Water Solutions

FT-Norm PRO Technical Manual

Version 0

January 2022

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Abbreviations

App	Application
FT-Norm PRO	DuPont FilmTec™ Normalization Software
PC	Personal Computer
RO	Reverse Osmosis

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1 Introduction

1.1 Normalization Tools

Normalization tools are commonly used in the industry as a key mechanism to detect performance deviations in Reverse Osmosis and Nanofiltration systems. They assist the user when deciding additional system evaluations or corrective actions to be applied, such as:

- Cleaning in place
- Mapping or probing pressure vessels
- Verifying status of anti-scalant dosing system

FT-Norm PRO, the Next Generation Reverse Osmosis/Nanofiltration systems normalization tool, has been developed to further assist end users to maximize the potential of their installations (Figure 1).



Figure 1. DuPont FT-Norm PRO

1.2 Key App Features

- Available for PCs and mobile devices compatible with Apple and Android
- Users can log an unlimited number of installations
- Intuitive menus for data introduction
- Customizable charts for easier data interpretation
- Data can be imported from existing files and exported in Excel format
- Option to print reports and export in PDF format
- Possibility to request support to a DuPont representative

1.3 Key Technical Features

- Up to 3-stage systems
- Compatible with all Reverse Osmosis and Nanofiltration suppliers
- Available in Chinese and English languages
- Metric/International/Imperial units
- Inclusion of Differential Pressure normalization

1.4 What Is FT-Norm PRO

Reverse Osmosis (RO) and Nanofiltration (NF) operating data normalization is strongly recommended for all RO and NF systems; it allows an early identification of potential problems, such as scaling or fouling.

Fluctuations in operating conditions such as for instance water temperature changes, feed water quality variations, operating flux, or system recovery settings will cause permeate flow, feed pressure and salt passage to change. This is a normal phenomenon which is a consequence of the changes in the operating conditions. But these fluctuations could cause performance deviations due to systems malfunctioning (e.g. fouling, aging, degradation) to go undetected.

A proper data Normalization eliminates the effects of these fluctuating operating conditions and allows monitoring the system performance based on membrane properties alone, showing the true performance and condition/health of the RO/NF membranes themselves.

FT-Norm PRO is an online tool from DuPont which makes the data normalization process simple and accessible at all times, allowing for effective monitoring of your RO system and timely execution of corrective measures.

Normalization formulas can be found in the FilmTec™ Reverse Osmosis Membranes Technical Manual, which can be accessed through the link below.

https://www.dupont.com/resource-center.html?BU=water-solutions&shared-asset=Doc-45-D01504-en.pdf

A video introducing the key functionality of FT-Norm PRO can be found in the link below.

https://www.youtube.com/watch?v=IhS-SpQNh94

2 Accessing FT-Norm PRO

2.1 Web Access

FT-Norm PRO can be accessed from the web app through the link below.

https://dupontwaterapp.com/en/tool/ft-norm

The tool can also be accessed through the DuPont Water Solutions webpage through the link below, along with other calculation tools.

https://www.dupont.com/water/resources/apps-calculators.html

2.2 Mobile App

FT-Norm PRO can also be installed in mobile devices that includes Apple (iOS) and Android devices through Apple App Store or Google Play Stores, respectively, using the links provided below.



https://apps.apple.com/es/app/dupont-waterapp/id1568668956



https://play.google.com/store/apps/details?id=com.dupont.dupontwaterapp

3 Step by Step User Manual

3.1 Log In / Register

FT-Norm PRO front page is shown in Figure 2. The main page describes the FT-Norm PRO tool and features an “Access” button. The tool is available in English and Chinese languages, which can be selected in the captions on the top right corner of the page.

To start using FT-Norm PRO, and email and password is required, hence users need to register upfront. The log-in access form can be seen in Figure 2.

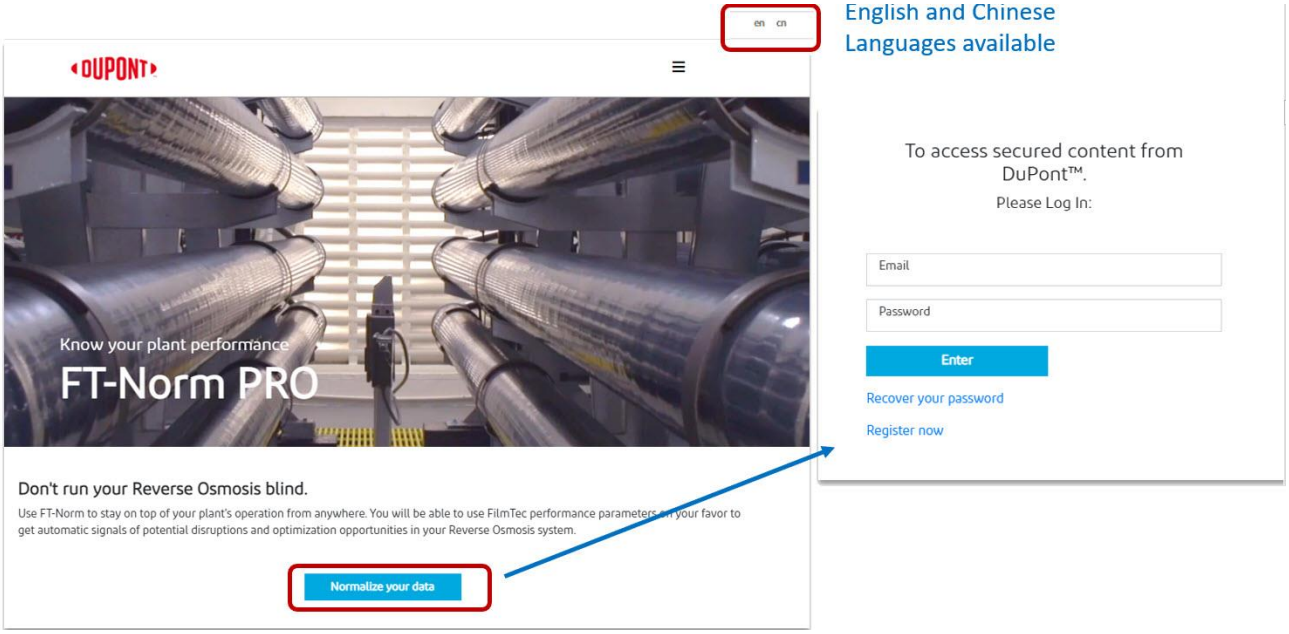


Figure 2. FT-Norm PRO – Front page and Log in screen

3.2 Add a New System Data

Once logged-in, the recorded installations will be populated. To add a new installation in the FT-Norm PRO, click “add new installation” as shown in Figure 3.

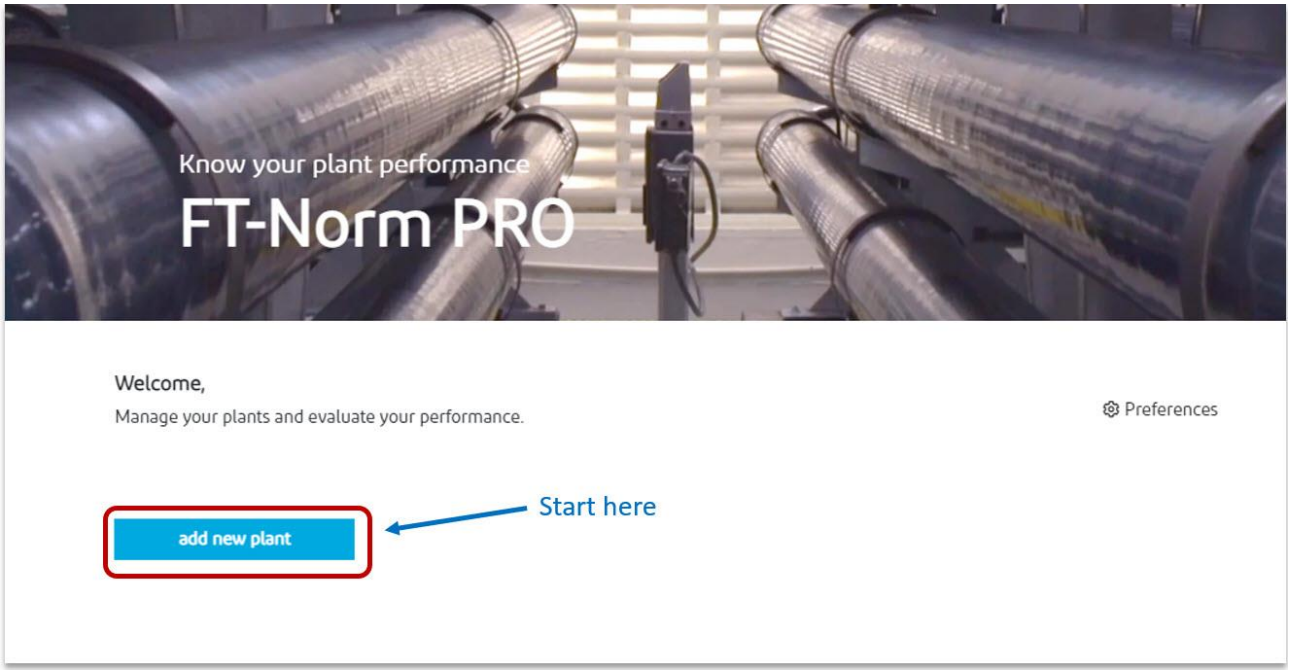


Figure 3. FT-Norm PRO – Add new installation

3.3 Edit Installation

After adding a new plant, the menu shown in Figure 4 will appear, where the user will be able to add information for the new plant such as name, location, number of stages, membrane model, membrane active area, number of pressure vessels, and number of membrane elements in each pressure vessels. Preferred units can also be selected: metric, international, or imperial. User can select the number of stages of the system as well. Options include single stage system, 2-stage systems, and 3-stage systems.

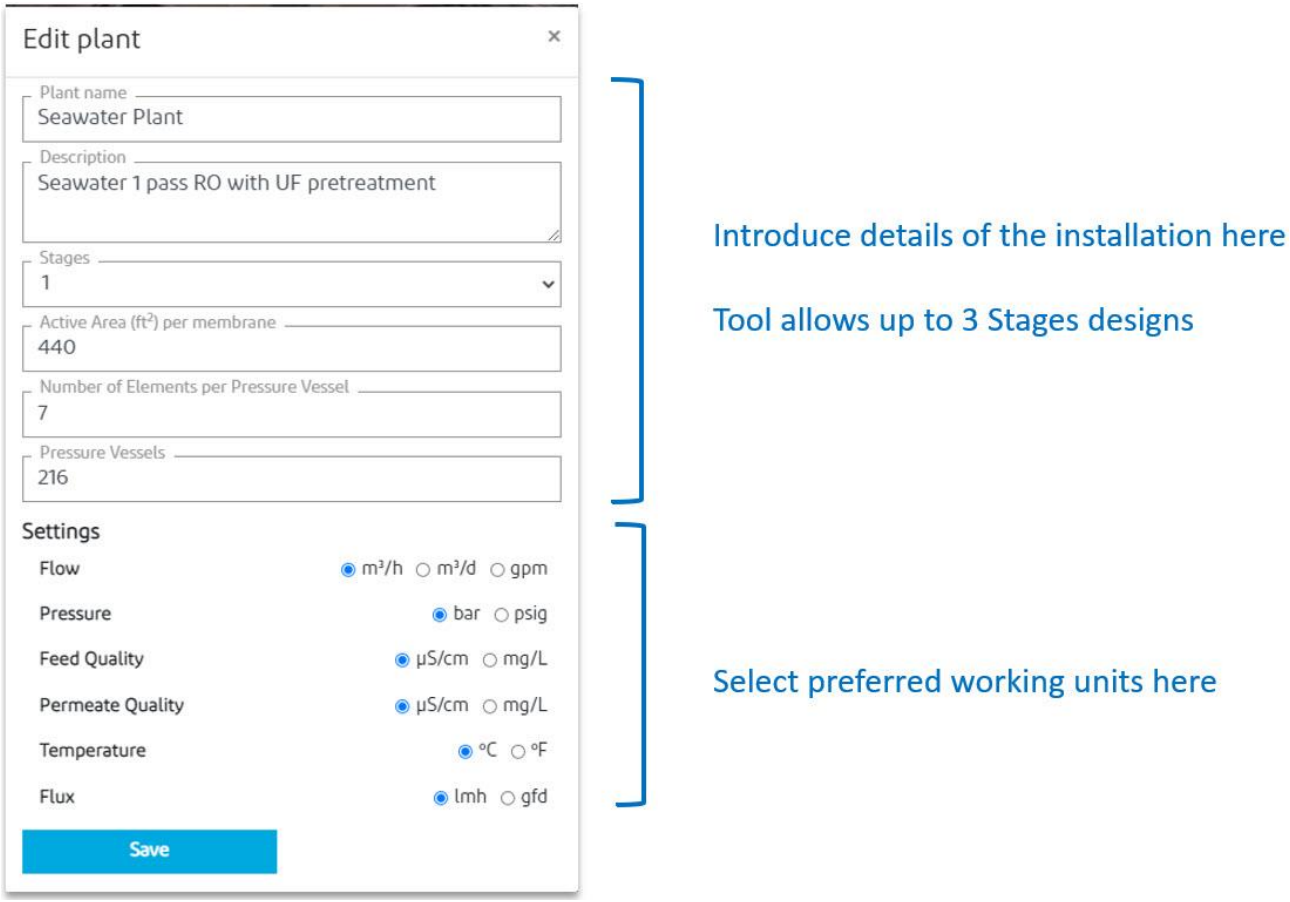


Figure 4. FT-Norm PRO – Installation overview and configuration

4 Data Introduction

4.1 Go to your installation

To start adding data, click on the button “Go to your installation”, as shown in Figure 5.

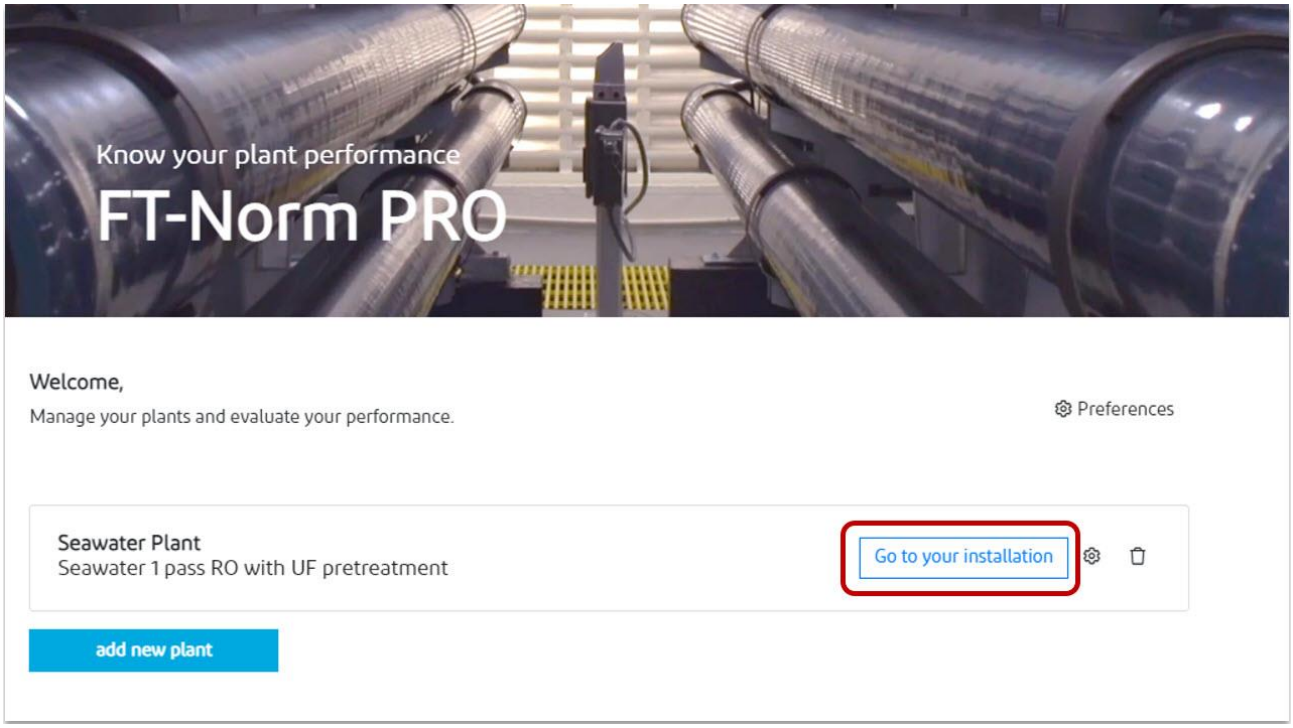


Figure 5. FT-Norm PRO – Go to your installation

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4.2 Add Reference Condition

Before adding data to the installation, the reference conditions must be set up. This can be done by clicking on “add reference conditions” button, as shown in Figure 6. Typically, the design conditions as per projections or the system start-up data is used as reference data.

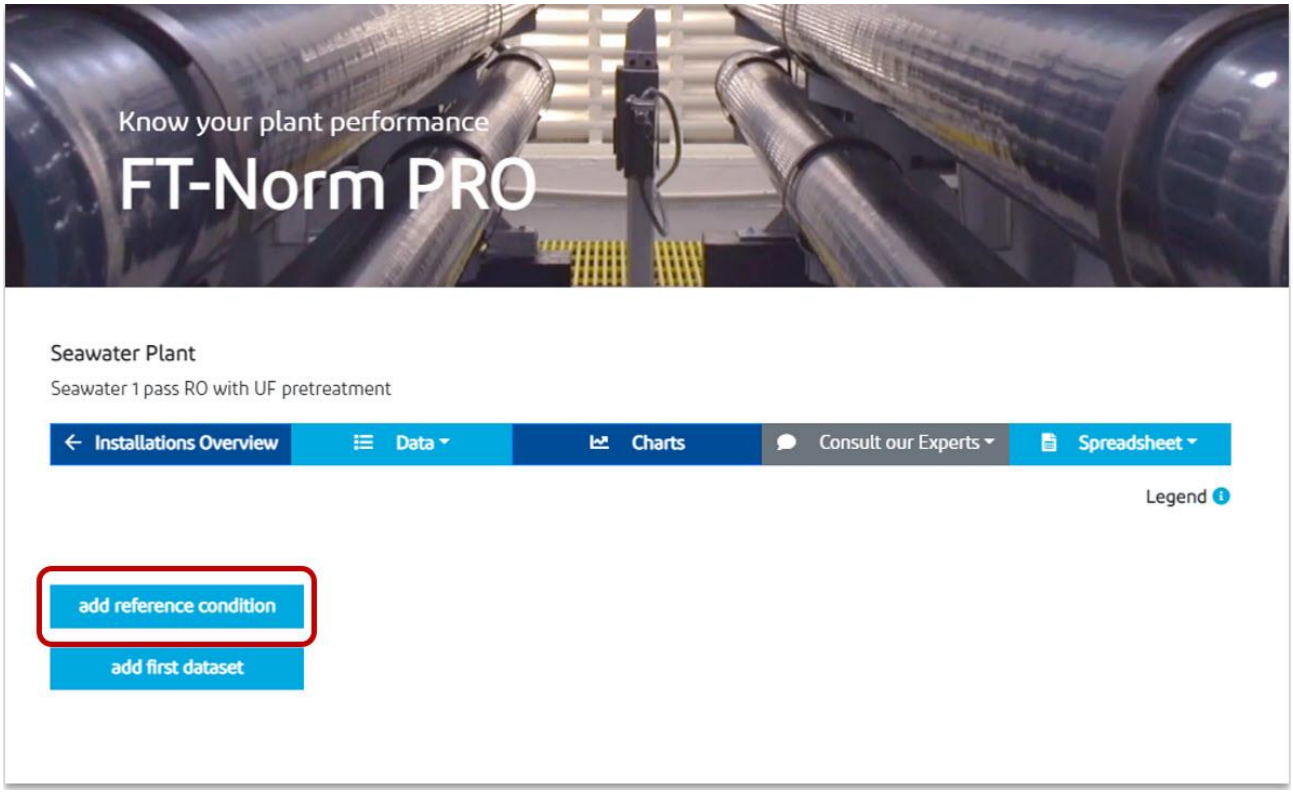


Figure 6. FT-Norm PRO – Add reference conditions

The interface to add reference conditions is shown below in Figure 7, where feed temperature; feed and permeate flows; feed, permeate, and concentrate pressures; and feed and permeate quality can be added.

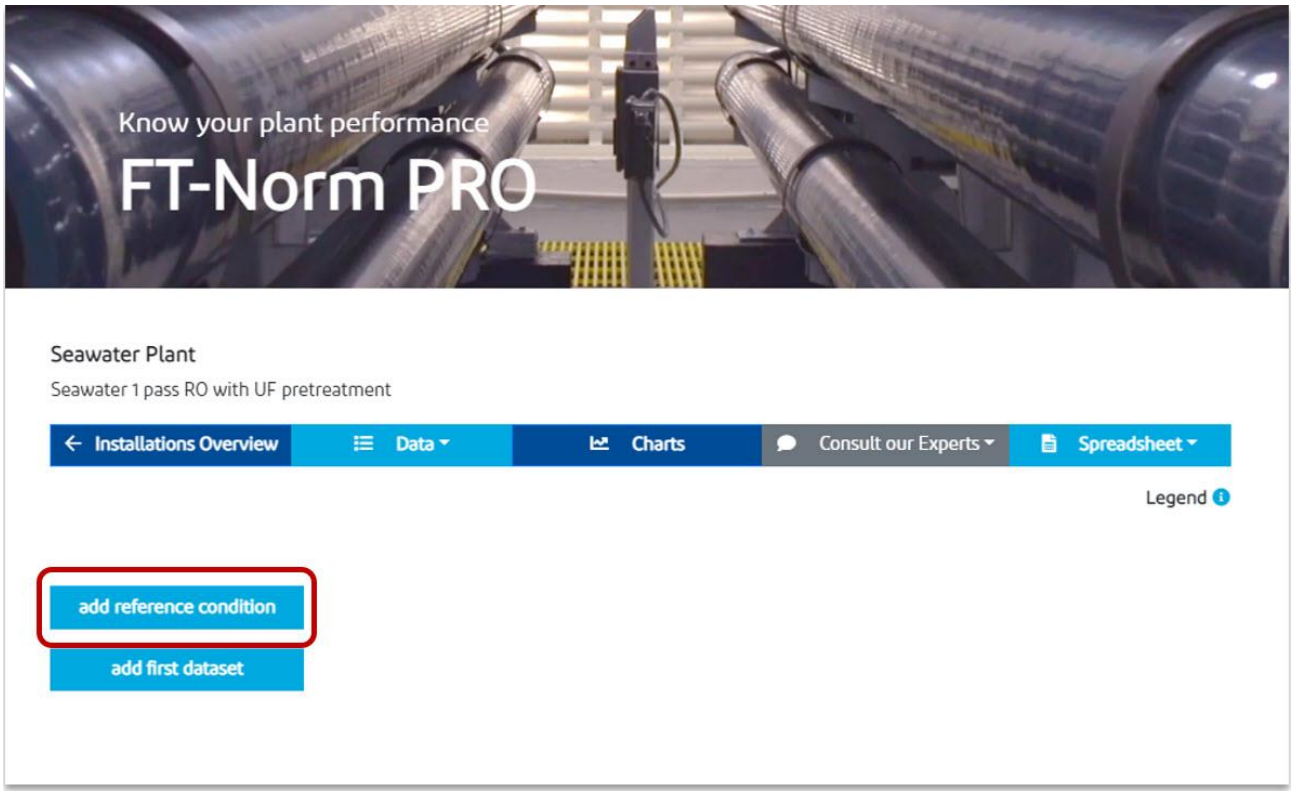


Figure 7. FT-Norm PRO – Reference conditions input data page

4.3 Tablet View – Add New Data

Data in Tablet View can be added by clicking the button “add new dataset”, as shown in Figure 8.

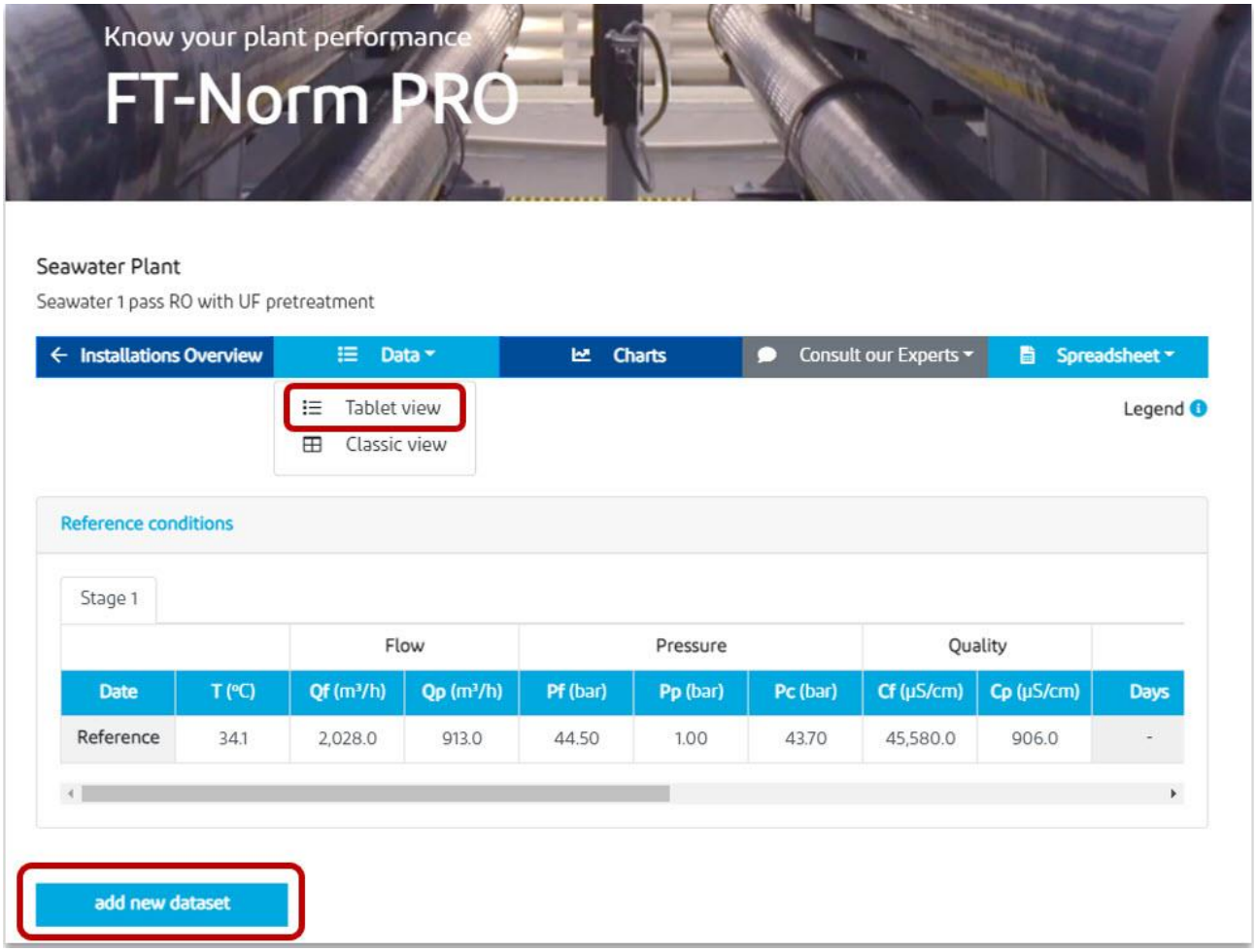


Figure 8. FT-Norm PRO – Adding data in tablet view

Tablet View option allows introduction of Data Sets one by one and it is more suitable for mobile devices and tablets use. It allows introducing time apart from date, for multiple sets of data within the same date. A similar interface as shown in previous section to input the data is shown in Figure 9.

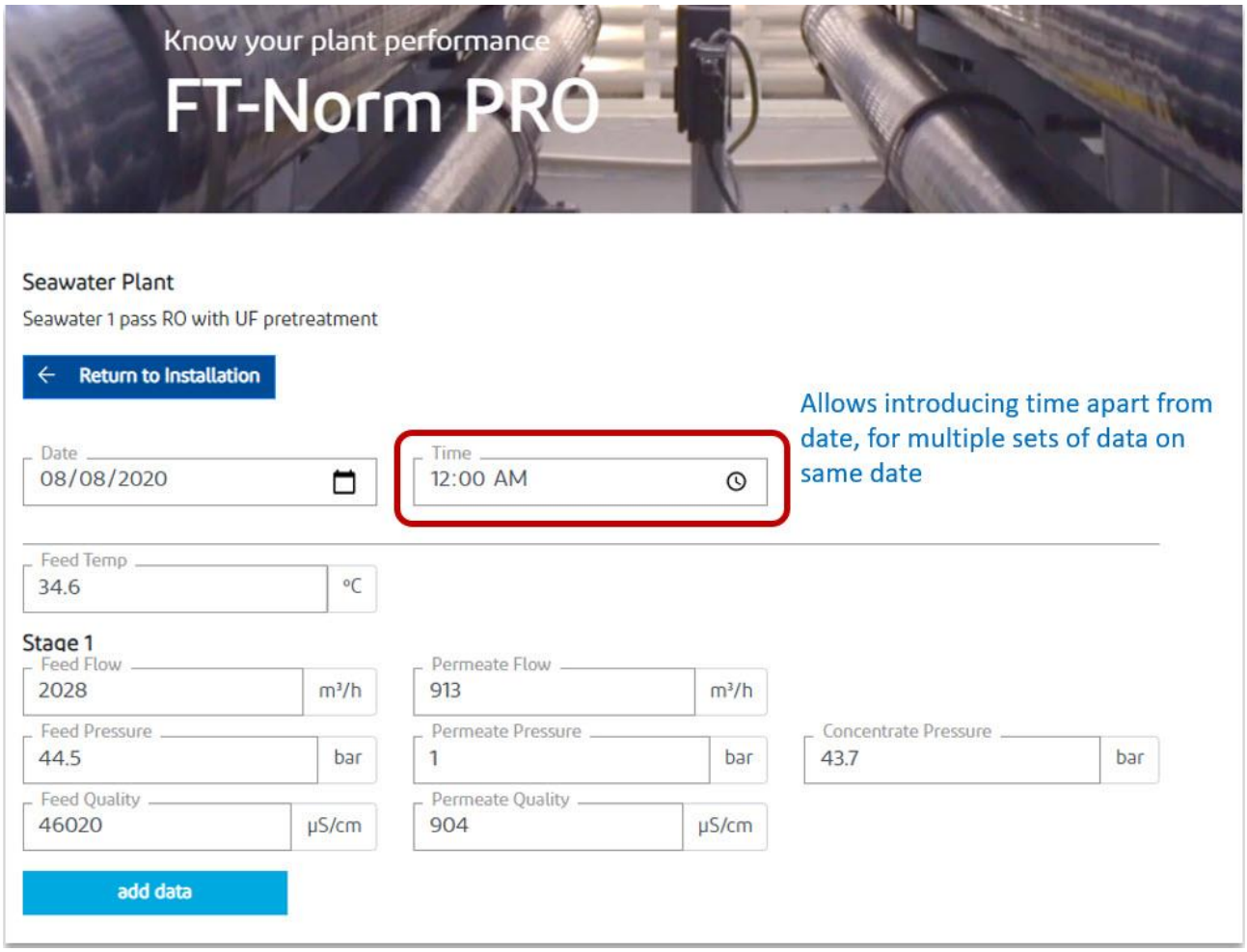


Figure 9. FT-Norm PRO – Adding data

4.4 Classic View – Add New Data Set

The Classic View option allows to copy and paste whole columns from an existing data file or import data from a standard Excel-based FT-Norm file. It is more suitable to be used with computers (PC). Simply add new data in the last empty row. When added, a new blank row will be created to enable the continued addition of new data. Introduced data must be saved by clicking on "save data" button. In order to import data from an existing file, click on the "import data" button at the bottom of the page. Please note that dates need to be imported in "yyyy-mm-dd" (year-month-day) format from the source file. To download the template, click on the link "Use this template". After data is imported, it will be automatically populated and calculations will be displayed on the right gray-shaded columns. This is shown in Figure 10.

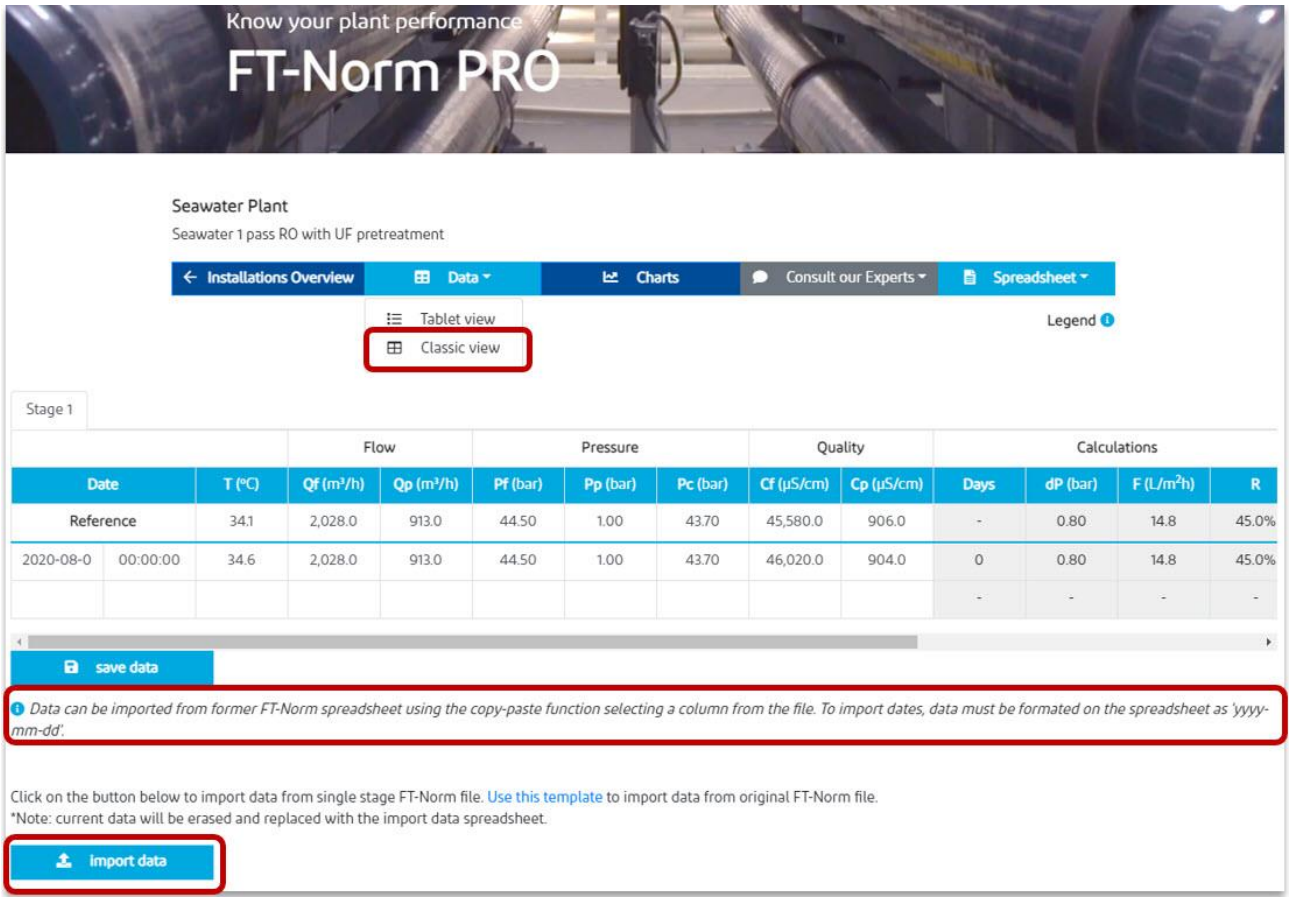


Figure 10. FT-Norm PRO – Classic view and import data feature

An example of imported data is shown in Figure 11.

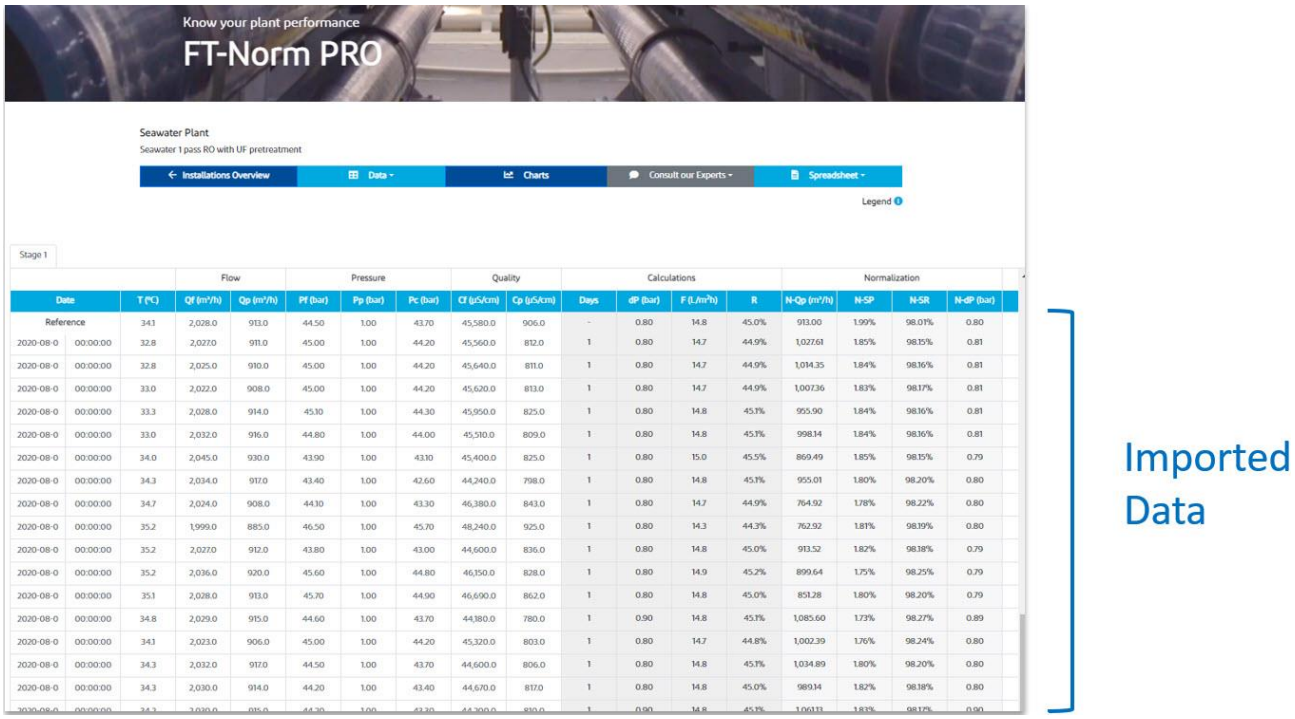


Figure 11. FT-Norm PRO – Import data

4.5 Legend

Click on Legend to get a description of the acronyms used in the tool's data table, as shown in Figure 12.

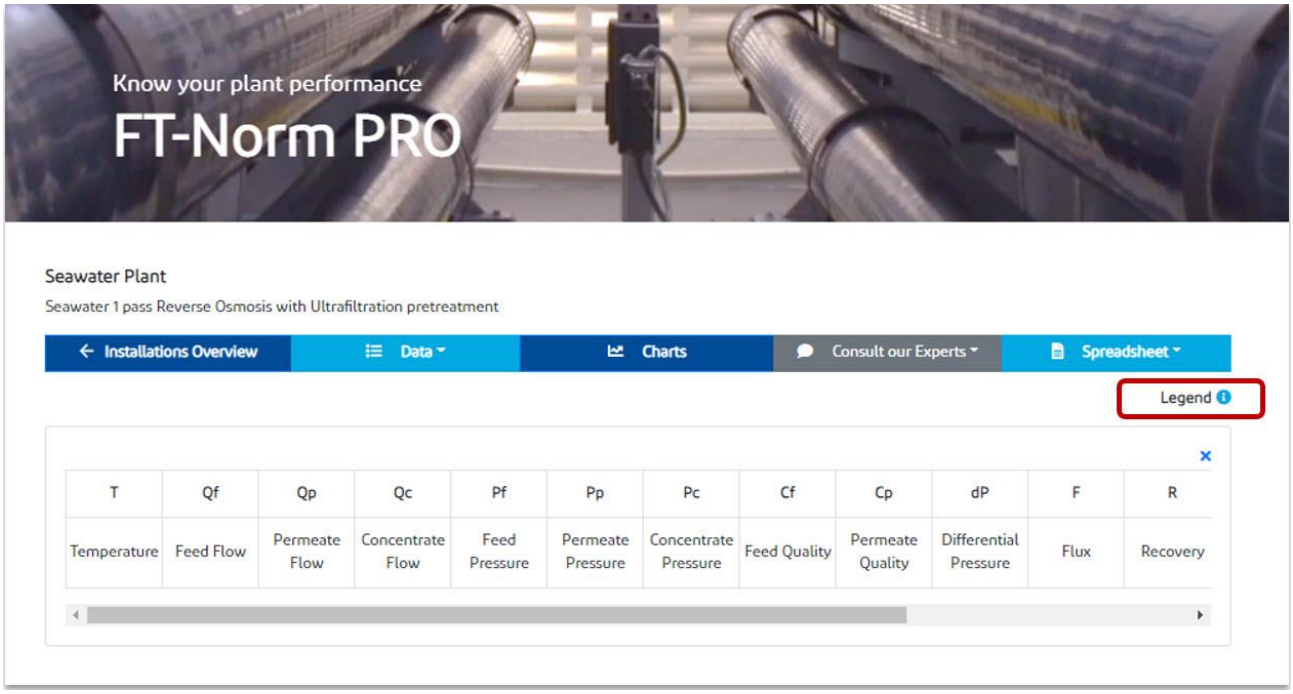


Figure 12. FT-Norm PRO – Legend

4.6 Data Download

Data can be downloaded to an Excel-based spreadsheet by clicking on the top menu tab “Spreadsheet”, and then selecting “Download Spreadsheet”. This is shown in Figure 13.

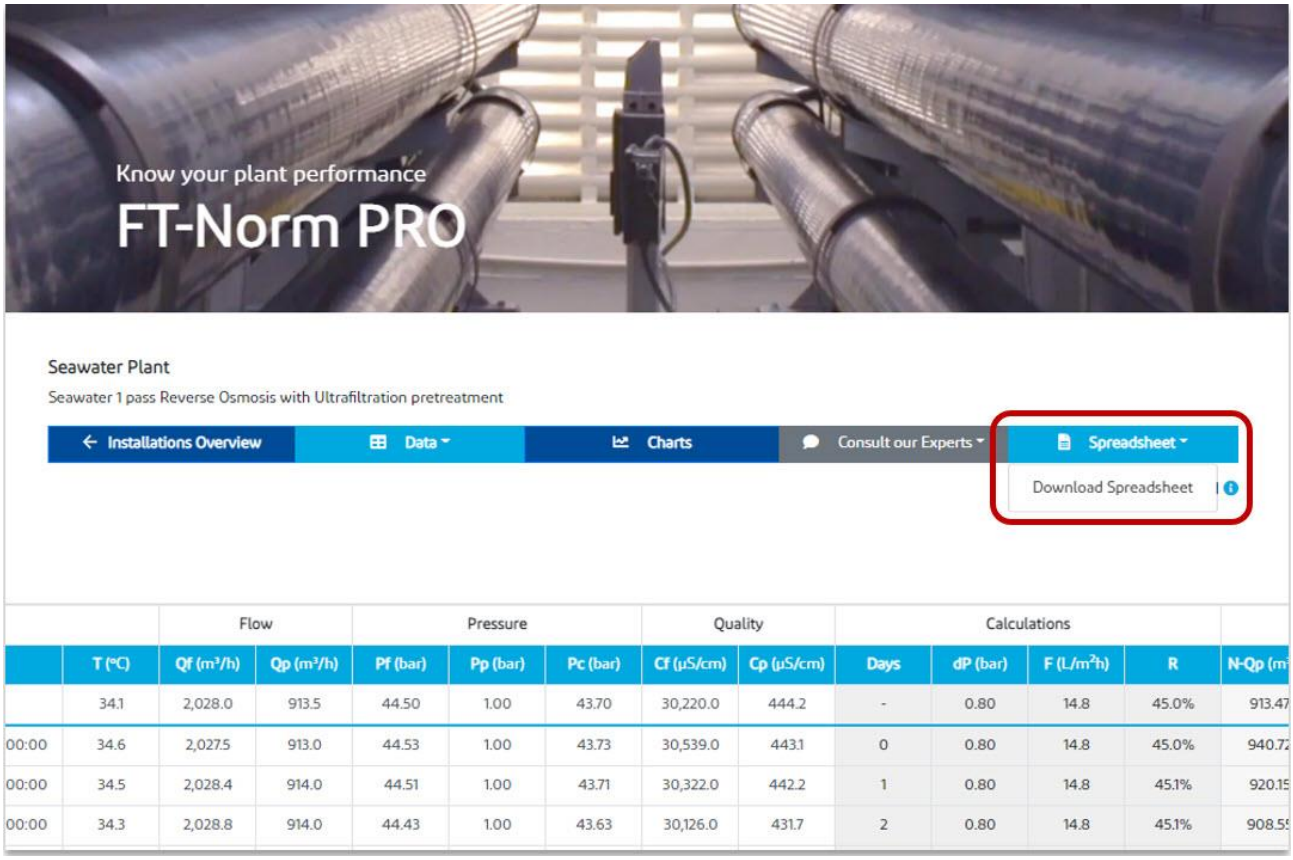


Figure 13. FT-Norm PRO – Download data to a spreadsheet

5 Charts and Reports

5.1 Charts

Performance and normalized data can be plotted in charts by clicking on the top menu tab “Charts”, as shown in Figure 14.

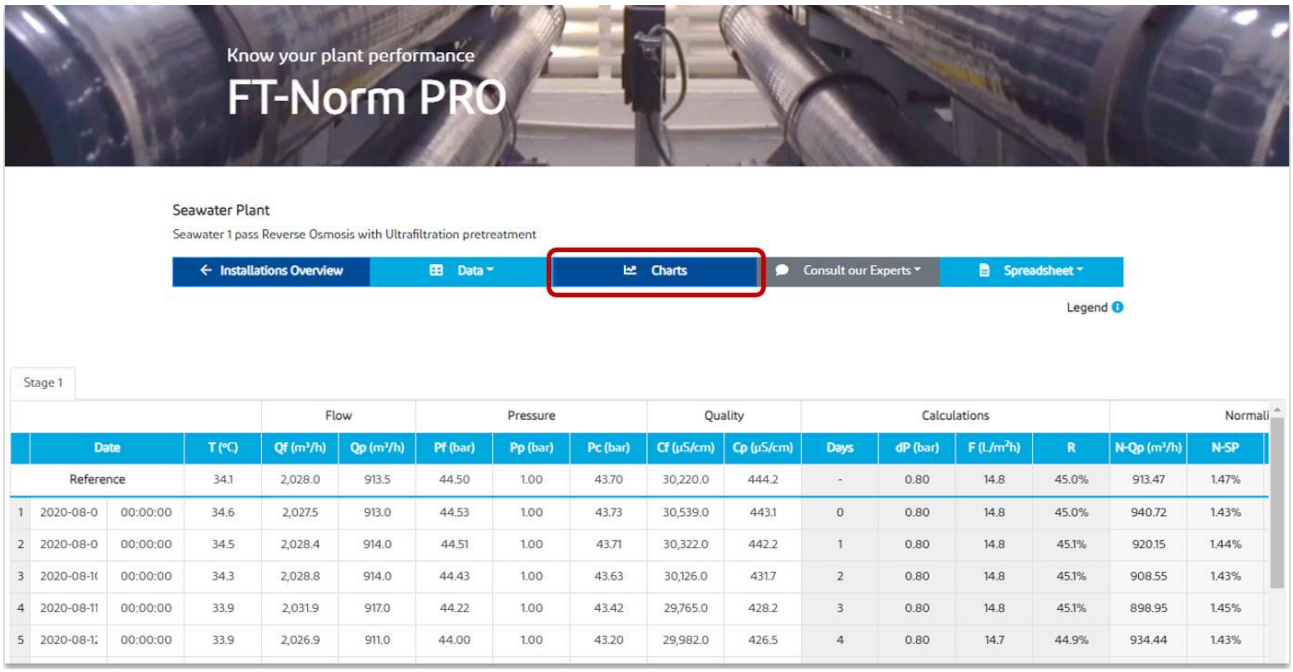


Figure 14. FT-Norm PRO – Charts

By default, the tool will just display the normalized permeate flow and the normalized salt passage charts. However, more can be added by clicking on the desired charts on the left side of the page. The charts also include the reference data points. The performance trends and reference data points can be hidden or displayed on the chart by clicking on the specific legend box. An example of the Charts feature is shown in Figure 15.

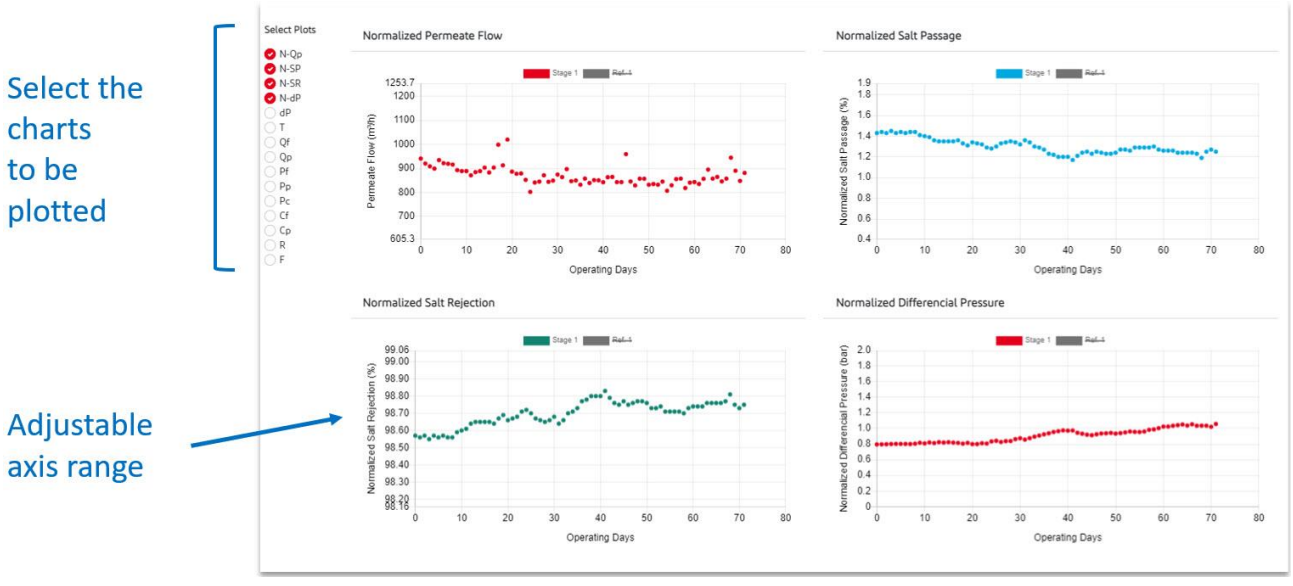


Figure 15. FT-Norm PRO – Selecting charts

5.2 Print Report

Charts can be exported into a report by clicking the top menu tab “Print report”. This is shown in Figure 16.



Figure 16. FT-Norm PRO – Print report

The report with the selected charts will be generated in PDF file format. An example of a report can be seen in Figure 17.



Figure 17. FT-Norm PRO – Report printed

6 MULTIPLE STAGES System

Multiple stage systems can also be normalized, up to three stages.

6.1 Data Introduction

Taking as example a two stage system, the reference data of the first and second stage must be introduced as described above for a single stage system. An example of a 2-stage system reference data entry can be seen in Figure 18.

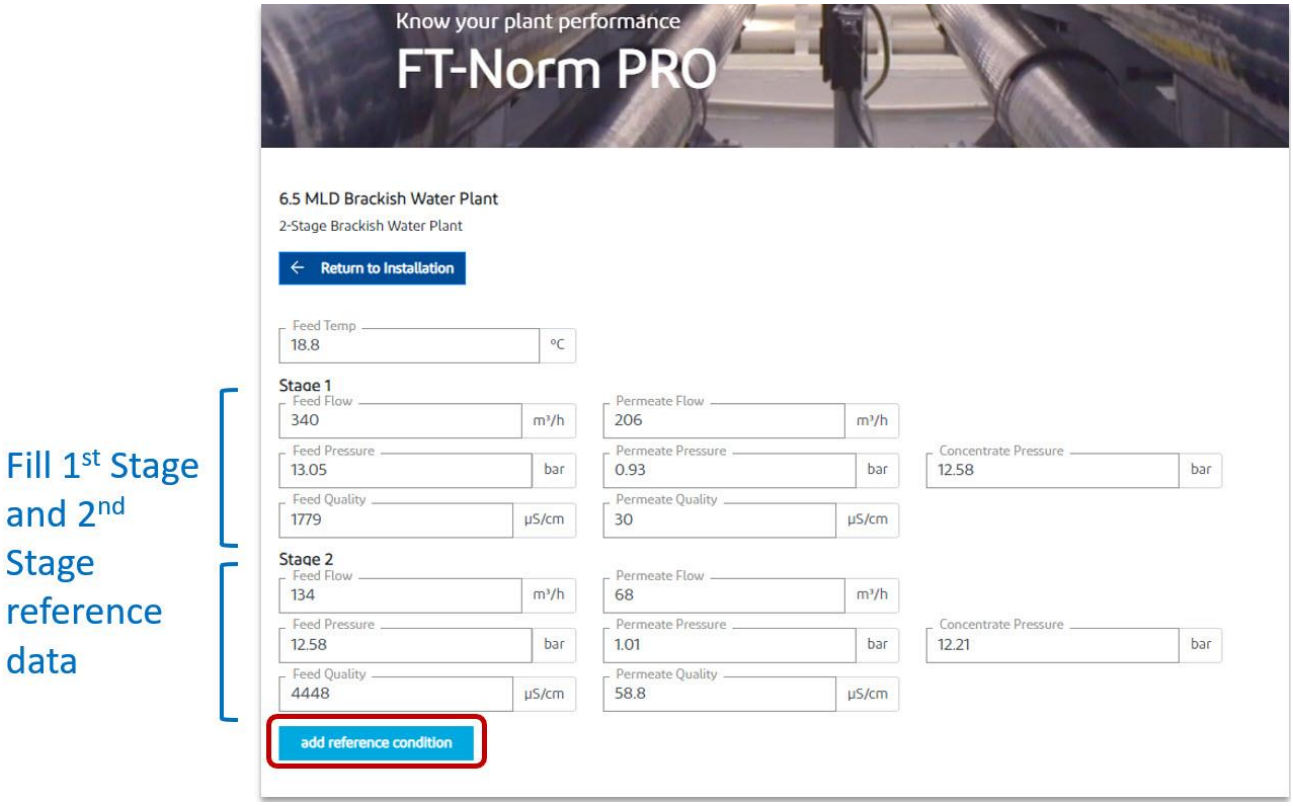


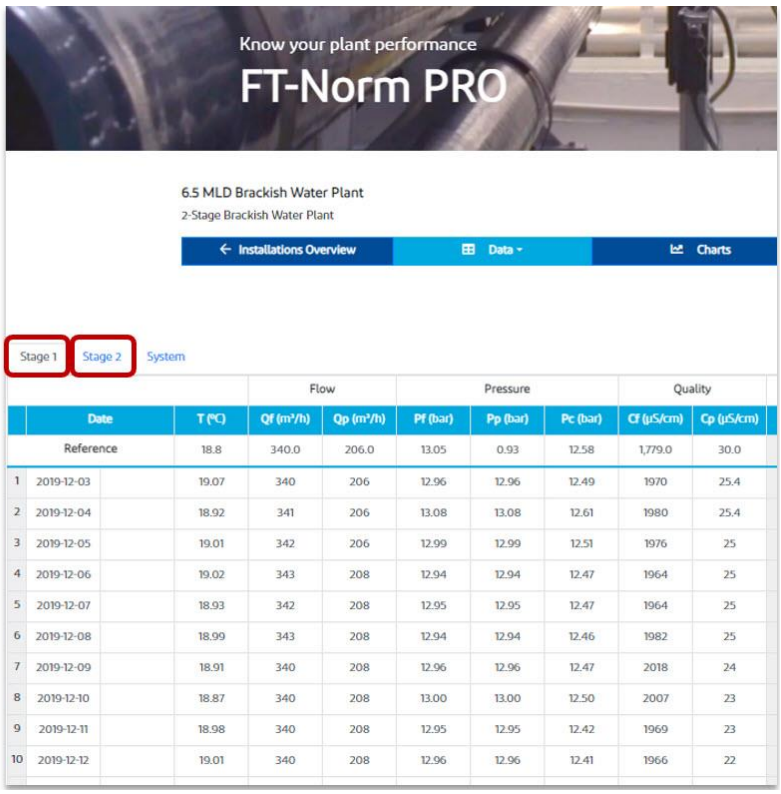
Figure 18. FT-Norm PRO – 2-stage system data introduction

It is worth noting that independent first stage concentrate pressure and second stage feed pressure inputs allow for simulation of an interstage booster pump.

Data can then be introduced for each stage by selecting the “Stage 1” or “Stage 2” tabs on the top of the data table as was described above for a single stage system. Data can also be imported from individual files for each stage. Data shown in “System” tab is only calculated data by combining Stage 1 and Stage 2 data, and it is only provided as a reference. An example can be found in Figure 19.

Fill data for 1st Stage and 2nd Stage separately (or import from template)

Independent 1st Stage concentrate pressure and 2nd Stage feed pressure inputs allow for simulation of interstage booster pump



			Flow		Pressure			Quality	
	Date	T (°C)	Qf (m³/h)	Qp (m³/h)	Pf (bar)	Pp (bar)	Pc (bar)	Cf (µS/cm)	Cp (µS/cm)
	Reference	18.8	340.0	206.0	13.05	0.93	12.58	1,779.0	30.0
1	2019-12-03	19.07	340	206	12.96	12.96	12.49	1970	25.4
2	2019-12-04	18.92	341	206	13.08	13.08	12.61	1980	25.4
3	2019-12-05	19.01	342	206	12.99	12.99	12.51	1976	25
4	2019-12-06	19.02	343	208	12.94	12.94	12.47	1964	25
5	2019-12-07	18.93	342	208	12.95	12.95	12.47	1964	25
6	2019-12-08	18.99	343	208	12.94	12.94	12.46	1982	25
7	2019-12-09	18.91	340	208	12.96	12.96	12.47	2018	24
8	2019-12-10	18.87	340	208	13.00	13.00	12.50	2007	23
9	2019-12-11	18.98	340	208	12.95	12.95	12.42	1969	23
10	2019-12-12	19.01	340	208	12.96	12.96	12.41	1966	22

Figure 19. FT-Norm PRO – 2-stage stage 1, stage 2 and system data

6.2 Charts

Charts can be displayed for Stage 1, Stage 2 and System, as well as their respective reference data points. Individual trends can be hidden or displayed on the chart by clicking on the specific legend box. An example of the charts with multiple stages and total system performance is shown in Figure 20.

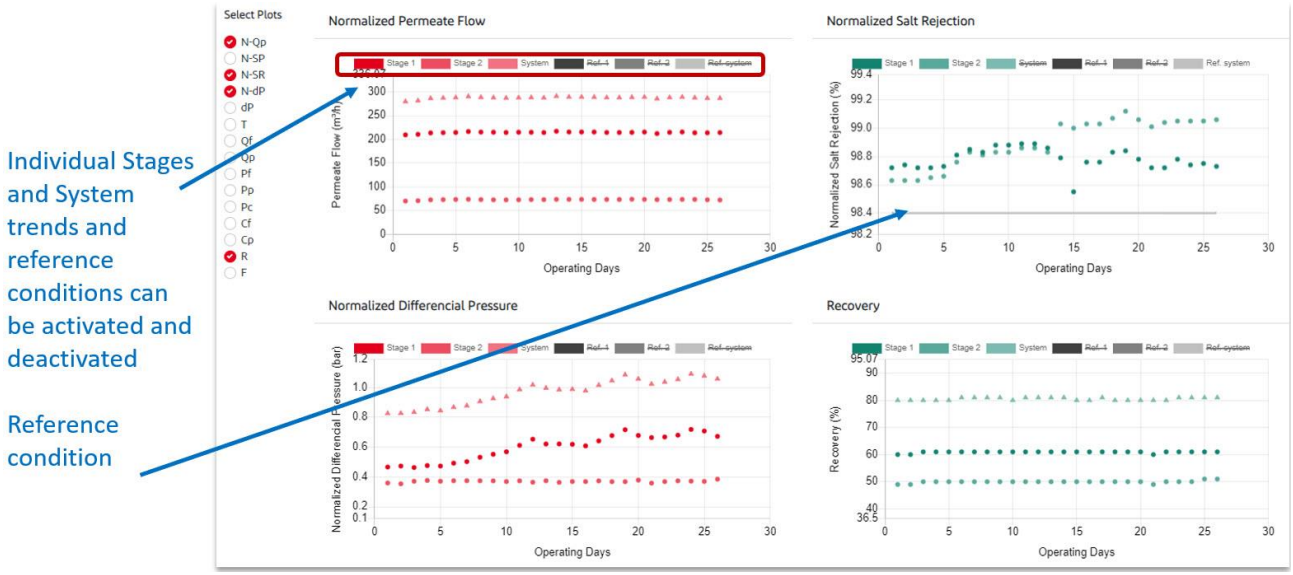


Figure 20. FT-Norm PRO – 2-stage system charts and reference conditions

6.3 Consult our Experts

FT-Norm PRO allows users to consult DuPont experts and request special services. This can be done by clicking on the option "Consult our Experts" on the top menu. This is shown in Figure 21.

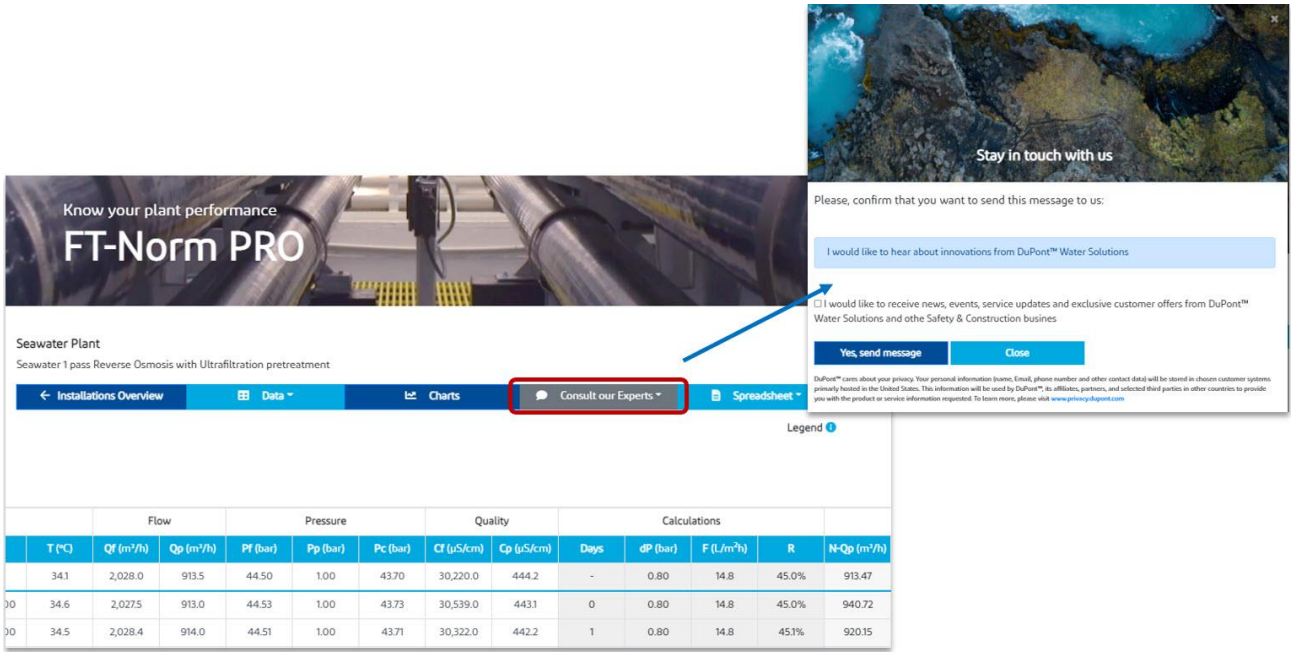


Figure 21. FT-Norm PRO – Consult our experts

7 TROUBLESHOOTING

Problem	Solution
FT-Norm PRO is not interpreting my data correctly when I import from an existing Excel spreadsheet	Make sure dates have a "yyyy-mm-dd" format in the source file. Go to Section 4.4 .
I want to import data from my Tablet, but the Tablet View is not convenient	Data import from an existing Excel spreadsheet is easier from computer (PC) and on Classic View option Go to Section 4.3 and Section 4.4
The tool does not allow enough flexibility to manipulate / introduce data.	It is still possible to work off-line on a traditional excel spread sheet. Select "use this template" option below the Classic View table and once completed import it to the tool using "Import data" feature. Go to Section 1.
Can I modify the charts generated by the tool before I export?	You can select which parameters to plot on the left hand section and clicking on the specific legend box of the chart. Go to Section 6.2.
The chart axes are out of range	You can zoom in and zoom out by using mouse scroll option (or finger in mobile devices) over the chart.

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