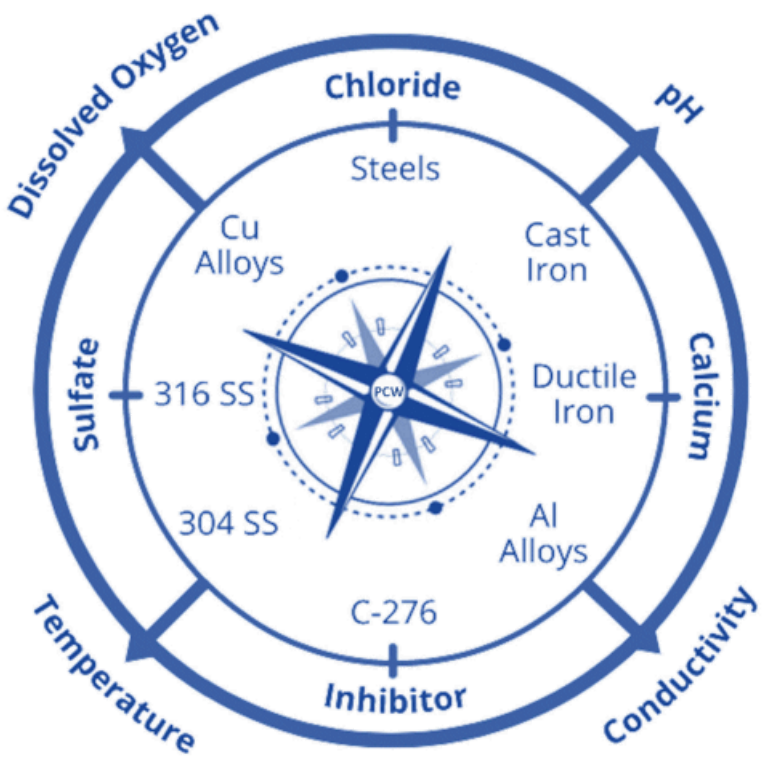


Corrosion Modeling Software and Corrosion Prediction Software Series

PCW-Compass®: Process Cooling Water Corrosion Modeling and Life Prediction

Highly Effective Software Solutions to Costly Corrosion in PCW Systems

Version 12.4

★ **Performance** ★ **Functionality** ★ **Usability**

Anytime Anywhere Any Device Any OS

No USB dongles No installation No Browser Plug-ins

Contact Us for Licensing Details

Overview of PCW-Compass: Predictive Modeling Software for Corrosion Prediction of Pipes/Tubes in Cooling Water Systems

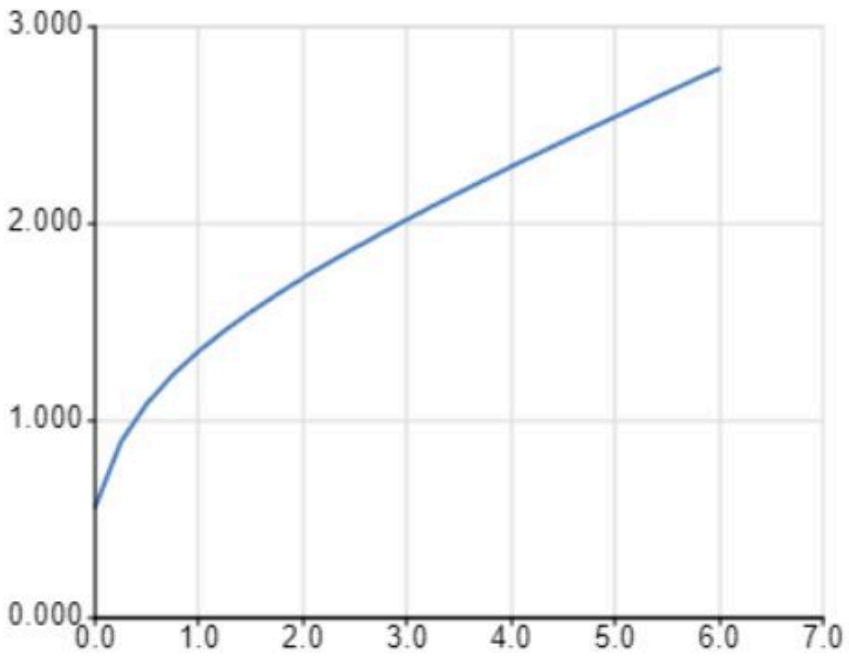
Cooling water systems are used in many industrial services, processes, and operations. Pipes and tubes are susceptible to severe corrosion if the cooling water chemistry is not properly controlled. Some of the critical factors influencing the corrosivity of the cooling water include: water pH, dissolved oxygen in water, water temperature, water velocity, water conductivity, concentrations of chloride and other ionic species. PCW-Compass is the only device and OS independent predictive software on the market for the modeling and life prediction of corrosion in process cooling water systems. Designers, engineers, architects, consultants, maintenance and inspection personnel can quickly assess and quantify the impact of the cooling water chemistry on the corrosion rate, corrosion depth, the remaining life, and the mode of failure for a range of materials including cast irons, ductile irons, mild steels, stainless steels, copper alloys, aluminum alloys, and nickel alloys.

Under the water chemistry shown in Figure 1 below, PCW-Compass predicts that the corrosion rate of ductile iron is 2.022 mm/y, the corrosion depth is 4.043 mm, the predicted lifespan is 6.183 yers, the remaining life (time-to-perforation) is 4.183 years, and the mode of failure is leak due to perforation or cracking. This ductile iron pipe cannot meet the design life of 30 years under the prevailing water chemistry. PCW-Compass models the effect of corrosion inhibitors on the corrosion in cooling water system. In Figure 2 below, PCW-Compass predicts that a corrosion inhibitor with 90% inhibiting efficiency and 90% availability will reduce the corrosion rate of the ductile iron pipe and increase the design life to over 30 years.

PCW-Compass®: Process Cooling Water Corrosion Modeling and Prediction Version 12.4.3

Pipe/Tube ID	Ductile Iron Pipe	Unit of Measure	SI Metric

Design Data			Corrosion Prediction		
Pipe/Tube Material	Ductile Iron		Corrosion Depth	mm	4.043
Design Life	years	30	Corrosion Rate	mm/y	2.022
Age of Pipe/Tube	years	2.000	Predicted Lifespan	years	6.183
Nominal Wall Thickness	mm	12.500	Remaining Life	years	4.183
Water Chemistry			Failure Mode: Leak due to perforation/cracking		
Water pH	pH	7.00			
Water Temperature	°C	90.00			
Water Velocity	m/s	3.000			
Dissolved O_2 (ppm)	measured	6.500			
Conductivity	µS/cm	3,500			
Calcium [Ca^{2+}]	mg/L	73			
Chloride [Cl^-]	mg/L	1,418			
Copper [Cu^{2+}]	mg/L	0.002			
Sulphate [SO_4^{2-}]	mg/L	2,592			
Total Alkalinity as CaCO3	mg/L	90			
Total Hardness as CaCO3	mg/L	380			
Total Dissolved Solids (TDS)	mg/L	2,275			
Inhibitor Efficiency	%	0.000			
Inhibitor Availability	%	0.000			
Dissolved Inorganic Carbon (DIC)	mg/L as C	25.62			



Corrosion Rate (mm/y) vs. Velocity (m/s)

Water Corrosivity:	Little corrosion	Langelier Saturation Index (LSI)	0.02
		Ryznar Stability Index (RSI)	6.97
Scaling Tendency:	Neutral/Balanced; Little scale will form.	Puckorius Scaling Index (PSI)	6.98
		Aggressive Index (AI)	11.53
		Larson–Skold Index (LSK)	52.20
		CaCO3 Precipitation Potential (CCPP)	0.71

Figure 1 Overview of PCW-Compass.

PCW-Compass®: Process Cooling Water Corrosion Modeling and Prediction Version 12.4.3

Pipe/Tube ID	Ductile Iron Pipe	Unit of Measure	SI Metric

Design Data		
Pipe/Tube Material		Ductile Iron
Design Life	years	30
Age of Pipe/Tube	years	2.000
Nominal Wall Thickness	mm	12.500

Water Chemistry		
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Water Temperature	°C	90.00
Water Velocity	m/s	3.000
Dissolved O_2 (ppm)	measured	6.500
Conductivity	µS/cm	3,500
Calcium [Ca^{2+}]	mg/L	73
Chloride [Cl^-]	mg/L	1,418
Copper [Cu^{2+}]	mg/L	0.002
Sulphate [SO_4^{2-}]	mg/L	2,592
Total Alkalinity as CaCO3	mg/L	90
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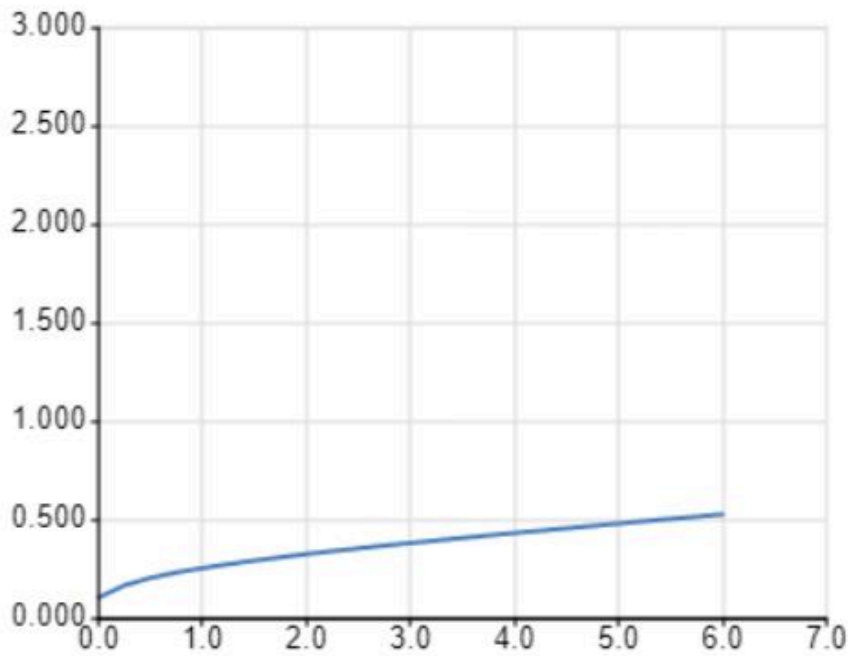
Inhibitor Efficiency	%	90.000
Inhibitor Availability	%	90.000
Dissolved Inorganic Carbon (DIC)	mg/L as C	25.62

Water Corrosivity: Little corrosion

Scaling Tendency: Neutral/Balanced; Little scale will form.

Corrosion Prediction		
Corrosion Depth	mm	0.768
Corrosion Rate	mm/y	0.384
Predicted Lifespan	years	32.543
Remaining Life	years	30.543

Failure Mode: Leak due to perforation/cracking



Corrosion Rate (mm/y) vs. Velocity (m/s)

Langelier Saturation Index (LSI)	0.02
Ryznar Stability Index (RSI)	6.97
Puckorius Scaling Index (PSI)	6.98
Aggressive Index (AI)	11.53
Larson–Skold Index (LSK)	52.20
CaCO3 Precipitation Potential (CCPP)	0.71

Figure 2 PCW-Compass models the effect of corrosion inhibitor on the remaining life of ductile iron pipe

Using PCW-Compass is as easy as 1-2-3:

(1) Select the pipe/tube material from the dropdown list;

(2) Enter the water chemistry;

(3) Review the prediction results.

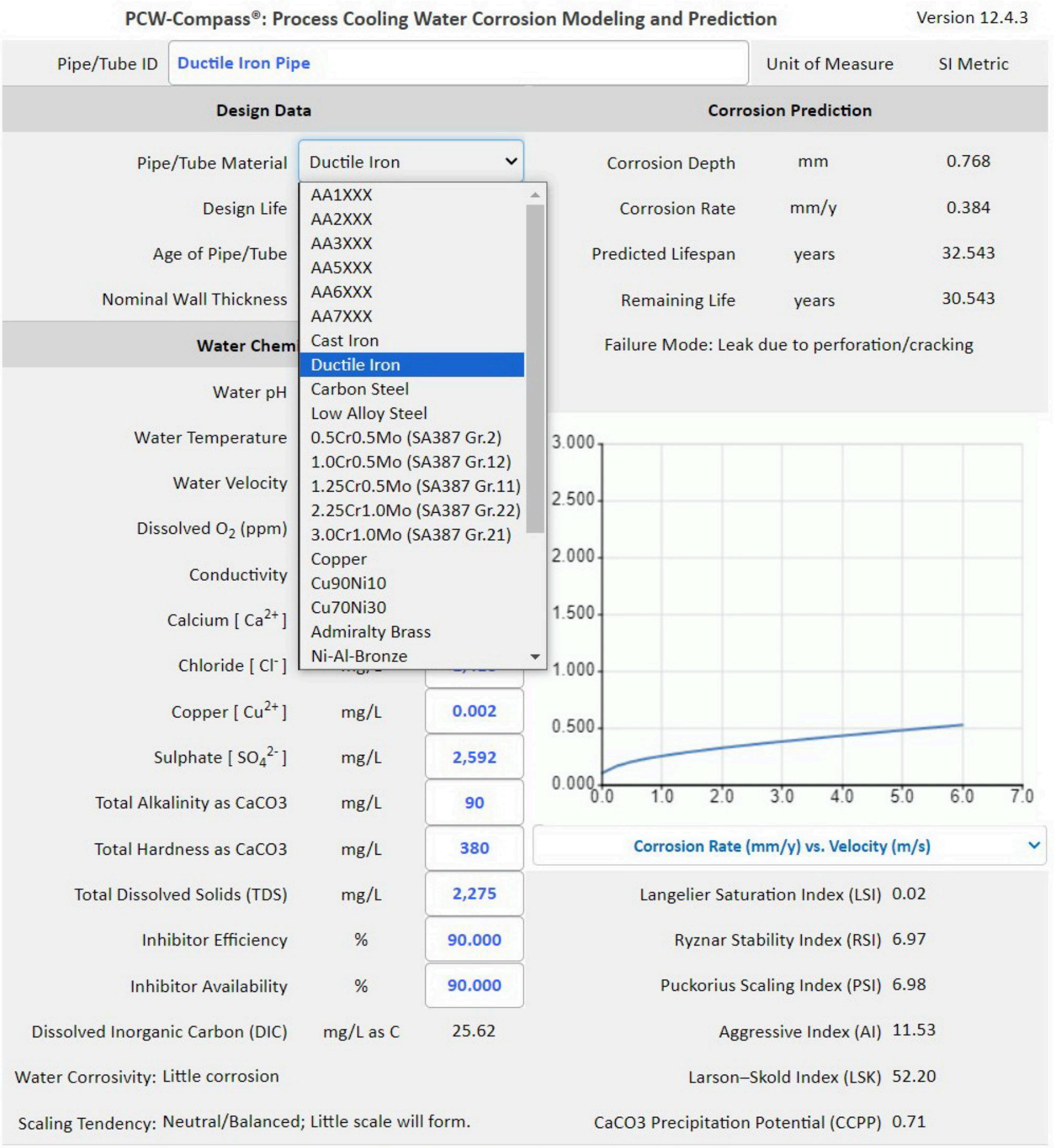


Figure 3 PCW-Compass A Software Tool for Materials Selection in Process Cooling Water Systems

The materials database in the PCW-Compass software is updated regularly with more alloys added to the list below:

AA1XXX

AA2XXX

AA3XXX

AA5XXX

AA6XXX

AA7XXX

Cast Iron

Ductile Iron

Carbon Steel

Low Alloy Steel

0.5Cr0.5Mo (SA387 Gr.2)

1.0Cr0.5Mo (SA387 Gr.12)

1.25Cr0.5Mo (SA387 Gr.11)

2.25Cr1.0Mo (SA387 Gr.22)

3.0Cr1.0Mo (SA387 Gr.21)

Copper

Cu90Ni10

Cu70Ni30

Admiralty Brass

Ni-Al-Bronze

Nitronic 60

Type 304

Type 316

Duplex 2304

Duplex 2205

Duplex 2507

Alloy C-276

If you cannot find the alloy of your interest in the list, do let us know through the Contact Us link and we will conduct the necessary work to add the alloy in the database, free of charge for licensed users of PCW-Compass.

PCW-Compass®: Process Cooling Water Corrosion Modeling and Prediction Version 12.4.3

Pipe/Tube ID	Ductile Iron Pipe	Unit of Measure	SI Metric

Design Data

Pipe/Tube Material		Ductile Iron
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Age of Pipe/Tube	years	2.000
Nominal Wall Thickness	mm	12.500

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Inhibitor Efficiency	%	90.000
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Dissolved Inorganic Carbon (DIC)	mg/L as C	25.62

measured
saturated
deaerated

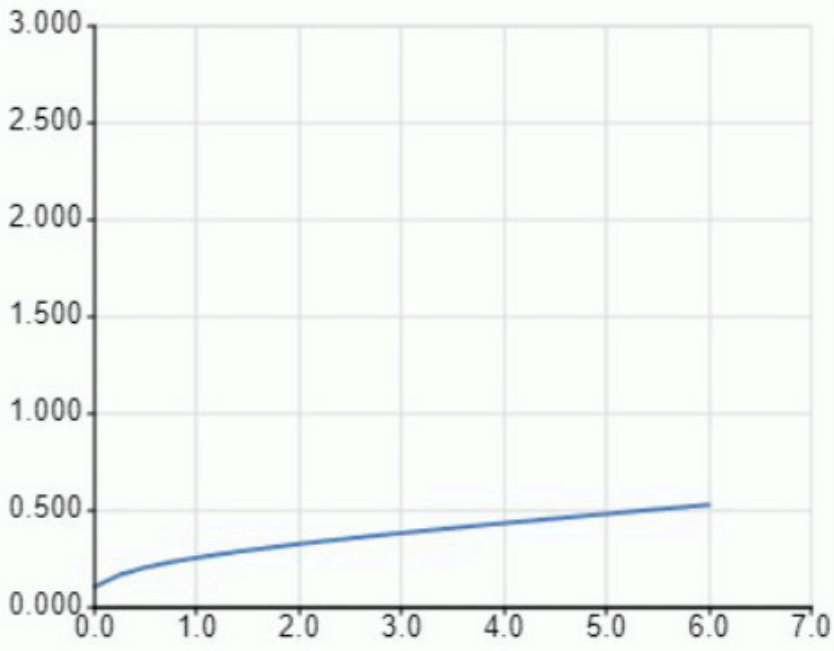
Water Corrosivity: Little corrosion

Scaling Tendency: Neutral/Balanced; Little scale will form.

Corrosion Prediction

Corrosion Depth	mm	0.768
Corrosion Rate	mm/y	0.384
Predicted Lifespan	years	32.543
Remaining Life	years	30.543

Failure Mode: Leak due to perforation/cracking



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Puckorius Scaling Index (PSI)	6.98
Aggressive Index (AI)	11.53
Larson–Skold Index (LSK)	52.20
CaCO3 Precipitation Potential (CCPP)	0.71

Figure 4 PCW-Compass models and predicts saturated oxygen concentration in water if it is not measured.

PCW-Compass also predicts the corrosivity and the scaling tendency of the specified water chemistry. The commonly used Langelier Saturation Index (LSI), Ryznar Stability Index (RSI), Puckorius Scaling Index (PSI), Larson–Skold Index (LSK), Aggressive Index (AI), Larson–Skold Index (LSK), and Calcium Carbonate Precipitation Potential (CCPP) are all computed for the prevailing operating conditions. The corrosivity of water and the scaling tendency are predicted and classified in accordance with ISO/TR4340 and best industry practice.

The powerful applications of PCW-Compass are truly unlimited in engineering design, materials selection, process operation, inspection and maintenance, modeling and prediction of corrosion in process cooling water systems.

WebCorr can also customize PCW-Compass for your specific process fluids and alloys used in your company's operations.

Click here to contact us for licensing details.

PCW-Compass, giving you the right directions in managing corrosion in cooling water systems.