NIPPON STEEL & SUMITOMO METAL

SEAMLESS STEEL LINE PIPE



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http://www.nssmc.com/

Nippon Steel & Sumitomo Metal Corporation
2-6-1 Marunouchi, Chiyoda-ku,Tokyo 100-8071 Japan
Tel: +81-3-6867-4111

SEAMLESS STEEL LINE PIPE
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INTRODUCTION

For more than five decades, NSSMC has been serving the needs of the oil and gas industries. All the supply records for most of the severe environment of pipe line project indicate that NSSMC is the leader in line pipe technologies.
We have been supplying high quality SEAMLESS STEEL LINE PIPE with most advanced technology and with most reliable quality. Our fully automated mill equipment ensures the high and stable quality of NSSMC SEAMLESS STEEL LINE PIPE. Research and development are being made in constant pursuit of technical innovation in all areas of SEAMLESS STEEL LINE PIPE product and production.

Principle of NSSMC SEAMLESS STEEL LINE PIPE

Quality

Quality is the most fundamental element of our SEAMLESS STEEL LINE PIPE business. We understand that quality leads to product reliability, which in turn leads to customer trust and that in the end, quality is the basis of our reputation. We will continue to be dedicated to maintaining and improving our quality standard.

Technology

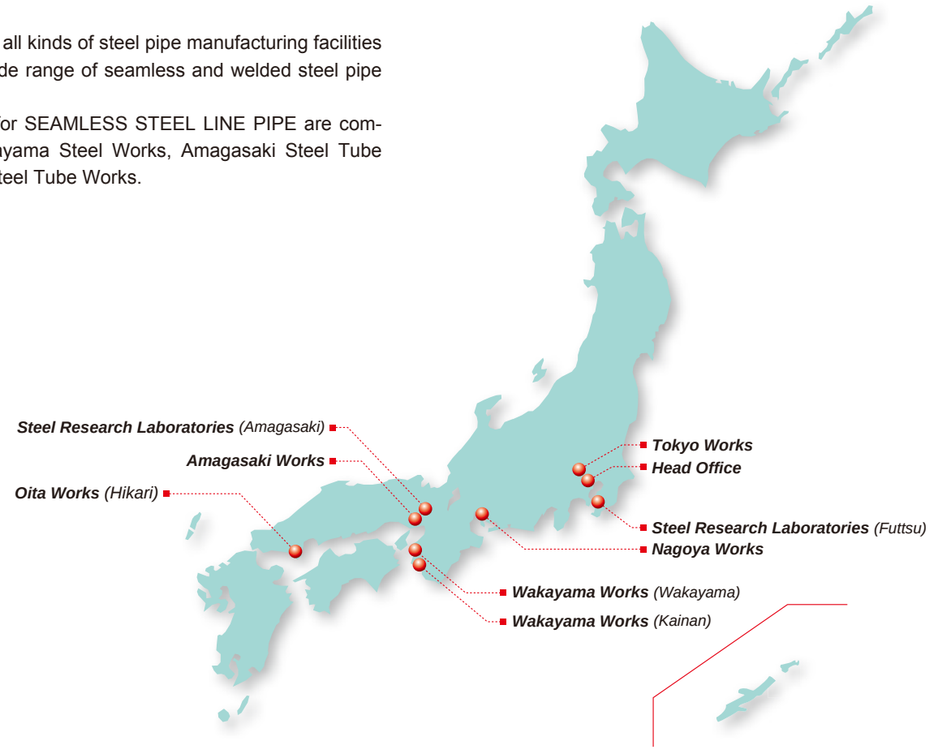
We understand that customers rely on the technology of our products when they plan pipe line project in severe environment, and we are proud of our No.1 technical position. We will continue to work through our R&D activities to develop high-end products for the future.

Customer Satisfaction

Our goal is to be more than just a superior product supplier. We intend to also be a superior solutions provider for our line pipe products customers. We place importance not just on managing material sales, but also on "before" and "after service". Customer satisfaction drives our constant and growing commitment to the oil and gas industries.

FACILITIES AND LOCATIONS

NSSMC has almost all kinds of steel pipe manufacturing facilities which produce a wide range of seamless and welded steel pipe and tubes.
The main facilities for SEAMLESS STEEL LINE PIPE are composed of our Wakayama Steel Works, Amagasaki Steel Tube Works and Tokyo Steel Tube Works.



NSSMC Tube Making Equipment and Available Sizes

Tube Mills		Location of Works	Outside Diameter in Inches: 1 2 3 4 5 6 7 8 9 10 15 20 25 30 35 40 45 50 60
Seamless (Hot Finished)	Mannesmann	Tokyo	1.315 – 6 5/8
	Mannesmann (2 sets)	Kainan	2 3/8 – 7
	Mannesmann	Wakayama	5 1/2 – 16 3/4
	Extrusion	Amagasaki	2 3/8 – 9 5/8
	Hollow Forging	Amagasaki	8 – 28
Cold Finished	Cold Drawn	Tokyo	0.675 – 6
	Cold Drawn	Kainan	0.625 – 5
	Cold Drawn	Amagasaki	2 3/8 – 20

MANUFACTURING SITES

Wakayama Steel Works

Wakayama Steel Works is the integrated supply center for seamless pipes. The steel billets are produced by a blast furnace, converter, continuous-casting machine. Then, three seamless pipe mills roll the billets into seamless pipes. Above all, the medium-size seamless mill is the most advanced in the world that is directly connected to a round CCM, combined with a cone-type piercer with high cross angle, a mandrel mill and an in-line heat treatment furnace.


Wakayama Plant


Kainan Plant



Amagasaki Steel Tube Works

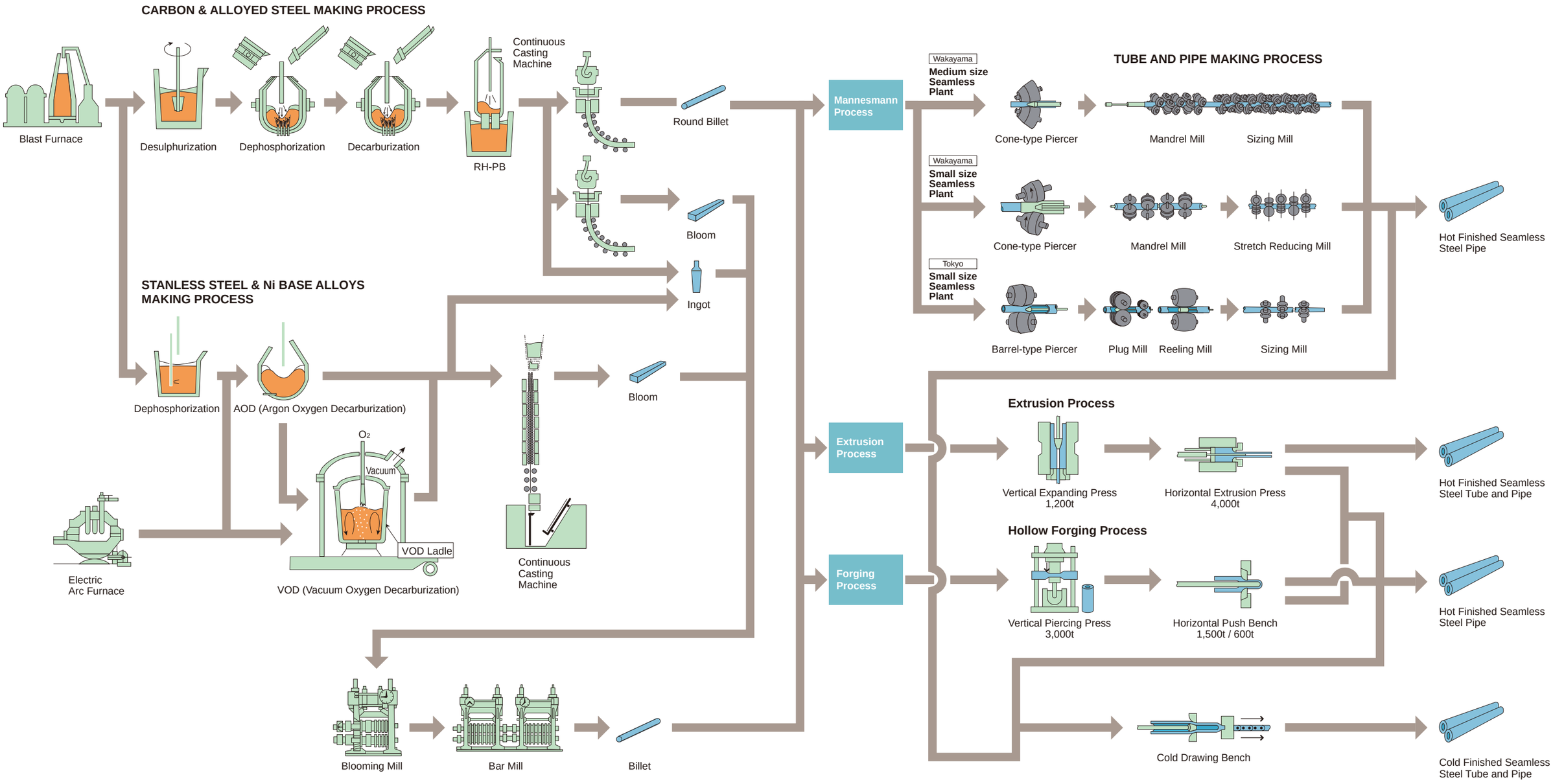
The Steel Tube Works was established in 1919 as the first integrated mill in Japan for the production of high quality seamless steel tubes and pipe. Since then, the Works has specialized in high quality steel tubes and pipes. The company is committed to ongoing research to improve manufacturing methods and to upgrade quality.

Tokyo Steel Tube Works

We use billets that have undergone tapping, casting, blooming, and rolling in our Kimitsu Works to produce seamless steel pipes and tubes by the Mannesmann plug mill method. Tokyo Works produces high-quality hot seamless steel pipes and tubes, using piercing mills, rolling mills, reeling mills, sizing mills, and stretch reducers on billets heated to high temperatures. We also produce high-grade cold products through cold processes using cold drawing equipment and a wide range of heat treatment furnaces in order to satisfy the continuously rising expectations of customers.



MANUFACTURING PROCESS OF STEEL TUBES AND PIPES



APPLICABLE SPECIFICATION

1. Line Pipes (Carbon Steel)

API 5L	Line Pipe (Grade B, X42, X46, X52, X56, X60, X65, X70, X80, X90, X100)
ISO 3183	Petroleum and natural gas industries -Steel Pipe for Pipelines-
DNV OS-F101	Submarine Pipeline Systems (Applicable Design Code)
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Seamless
ASTM A106	Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A333	Seamless Steel Pipe for Low-Temperature Service
DIN 1629	Seamless Non-Alloy Steel Tubes
CSA Z245.1-M1982	Steel Line Pipe
JIS G3454	Carbon Steel Pipes for Pressure Service (STPG)
JIS G3455	Carbon Steel Pipes for high Pressure Service (STS)

2. Line Pipes (Corrosion Resistant Alloy)

API 5LC	CRA Line Pipe
DNV OS-F101	Submarine Pipeline Systems (Applicable Design Code)
ASTM A790	(S31803) Seamless Ferritic / Austenitic Stainless Steel Pipe
ASTM A790	(S31260) seamless Ferritic / Austenitic Stainless Steel Pipe

MATERIAL DESIGN TECHNOLOGY

1. NSSMC MATERIAL DESIGN CONCEPT FOR SOUR SERVICE

Performance

1. High Strength & Toughness
2. Excellent Weldability
3. Excellent Corrosion Resistance

Performance Requirements

- Strength
- Toughness
- Weldability
- HIC

Design Concept

- **Strength Control by Q&T Heat Treatment**
- **Clean steel**
  - Fully killed and fine grained
  - Low P, S, N, O, H
  - Inclusion shape control
  - Low segregation
- **Pcm Control Weldability**

Manufacturing Available Size Range (Carbon Steel Pipes)

Available size range for seamless steel pipe (as rolled condition, API 5L PSL1)

OD (mm)	Wall thickness (mm)																																																OD (mm)
	2.5	3.0	3.2	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10	11	12	13	14	15	16	17	18		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	45	50	
(26.7)																																																		(26.7)
33.4																																																		33.4
42.2																																																		42.2
48.3																																																		48.3
60.3																																																		60.3
73.0																																																		73.0
(76.3)																																																		(76.3)
88.9																																																		88.9
89.1																																																		89.1
101.6																																																		101.6
114.3																																																		114.3
(127.0)																																																		(127.0)
(139.7)																																																		(139.7)
141.3																																																		141.3
(165.2)																																																		(165.2)
168.3																																																		168.3
177.8																																																		177.8
190.7																																																		190.7
193.7																																																		193.7
(216.3)																																																		(216.3)
219.1																																																		219.1
(241.3)																																																		(241.3)
244.5																																																		244.5
(250.8)																																																		(250.8)
(254.0)																																																		(254.0)
273.1																																																		273.1
(280.0)																																																		(280.0)
(298.5)																																																		(298.5)
(305.0)																																																		(305.0)
(318.5)																																																		(318.5)
323.9																																																		323.9
(325.0)																																																		(325.0)
339.7																																																		339.7
(346.1)																																																		(346.1)
355.6																																																		355.6
(365.1)																																																		(365.1)
(377.0)																																																		(377.0)
(381.0)																																																		(381.0)
406.4																																																		406.4
426.0																																																		426.0
OD (mm)	2.5	3.0	3.2	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10	11	12	13	14	15	16	17	18		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	45	50	OD (mm)
	Wall thickness (mm)																									Wall thickness (mm)																									

Cold finished condition

OD (mm)	Wall thickness (mm)													
	1.5	2.0	2.5	3.0	3.2	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
17.1															
21.3															
26.7															

OD in parentheses : Please contact us in advance

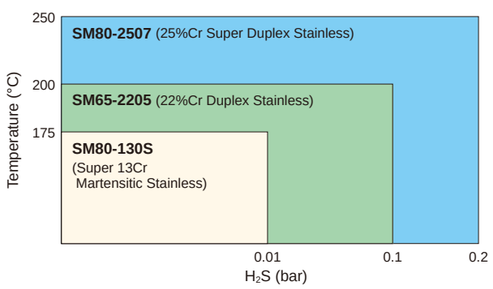
CORROSION RESISTANT ALLOY LINE PIPES

NSSMC has supplied Corrosion Resistant Alloy pipes in a wide range of sizes and material grades. In the area of flow lines, Corrosion Resistant Alloy line pipes are used under hostile environmental conditions including CO_2, Cl^- and H_2S.

Material Selection Guideline for Weldable 13Cr and Duplex Stainless Steel Line Pipe

For CO_2 : Superior CO_2 corrosion resistance at elevated temp.
Beyond the limitation of C-steel + inhibitor system,
Merit for lower life-cycle-cost and less environmental impact.

For H_2S : Applicable up to following sour condition



Chemical Composition

Material		Chemical Composition (mass%)								
		C	Cr	Ni	Mo	W	Cu	Ti	N	PREW
SM80-130S <13CrS> (UNS S41525)	Martensitic Stainless	max.0.03	11.5-13.5	4.5-7.0	2.0-3.0	–	–	0.01-0.50	–	–
SM65-2205 <DP8> (UNS S31803)	Duplex Stainless	max.0.03	21.0-23.0	4.5-6.5	2.5-3.5	–	–	–	0.08-0.20	min.34
SM80-2507 <DP3W> (UNS S39274)		max.0.03	24.0-26.0	6.0-8.0	2.5-3.5	1.5-2.5	0.20-0.80	–	0.24-0.32	min.40

Mechanical Properties

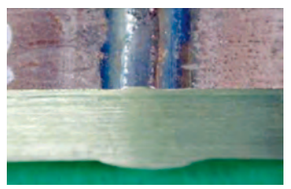
Material		Temperature (deg.C)	Yield Strength (MPa)	Tensile Strength (MPa)	Hardness
SM80-130S <13CrS> (UNS S41426)	Martensitic Stainless	25	min.550	min.750	max.310 HV
		100	min.540	min.690	–
SM65-2205 <DP8> (UNS S31803)	Duplex Stainless	25	min.450	min.640	max.28 HRC
		100	min.380	min.575	–
SM80-2507 <DP3W> (UNS S39274)		25	min.550	min.800	max.32 HRC
		100	min.480	min.725	–

Technical Data for SM80-130S

PWHT is recommendable after GMAW for SM80-130S
<SCC Resistance at elevated temperature condition>

PWHT is effective to improve SCC resistance of GMAW.

NSSMC recommends the PWHT of 650°C × 5 minutes.



(root bead of GMAW – as weld)

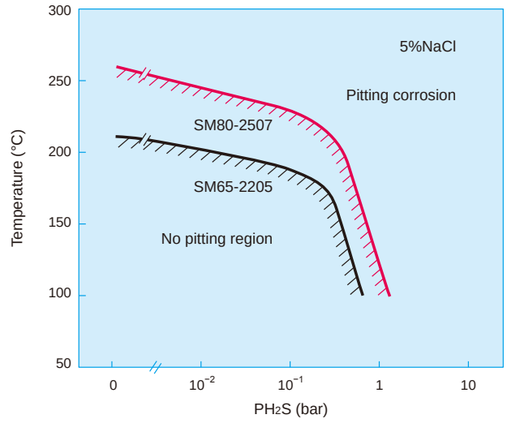
Table. Summary of 4PB test (25%NaCl. 10barCO_2. 110°C. 720h)

No.	Welding process		PWHT	SCC test results		
				Batch-A	Batch-B	Batch-C
1	GMAW	5G	No	SCC	SCC	SCC
2			650°C × 5min.	No SCC	No SCC	No SCC

[NACE 2008 Paper No.08100]

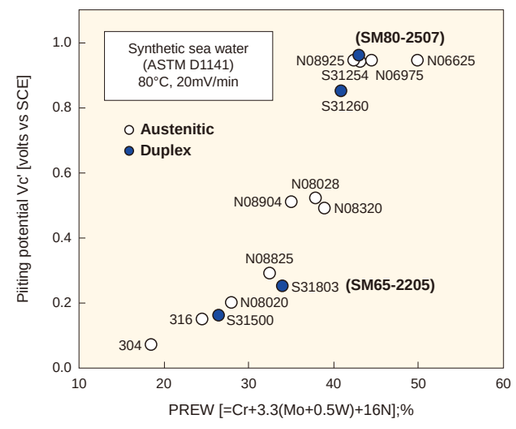
Technical Data for SM65-2205 and SM80-2507

<Corrosion Resistance at elevated temperature condition>



Effect of temperature and partial pressure of H_2S (PH_2S) on the susceptibilities of SM80-2507and SM65-2205 to pitting corrosion in 5%NaCl solution.

<Pitting Resistance in Seawater Environment>



Relationship between pitting potential and PREW
(Synthetic Seawater, 80°C)

memo