

IMSDesign 2016 – Hydranautics New Projection Program

New Features in IMSDesign–2016

IMSDesign-2016 Version 216.73 RO/NF projection program was released in August 2016 and is an update to Version 215.68 which was released in March 2016. Version 216.73 includes certain bug fixes and improvements. The IMSDesign program went through a complete redevelopment phase in 2015 when the VB6 technology used earlier was replaced by Microsoft's .NET Technology. The .NET technology offers enhanced program features with improved graphics to aid the RO/NF designer. IMSDesign-2012 and earlier versions of the program, dating back to 1998, were developed using VB6 technology. Using the current version the user will be able to continue work on all saved IMSDesign-2012 des files dating back to 2009.

Following is a condensed list of improvements that have been incorporated in the current version:

New Elements (all 40" long):

- **ESPA2-LD MAX:** The next generation low-pressure RO element with increased membrane area for capital cost and energy cost savings!
 - An 8.0-inch diameter element with 99.6% rejection and 12,000 gpd at 150 psi at STC (standard test conditions)
 - 10% higher membrane area at 440 ft² (40.9 m²)
 - Retains the operating advantages of a thicker 34 mils feed spacer for reduced colloidal fouling rate
 - For new systems, reduces number of pressure vessels 10%
 - For replacement, it can reduce feed pressure or increase permeate flow 10%
 - A better element for industrial and municipal water and wastewater treatment systems
 - Replaces either ESPA2 MAX or ESPA2-LD
 - Compared to ESPA2 MAX:
 - **Delta P is less:** At the same flux rate and due to the 34 mils spacer, the delta P is significantly better (up to 50% less) versus the 28 mils ESPA2 MAX
 - **Feed pressure is less:** At the same flux rate the feed pressure is less (up to 10%) due to this reduced delta P with the 34 mils spacer
 - **Better Interstage Flux Balance:** Reduces rate of colloidal fouling



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- **CPA7-LD:** An 8.0 inch diameter element with 400 ft² (37.2 m²) membrane area and 34 mils feed spacer for reduced colloidal fouling rate
 - This is the sixth generation CPA brackish water RO membrane
 - Rated at 11,500 gpd and 99.8% rejection at 225 psi STC
 - Lower feed pressure and better permeate quality than CPA5-LD
- **CPA6-LD:** An 8.0-inch diameter element with 400 ft² (37.2 m²) membrane area and 34 mils feed spacer for reduced colloidal fouling rate
 - This is the fifth generation CPA brackish water RO membrane and has the best rejection of all of its predecessors
 - Rated at 8000 gpd and 99.8% rejection at 225 psi STC
 - This 400 ft² membrane operates at a higher feed pressure than CPA5-LD and CPA7-LD but it has the highest rejection in the CPA family
- **CPA6-MAX:** Has the same high rejection membrane of CPA6-LD, but features a 10% increase in membrane area at 440 ft² (40.9 m²) and 28 mils feed spacer
 - Rated at 8800 gpd and 99.8% rejection at 225 psi STC
 - A preferred choice for feed waters of low turbidity and silt density index such as low fouling brackish well waters and for 2nd pass polishing applications
- **CPA-4040E:** A 4.0-inch diameter high rejecting brackish water RO shipped dry and 34 mils feed spacer for reduced fouling rate
- **ESNA1-LF-LD-4040:** A 4-inch diameter high flow brackish water NF and 34 mils feed spacer for reduced fouling
- **ESNA1-LF2-LD-4040:** A 4-inch diameter higher flow brackish water NF and 34 mils feed spacer for reduced fouling
- **ESPA-2540:** A 2.5-inch diameter low energy brackish water RO mini-element
- **SWC-2540:** A 2.5-inch diameter seawater RO mini-element



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Elements with Modified Projections

- **ESPA2-LD and ESPA2 MAX:** The projected permeate TDS for mixed ion feeds has been increased 7-10% based on field studies. There is no change in specification sheet flows or NaCl rejection at STC
- **ESPA4-LD:** These elements have improved mixed ion feed rejection accuracy based on recent field studies. There is no change in specification sheet flows or NaCl rejection at STC
 - The projection shows better permeate quality due to improved mixed ion rejection
 - Total hardness, alkalinity and nitrates project much better and accurately than before
- **SWC4 and SWC5 Product Lines:** Boron salt passage has increased 5% by projection based on field studies. There is no change in the specification sheet flows or NaCl rejection at STC.
- **SWC4B Product Line:** This product line continues to have the best boron rejection for seawater elements
 - The specification sheets and projections have been modified. The SWC4B-LD flow has been reduced from 6500 to 5800 gpd. The SWC4B-MAX flow has been reduced from 7200 to 6400 gpd.
 - Projected permeate TDS remains unchanged
 - Boron salt passage has increased 5% by projection based on field studies

Analysis Screen

- **SDSI:** The Stiff & Davis Saturation Index has been removed. It is not considered a viable predictor of calcium carbonate scaling in high TDS feed waters like seawater.
- **LSI:** The Langelier Saturation Index is calculated by default for brackish water RO and NF when feed TDS is less than or equal to 10,000 ppm. It can also be selected for display for feeds > 10,000 ppm by checking the box in the IMSDesign Option screen found in the upper left corner of the program screen, but its validity at higher feed TDS values is marginal. The LSI can also be viewed for all streams by selecting it as 1 of the 4 display options in the Flow Diagram option list.



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- **CCPP:** The Calcium Carbonate Precipitation Potential is a quantitative calculation reported as mg/l as CaCO_3 . This is new to the Hydranautics' program and is considered by many of the chemical suppliers as being a better predictor of calcium carbonate scaling potential than LSI and SDSI. CCPP levels increase with higher calcium levels, higher alkalinity levels, higher pH levels, higher temperatures, and lower TDS values. Alarm values will be established by the end of 2016.
- **H and OH Ions:** H and OH ions are now displayed in the printouts for all projections when they exist at low and high feed pH respectively

Design Screen

- **Six Stage Design:** Both RO passes can now be designed with up to six stages each
- **Degasser:** The ability to include the impact of an atmospheric degasser/decarbonator for carbon dioxide reduction is now available with 5 mg/l CO_2 as the default degassed level. It is an option found in the Post-Treatment design block where you can readjust the degasser/decarbonator outlet carbon dioxide level. When you save the Post-Treatment adjustments, you will get a Degassed Permeate column on page 1 of the printout.
- **% Flux Decline:** The designer can select Annual or First Year. Annual is linear and is the default setting for all feed water types. First Year is exponential and is the default for waste waters. The First Year % Flux Decline is used primarily for municipal tertiary waste water feeds which exhibit a rapid increase in feed pressure after startup, then the flux stabilizes as time progresses with a lower increase in feed pressure over time compared to a First Year % Flux Decline curve.
- **Seawater RO Pressure Limits for Temperature:** A high pressure alarm will occur in seawater RO designs on a sliding scale based on temperature. The pressure limits decrease from 1200 psi (82.8 bar) at 50 °F/10 °C with increasing temperature to 1000 psi at 106 °F (and 69 bar at 40 °C). The high pressure alarm points are found on the website in Technical Service Bulletin TSB-105.
- **Improved Municipal Waste Water Quality:** The program will automatically project 10% better permeate quality when feed is waste water based on years of experience in evaluating municipal waste water plant operations. This is attributed in part to the higher level of organics and their impact on the performance of the membranes.

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Flow Diagrams

- **4 Custom Parameters:** The designer can now select up to 4 custom parameters for display on the Flow Diagram for display for every flow in the Flow Diagram. Parameters included are total hardness, any standard or custom cation or anion, osmotic pressure and any saturation index.
- **Conductivity and pH:** These are now default parameters for display in the Flow Diagram. Other default parameters are flow, pressure and TDS.

DESX Design Files

- **Custom Elements:** Hydranautics will allow you run designs with custom elements for a project. Hydranautics Technical Group will send you a .desx design file for the project and you will be able to run the projection with custom elements

Printout

- **Post-Treatment:** The ability to display the results of Permeate Post-Treatment calculations in a separate column on page 1 of the printout is now available. The Post-Treatment option allows the chemical adjustment of the RO permeate with a number of chemicals such as NaOH, NaHCO₃, Na₂CO₃, Ca(OH)₂, H₂SO₄, HCl, CO₂ gas, or NaOCl.
- **Power Requirement Calculations:** The default values for estimating kwh per 1000 gal or 1 cubic meter of permeate are 83% for mechanical pump efficiency, 93% for motor efficiency, and 97% for VFD efficiency for a combined efficiency of 74.8%. If any of these efficiency values are changed, an additional page is printed out for design projections noting such.



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Auto Update of the Program

- This feature enables automatic updating of IMSDesign-2016 software when an update is posted by Hydranautics. The software will regularly check for updates and will advise you when an update is available. It will first show a list of all the new features and bug fixes in the update. You can then decide to download and install the update on your computer with a single click. You may be asked to close the program if it is working. You can disable this feature if you wish. You should be a registered user of the software. In case you are not, the software will also remind you to register. Both these above reminders will work even if the software is not working.

If you have any issues installing or running this software, please send an e-mail to:
imsd-support@hydranauticsprojections.net

