09100	RO membrane (0.000152587890625%)	2 - 3 years
WTF09101	RO membrane (0.0000762939453125%)	2 - 3 years
WTF09102	RO membrane (0.00003814697265625%)	2 - 3 years
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WTF09199	RO membrane (0.000000000000000000000000000000000240741243048566034861011718750000001612607777832031	

Assignment

Imagine a scenario where a client submits a request to our company, detailing their needs for a specific water treatment solution. The client's request includes descriptions of required specifications and potential applications (see examples below). The model developed through this assignment will be required to:

1. **Analyze the Client's Request:** The model will parse and understand the textual content of the client's description, extracting key features and requirements.
2. **Match with Product Datasheets:** the system will compare the client's requirements with the information contained in our product datasheets.
3. **Recommend Suitable Products:** Based on the degree of match between the client's needs and our product information, the AI will generate a list of suitable products, prioritizing those that best fit the client's specifications.

Bonus / star options

1. **Explainability in reasoning:** Some representation of why a product is a good match based on its characteristics.
2. **Matching products to competitors prices:** To turn a product into an offer we would like to factor in online listed prices from competitors.

Examples

As the full dataset is big, a subset is provided. Note however that the full client requests cannot be answered using this SUEZ subset. For that subset, SUEZ specific requests are added below.

SUEZ dataset

1.

I am looking for a Depth Filter for oil and gas of the brand SUEZ. It should have an outer diameter of 7 centimeters and length of 85.6 centimeters.

Output:

- [products/SUEZ-Hytrex-RX/1194709/1194709-20-337-melt-blown-depth-filter-for-oil-gas-applications/index.html](#)
- [Data-sheets/SUEZ-Hytrex-RX-L.pdf](#)

2.

Need a pleated filter with polyethersulfone membrane that can handle temperatures of up to 75 degrees celsius. Diameter should be 2.75 inch. Should contain a gasket adapter.

Output:

- products/SUEZ-Memtrex-MP/1188394/1188394-MMP921AAB,10.024-pleated-filter-with-polyethersulfone-membrane/index.html
- Data-sheets/SUEZ-Memtrex-MP-L.pdf

3.

Find a SUEZ brand filter for which the Aqueous extracts from contain less than 0.25 EU/ml.

Output: Data-sheets/SUEZ-Flotrex-PN-L.pdf

4.

Find a SUEZ brand filter for which the Maximum Forward Differential Pressure is 60 psi and the Maximum Operating Temperature is 82 C and with no resin binders

Output: Data-sheets/SUEZ-Flotrex-PN-L.pdf

5.

Find a Municipal water systems pre-filtration suez filter:

Output: Data-sheets/SUEZ-Muni.Z-L.pdf

6.

You can form extra examples by selecting a random product from the dataset and describing it as if being a client.

Datasheets + products dataset / Full dataset

1.

“

Provide us with a **reverse osmosis membrane** for the given specifications:

45.4 m³/day production:

99.5% salt rejection

maximum operating pressure of 600 psi

8-inch diameter

and pH range of 2-11

the following reverse osmosis membranes from the brands Toray, DuPont, CSM, Hydranautics, or SUEZ can be considered

“

Output:

"CSM RE8040-BE440-L (Data-sheets/CSM-RE8040-BE440-L.pdf)"

2.

please find a commercially available ion exchange resin with the below characteristics

Basic Features:

Typical Physical and Chemical Characteristics:

Application Selective Removal of Ferric Iron

Polymer Structure Macroporous crosslinked polymer

Appearance Spherical beads

Functional Group Phosphonic+ Sulphonic Acid

Ionic form as shipped H

Iron Capacity min. 18 g/l

Moisture Retention (H) 55-70 %

Mean Size Typical 0.55-0.75 mm

Uniformity Coefficient (max.) 1.40

Specific Gravity 1.19 g/ml

Shipping Weight (approx.) 755-785 g/l

Output: unknown to Lenntech ;)

3.

Find a strongly acidic cation exchange resin from Dupont made of sulfonated polystyrene used for water demineralization in co-flow regenerated units. It is a gel type resin in the hydrogen (H⁺) ionic form with a high total exchange capacity (≥ 1.80 eq/L) and moisture holding capacity (53-58%)

Output: unknown to Lenntech ;)

4.

You can form extra examples by selecting a random product from the dataset and describing it as if being a client.