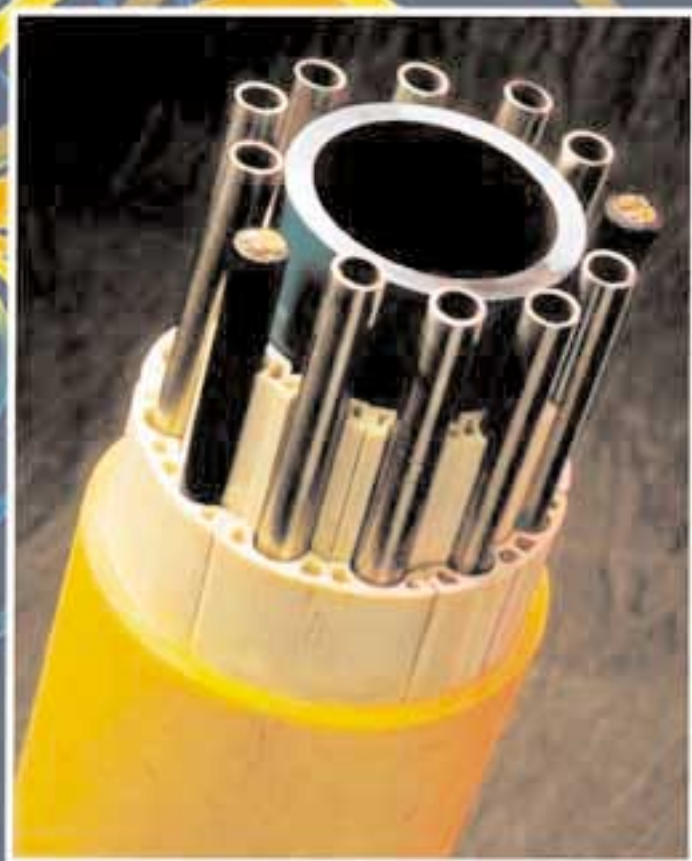




DMTV
STAINLESS



**High-quality
Super Duplex tubing
for umbilical lines**

A GLOBAL SERVICE





Does Sigma Phase in your umbilical tubing concern you?

Let DMV allay your fears...

DMV's manufacturing processes, especially annealing, are tightly controlled to ensure that no embrittlement can occur during the production of its seamless duplex grades of umbilical tubes.

For these grades, DMV employs a specifically designed furnace to ensure the precisely heating and cooling of the tubes during the annealing process. Additionally, a quality assurance test, employing special state-of-the-art eddy-current equipment, is used to continuously detect the presence of any sigma-phase anywhere along the total length of the tube.



Furnace and test equipment in the Costa Volpino plant

Subsea oil production systems used to operate remotely located fields have for the past ten years utilised super duplex steel within their umbilical tubes.

Traditionally umbilicals were manufactured using thermoplastic hoses but super duplex steel has demonstrated improved qualities for service lines carrying methanol, hydraulic and chemical injection fluids.

Compared to thermoplastic hoses, super duplex steel tubes offer the following advantages:

- **high corrosion resistance in sea water**
- **high mechanical properties compared to low weight of the steel**
- **less volumetric expansion without any significant time-delay in hydraulic response over long distances**
- **resistance to collapse**
- **no risk of methanol diffusion**
- **long working life.**

REFERENCE LIST



Customer+ project	Delivery Date	Total Length
Kvaerner for BP-ETAP	1996	195 km
Kvaerner for BP-ETAP	1997	144 km
Kvaerner for SSP Nordflanke	1997	11 km
Kvaerner for Shell-ETAP	1997	272 km
Alcatel for Shell OSPREY	1997	158 km
N.S.C. for Troll Pilot	1997	60 km
Alcatel for BPX Troika	1997-8	43 km
Kvaerner for Shell-ETAP	1998	74 km
DUCO for Elgin Franklin	1998	106 km
Kvaerner for Shell-ETAP	1999-2000	216 km

DMV MATERIALS FOR STEEL UMBILICALS

The material criteria for subsea applications of a duplex stainless steel alloy requires that it must be able to withstand the sea environment and must be essentially inert to the commonly used fluids transmitted through the tubes.

DMV 25.7N super duplex meets this criteria offering:

- **High corrosion resistance to sea water**
- **Excellent corrosion resistance to the commonly used fluids transmitted through umbilicals**
- **Good weldability**
- **Cost effectiveness**

The typical super duplex chemical composition of DMV 25.7N – Chrome, Nickel, Molybdenum, Nitrogen with minor additions of Copper and Tungsten – guarantees an excellent resistance to the localised corrosion.

The resistance to localised corrosion is generally assessed using the PREN number (Pitting Resistance Equivalent Number) – shown as follows:

$$\text{PREN: \%Cr} + 3.3\% \text{Mo} + 16\% \text{N}$$

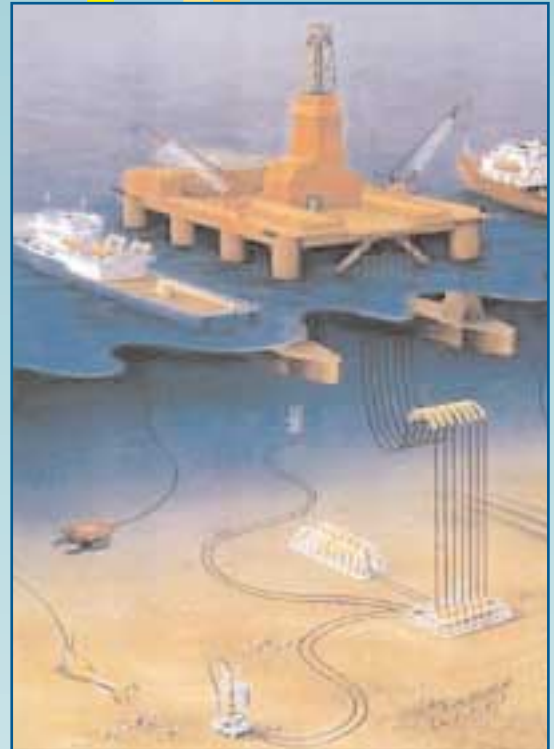
To ensure a high resistance to pitting and crevice corrosion the super duplex DMV 25.7N is made to a minimum PREN of 40.

The positive influence of Tungsten (W) to localised corrosion resistance of stainless steel is very well known and taken into consideration when calculating the modified formula of:

$$\text{PREW: \%Cr} + 3.3 (\% \text{Mo} + 0.5\% \text{W}) + 16\% \text{N}$$

where W is supposed to behave similarly to Mo and may form a stable protecting film at oxidising potentials, within a low pH region.

The typical PREW for DMV 25.7N is 42.5.



Typical FPSO using umbilicals



DMV Costa Volpino plant

TYPICAL CHEMICAL ANALYSIS

SUPER DUPLEX STEEL GRADE					
DMV 25.7N™			UNS S 32760		
Cr	Ni	Mo	W	Cu	N
25%	7%	4%	0.70%	0.60%	0.26%

TYPICAL MECHANICAL PROPERTIES

Yield Strength (0.2% offset)	min. 600 MPa
Tensile Strength	min. 800 MPa
Elongation in 2" or 50mm	25% min.
Hardness	max. 32 HRc or max. 320 HV

TYPICAL CORROSION RESISTANCE

Method of examination: ASTM G 48 Meth. A for 24h

Temperature 50°C: No pitting (at 20x), max weight loss 1.0 g/m²

Method of examination: ASTM G 48 Meth. B for 24h

Temperature 38°C: No crevice (at 20x), max weight loss 1.0 g/m²



DMV 25.7 typical ferritic-austenitic microstructure, with a ferrite content of 40% to 60% (typical value is 45% to 55%).

PHYSICAL PROPERTIES OF DMV 25.7 N

Density: 7.8 g/cm³ at 20°C

Resistivity: 0.50 · 10⁻⁶ Ωm at 20°C

Magnetic Permeability: The typical relative peak of DMV 25.7N is 29 at 20°C

Specific Heat & Thermal conductivity:

°C	J.Kg ⁻¹ .K ⁻¹	Wm ⁻¹ .K ⁻¹
20	450	14.2
200		18.4

Thermal Expansion Coefficient:

°C	10 ⁻⁶ .K ⁻¹
20 - 100	12.8
20 - 200	13.3
20 - 300	13.8

Modulus of Elasticity: (Young's Modulus)

The modulus is a function of the actual ratio ferrite/austenite and of the production process followed:

Temp. °C	E in tension GPa	E in torsion GPa
20	200	75
280	170	

AVAILABLE SIZES

All common umbilical sizes are available: Electro hydraulic lines from 3/8" O.D. with a minimum wall thickness of 1mm and methanol injection lines of 3" O.D. and more. Straight lengths are available up to 26 m depending on inside diameter.



DMV Stainless was incorporated in 1994 through the integration of the seamless stainless steel and nickel alloy tubular business of three well-established European corporations from Italy, Germany and France...

Dalmine, **M**annesmann and **V**allourec.

The objective of this consolidation was to establish the world's most comprehensive and flexible supplier of quality seamless stainless steel and nickel alloy pipes and tubes.

With facilities in France, Germany, Italy and the United States, DMV is in an excellent position to provide customer support on a global basis.

Through the rationalisation and optimization of the plants, techniques, facilities and personnel, DMV STAINLESS has become synonymous with the concept ...

'Diversity is our Strength'.

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