Tenaris

Environmental Product Declaration

Offshore and Onshore Seamless Line Pipe Solutions

BASED ON:
PCR 2019:14 (versions 1.1). Construction products

CPC code 41

ISO 14025:2006

EN 15804:2012+A2:2019

ISO 21930:2017

CERTIFICATION N°:
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EPD® ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD EN 15804 VERIFIED

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Programme information

EPD REFERENCES

EPD OWNER: TENARIS SA, 29 AVENUE DE LA PORTE-NEUVE, L2227 - LUXEMBOURG

PROGRAM OPERATOR: EPD INTERNATIONAL AB, BOX 21060, SE-100 31 STOCKHOLM, SWEDEN; INFO@ENVIRONDEC.COM

INDEPENDENT VERIFICATION

This declaration has been developed referring to the International EPD System, following the General Programme Instructions v 3.01; further information and the document itself are available at: www.environdec.com. EPD document valid within the following geographical area: Italy and other countries according to sales market conditions (North Africa and Europe).

ISO standard ISO 21930 and CEN standard EN 15804 served as the core PCR
PCR 2019:14 Construction products, Version 1.1, 2020-09-14
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepciòn, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Independent verification of the declaration and data, according to EN ISO 14025 : 2018

Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it) ☐ EPD process certification (Internal) ☑ EPD verification (External)

Accredited by: Accredia

Procedure for follow-up during EPD validity involves third party verifier: ☑ YES ☐ NO

Environmental declarations published within the same product category, but from different programmes may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804. EPD owner has the sole ownership, liability and responsibility of the EPD.

CONTACTS

TenarisDalmine is available to release an Environmental Product Declaration for one specific product at the customer's request. To get more information about this environmental declaration or about TenarisDalmine activities please contact:

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Technical support to TenarisDalmine was provided by Life Cycle Engineering, Italy. (info@studiolce.it, www.lcengineering.eu).

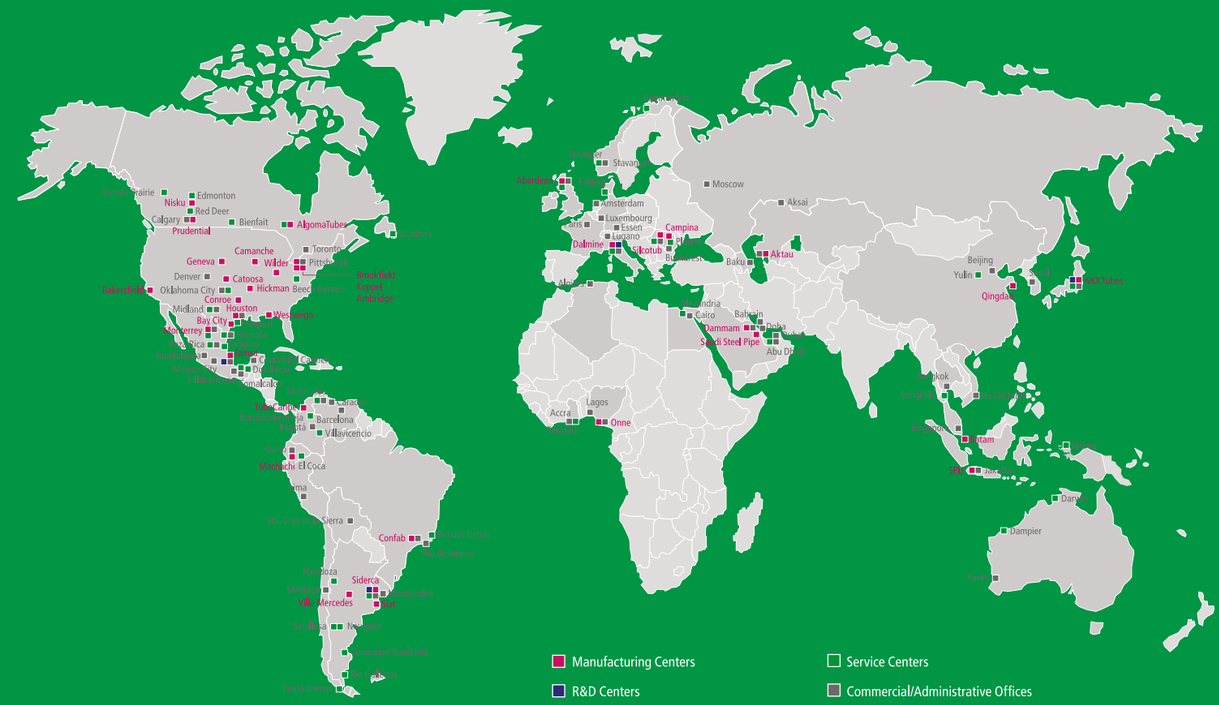
Tenaris

Tenaris is the leading global manufacturer and supplier of tubular products and services used in the drilling, completion and production of oil and gas and a leading supplier of tubular products and services used in process and power plants and in specialized industrial and automotive applications.
Tenaris prioritizes the health and safety of its personnel, collaborators and visitors, the satisfaction of its customers, the protection of the environment and the development of the communities with which it interacts as an absolute and integrated priority; the entire organization is oriented toward achieving these goals openly and transparently.

Tenaris is committed to developing long-term sustainable business, preventing pollution and minimizing the environmental impact of its operations, making the most efficient use of natural resources and energy.

TenarisDalmine

TenarisDalmine - the steel pipe operations of Tenaris in Italy - is the top Italian producer of seamless steel tubes for the energy, automotive and mechanical industries, with an annual production capacity of 950,000 tons of finished products, , 5 plants, a steel shop and a 120 MW self-production power plant which, as well as all TenarisDalmine production sites, received both the ISO EN 14001 and OHSAS 18001 certifications.
As far as energy efficiency, TenarisDalmine mills and its power plant received the ISO EN 50001 certification, the international standard guaranteeing the use of procedures developed for a continuous improvement and an efficient energy management.



Tenaris Offshore and Onshore Seamless Line Pipe

Continuing global oil and gas demand is driving operators to extend their exploration efforts into deeper offshore waters and tap difficult-to produce land reservoirs.

To satisfy this demand, offshore operators need advanced technology solutions to challenges such as sour service, high-temperature/high-pressure (HT/HP) environments, and long-distance tiebacks in deep and ultra-deep water. Similar trends are also present in the onshore business for long pipelines, sour service requirements, artic and artic alike environment as well as HP/HT.

With more than 200 line pipe projects successfully delivered with ancillary services, Tenaris is able to offer a wide range of solutions, including:

- Complete LP and Riser Package
- Premium Connections
- Coating (including corrosion resistance, flow assurance, concrete weight, and thermal insulation)
- Ancillary (Anode Pad, Taper Joint, Buckling Arrestor,…)
- Hot Induction Bends
- Welding & Multiple Jointing
- Laser End Information Services
- End Conditioning
- Corrosion Resistant Alloys (clad, lined and solid)

Scope and type of EPD®

The approach used in this EPD is “Cradle to gate with options” one

TABLE OF MODULES

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
	Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De- construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
MODULE	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	IT	IT	IT	WLD	–	–	–	–	–	–	–	–	WLD	WLD	WLD	WLD	WLD
Specific data used	> 90%			–	–	–	–	–	–	–	–	–	–	–	–	–	–
Variation-products	NOT RELEVANT			–	–	–	–	–	–	–	–	–	–	–	–	–	–
Variation-sites	NOT RELEVANT			–	–	–	–	–	–	–	–	–	–	–	–	–	–

SOFTWARE: SimaPro ver. 9.1.0.8 (www.pre.nl)
MAIN DATABASE: Ecoinvent 3.6
REPORT LCA: Life Cycle Assessment (LCA) for manufacturing of seamless line pipe with the EAF process
GEOGRAPHICAL SCOPE OF THE EPD: World according to sales market conditions.
TYPE OF EPD: Product EPD
REFERENCE YEAR: 2019

Environmental declarations published within the same product category, though originating from different programs, may not be comparable.

Detailed product description

Detailed product description

Tenaris provides complete tubular and services solutions packages for the most demanding operator challenges in oil & gas application. Solutions include:

- Steel catenary, hybrid risers and top tension risers
- Export lines and flowlines
- Tubular components for subsea applications
- Tubular components for structural applications
- Premium connections
- Pipe End Conditioning
- Laser Ends Measurement Services
- Coating

INFORMATION	LINE PIPE	LINE PIPE WITH LARGE DIAMETER
PRODUCT IDENTIFICATION	C-Mn steel seamless pipe for on-shore and offshore LP applications	C-Mn steel seamless pipe for on-shore and offshore LP applications
PRODUCT FEATURES	OD from 159 mm to 406 mm, WT up to 60 mm	OD from 407 mm to 711 mm, WT up to 60 mm
PRODUCT PROPERTIES	Steel grades and pipe properties according to main international standards (DNV OS F101, API 5L, ISO 3183) and customer requirements.	Steel grades and pipe properties according to main international standards (DNV OS F101, API 5L, ISO 3183) and customer requirements.
COATING*	FBE + 3 LPP	FBE + 3 LPP
MANUFACTURING PLANT	Dalmine	Dalmine

* The coating may vary in material and geometric characteristics as well as in its environmental burden.
In this document a coating system composed of one internal layer of epoxy powder and three external layers of polypropylene is analysed as it is one of the most utilized to protect pipes in aggressive environment.
This solution is contributing 10% on total green house gases emission, other systems may lead to partial increase or reduction of this contribution.

CONTENT DECLARATION

MATERIAL	MASS SHARE
IRON FROM POST CONSUMER SCRAP	93 %
IRON FROM OTHER SOURCES	5 %
ALLOY ELEMENTS	1 %
OTHER ELEMENTS	0.8 %
PACKAGING	0.2 %

The minimum content of recycled material is 93%, according to UNI EN ISO 14021

Manufacturing Specification

Dalmine plant

STEEL SHOP

The furnace at the steel shop is loaded mostly by pre-selected scrap and pig iron (approx. 100 ton in 2 steps), which is melted with the heat generated by an electric arc created between the electrode and the scrap and by the use of chemical energy coming from combustion processes (natural gas and coal).

Once the slag has been removed around 95 tons of liquid steel at a temperature of around 1,650°C are poured into the ladle furnace, where secondary metallurgy is carried out. Vacuum degassing for special steels is performed.

Continuous casting transforms liquid steel into round section solid bars with diameters between 148 and 395 mm for subsequent rolling.

All processes are controlled by an integrated system including the furnace power management, the furnace fumes emission, the addition of ferro-alloys to reach the required chemical composition and the control of the casting parameters until the cut-to-length of the bars.

MANDREL ROLLING

After passing through a rotary hearth furnace, the bars are transferred to the hot rolling mill in order to carry out the piercing process, thickness rolling and diameter sizing. The piercing process transforms the hot bar into a hollow: the bar turns due to the movement of two skewed opposing rollers.

As a result of the internal tension generated, a hollow is created in the center of the bar, into which the piercing plug is introduced.

A “hollow” with very thick walls is thereby produced. To transform the hollow into a tube with the specified dimensions, the wall thickness must be reduced. The mandrel is inserted into the hollow and lamination takes place between the rolls and the mandrel with a gradual reduction in thickness. The tube is then sent to the sizing, to set the final diameter and wall thickness according to customer’s requests.

EXPANDER MILL

Mother pipes with an external diameter of 360 and 406 mm produced by the continuous rolling mill are used for the production of big diameter pipes.

After heating, the mother pipes are expanded through a cross rolling mill on a taper plug. The reduction in thickness is compensated by the increase in the diameter. It can produce tubes with an external diameter between 406 and 711 mm.

HEAT TREATMENTS

In order to obtain the required mechanical properties, heat treatments of normalizing or quenching & tempering are performed in different facilities depending on tube dimension.

Quench and tempering is the most commonly used heat treatment for medium-high steel grades and for demanding LP applications; the cooling phase from austenitizing temperature can be performed with quenching head for thinner wall thickness or with more effective water tank in case of thicker wall.

FINISHING & NON-DESTRUCTIVE TESTS

To guarantee the high quality of its material, Tenaris performs a combination of non-destructive tests (ultrasound, flux leakage, Eddy current, magnetic particle inspections).

TENARISDALMINE POWER PLANT

TenarisDalmine Thermal Power Plant is based on a combined cycle technology (energy and heat), counting on two 43MW natural gas turbines and one 41MW steam turbine.

The Thermal Power Plant is able to produce almost 900 GW per year, 70% is used to serve the TenarisDalmine energy need and 30% is sold in the free energy market, with a cycle performance of 51% vs an Italian energy park average of 40% and with the highest environmental performance among Italian thermal power plant of such dimension. The remote heating network uses a part of the steam that, instead of producing energy, is sent to heat exchangers which produce 90°C hot water.

A special pipeline system provides hot water to the buildings in the remote heating network, where an exchanger gives heat to the building heating system. Cooled water goes back to the Thermal Power Plant, where it is re-heated to the maximum temperature before starting again the cycle.

Environmental Performance
LINE PIPE (OD: 159 ÷ 406 mm)

The detailed environmental performance (in terms of potential environmental impacts, use of resources and waste generation) is presented for the three phases Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4). Construction installation (A5) and use phase (B1 - B7) are modules not declared (MND). End of life (C1 - C4, D) is considered.

DECLARED UNIT (D.U.) The declared unit is 1 tonne (1000 kg) of fabricated steel product in Dalmine[1] plant.

ENVIRONMENTAL IMPACTS

POTENTIAL ENVIRONMENTAL IMPACTS	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
GWP	kg CO_2 eq	1,58E+03		7,57E+01	9,69E+00	3,51E+00	3,80E-01	1,77E-02	**1,67E+03**	-2,10E+02
GWP,f	kg CO_2 eq	1,58E+03		7,56E+01	9,68E+00	3,51E+00	3,75E-01	1,76E-02	**1,67E+03**	-2,10E+02
GWP,b	kg CO_2 eq	4,12E+00		4,44E-02	9,90E-03	1,50E-03	3,93E-03	5,83E-05	**4,18E+00**	-6,73E-01
GWP,luluc	kg CO_2 eq	2,92E-01		1,25E-03	1,62E-04	2,94E-05	7,61E-04	4,31E-07	**2,94E-01**	-2,08E-02
GWP,ghg	kg CO_2 eq	1,58E+03		7,56E+01	9,68E+00	3,51E+00	3,76E-01	1,76E-02	**1,67E+03**	-2,10E+02
ODP	kg CFC11 eq	2,16E-04		1,59E-05	2,15E-06	8,06E-07	1,70E-08	3,69E-09	**2,35E-04**	-6,26E-06
AP	mol H+ eq	6,12E+00		2,54E+00	1,04E-01	3,79E-02	1,90E-03	1,82E-04	**8,81E+00**	-1,01E+00
EP,f	kg P eq	2,55E-02		7,79E-05	1,38E-05	2,19E-06	2,00E-05	6,44E-08	**2,56E-02**	-1,25E-02
EP,m	kg N eq	1,24E+00		6,27E-01	4,62E-02	1,19E-02	3,44E-04	7,91E-05	**1,92E+00**	-1,94E-01
EP,t	mol N eq	1,38E+01		6,98E+00	5,06E-01	1,32E-01	3,84E-03	8,68E-04	**2,14E+01**	-2,19E+00
POCP	kg NMVOC eq	4,56E+00		1,77E+00	1,39E-01	3,40E-02	1,03E-03	2,42E-04	**6,51E+00**	-1,07E+00
ADPE	kg Sb eq	5,32E-02		3,13E-06	4,26E-06	1,95E-07	2,31E-07	7,32E-09	**5,32E-02**	-3,78E-03
ADPF	MJ	3,16E+04		9,78E+02	1,33E+02	4,92E+01	4,85E+00	2,35E-01	**3,27E+04**	-1,69E+03
WDP	m^3	7,48E+04		-1,80E-01	3,01E-02	-1,09E-02	5,62E-02	8,09E-05	**7,48E+04**	-1,87E+01

GWP Global warming potential, total
GWP,f Global warming potential, fossil
GWP,b Global warming potential, biogenic
GWP,luluc Global warming potential, land use & land use change
GWP,ghg Global warming potential, excluding biogenic biogenic uptake, emission and storage
ODP Ozone depletion potential
AP Acidification Potential
EP,f Eutrophication potential, freshwater
EP,m Eutrophication potential, marine
EP,t Eutrophication potential, terrestrial
POCP Photochemical ozone creation potential
ADPE Abiotic depletion potential minerals & metals*
ADPF Abiotic depletion potential fossil fuels*
WDP Water use deprivation potential*

Additional environmental impact indicators are computed in the LCA report but not reported in the EPD.

*: The results of these environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

1 Piazza Caduti del 6 luglio 1944 1 - 24044 - Dalmine (BG) - IT

RESOURCE USE PER DECLARED UNIT

USE OF RENEWABLE MATERIAL RESOURCES	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
PERE	MJ	7,03E+02		2,01E+00	2,68E-01	6,83E-02	5,59E-01	8,89E-04	**7,05E+02**	-1,56E+02
PERM	MJ	0,00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
PERT	MJ	7,03E+02		2,01E+00	2,68E-01	6,83E-02	5,59E-01	8,89E-04	**7,05E+02**	-1,56E+02
PENRE	MJ	3,52E+04		9,58E+02	1,31E+02	4,81E+01	6,33E+00	2,35E-01	**3,64E+04**	-2,51E+03
PENRM	MJ	6,24E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**6,24E+00**	0,00E+00
PENRT	MJ	3,52E+04		9,58E+02	1,31E+02	4,81E+01	6,33E+00	2,35E-01	**3,64E+04**	-2,51E+03
SM	kg	1,21E+03		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1,21E+03**	0.00E+00
RSF	MJ	0,00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
NRSF	MJ	0,00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
FW	m^3	1,84E+01		1,83E-02	3,55E-03	9,38E-04	2,71E-03	7,05E-06	**1,84E+01**	-3,92E-01

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM Use of renewable primary energy resources used as raw materials
PERT Total use of renewable primary energy resources
PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM Use of non-renewable primary energy resources used as raw materials
PENRT Total use of non-renewable primary energy resources
SM Use of secondary raw materials
RSF Use of renewable secondary fuels
NRSF Use of non-renewable secondary fuels
FW Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES PER DECLARED UNIT

WASTE GENERATION AND TREATMENT	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
HWD	kg	1,17E+01		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1,17E+01**	0.00E+00
NHWD	kg	7,42E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**7,42E+00**	0.00E+00
RWD	kg	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
CRU	kg	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
MFR	kg	2,16E+02		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**2,16E+02**	0.00E+00
MER	kg	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00
EE	MJ	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0,00E+00**	0.00E+00

HWD Hazardous waste disposed
NHWD Non-hazardous waste disposed
RWD Radioactive waste disposed
CRU Components for re-use
MFR Materials for recycling
MER Materials for energy recovery
EE Exported energy

The environmental impacts associated with waste disposal to landfill and incineration are accounted in the indicators related to the potential environmental impact (page 12).

Environmental Performance
LINE PIPE (OD: 407 ÷ 711 mm)

The detailed environmental performance (in terms of potential environmental impacts, use of resources and waste generation) is presented for the three phases Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4). Construction installation (A5) and use phase (B1 - B7) are modules not declared (MND). End of life (C1 - C4, D) are considered.

DECLARED UNIT (D.U.) The declared unit is 1 tonne (1000 kg) of fabricated steel product.

ENVIRONMENTAL IMPACTS

POTENTIAL ENVIRONMENTAL IMPACTS	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
GWP	kg CO_2 eq	1,93E+03		7,57E+01	9,69E+00	3,51E+00	3,80E-01	1,77E-02	**2,02E+03**	-2,10E+02
GWP,f	kg CO_2 eq	1,92E+03		7,56E+01	9,68E+00	3,51E+00	3,75E-01	1,76E-02	**2,01E+03**	-2,10E+02
GWP,b	kg CO_2 eq	4,45E+00		4,44E-02	9,90E-03	1,50E-03	3,93E-03	5,83E-05	**4,51E+00**	-6,73E-01
GWP,luluc	kg CO_2 eq	3,11E-01		1,25E-03	1,62E-04	2,94E-05	7,61E-04	4,31E-07	**3,13E-01**	-2,08E-02
GWP, ghg	kg CO_2 eq	1,92E+03		7,56E+01	9,68E+00	3,51E+00	3,76E-01	1,76E-02	**2,01E+03**	-2,10E+02
ODP	kg CFC11 eq	2,73E-04		1,59E-05	2,15E-06	8,06E-07	1,70E-08	3,69E-09	**2,92E-04**	-6,26E-06
AP	mol H+ eq	9,76E+00		2,54E+00	1,04E-01	3,79E-02	1,90E-03	1,82E-04	**1,24E+01**	-1,01E+00
EP,f	kg P eq	2,89E-02		7,79E-05	1,38E-05	2,19E-06	2,00E-05	6,44E-08	**2,90E-02**	-1,25E-02
EP,m	kg N eq	3,56E+00		6,27E-01	4,62E-02	1,19E-02	3,44E-04	7,91E-05	**4,25E+00**	-1,94E-01
EP,t	mol N eq	3,92E+01		6,98E+00	5,06E-01	1,32E-01	3,84E-03	8,68E-04	**4,68E+01**	-2,19E+00
POCP	kg NMVOC eq	1,07E+01		1,77E+00	1,39E-01	3,40E-02	1,03E-03	2,42E-04	**1,26E+01**	-1,07E+00
ADPE	kg Sb eq	4,20E-02		3,13E-06	4,26E-06	1,95E-07	2,31E-07	7,32E-09	**4,20E-02**	-3,78E-03
ADPF	MJ	3,46E+04		9,78E+02	1,33E+02	4,92E+01	4,85E+00	2,35E-01	**3,58E+04**	-1,69E+03
WDP	m^3	1,52E+03		-1,80E-01	3,01E-02	-1,09E-02	5,62E-02	8,09E-05	**1,52E+03**	-1,87E+01

GWP Global warming potential, total
GWP,f Global warming potential, fossil
GWP,b Global warming potential, biogenic
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ODP Ozone depletion potential
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POCP Photochemical ozone creation potential
ADPE Abiotic depletion potential minerals & metals*
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WDP Water use deprivation potential*

Additional environmental impact indicators are computed in the LCA report but not reported in the EPD.

*: The results of these environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

RESOURCE USE PER DECLARED UNIT

USE OF RENEWABLE MATERIAL RESOURCES	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
PERE	MJ	7,88E+02		2,01E+00	2,68E-01	6,83E-02	5,59E-01	8,89E-04	**7,91E+02**	-1,56E+02
PERM	MJ	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
PERT	MJ	7,88E+02		2,01E+00	2,68E-01	6,83E-02	5,59E-01	8,89E-04	**7,91E+02**	-1,56E+02
PENRE	MJ	3,89E+04		9,58E+02	1,31E+02	4,81E+01	6,33E+00	2,35E-01	**4,01E+04**	-2,51E+03
PENRM	MJ	1,55E+01		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**1,55E+01**	0,00E+00
PENRT	MJ	3,90E+04		9,58E+02	1,31E+02	4,81E+01	6,33E+00	2,35E-01	**4,01E+04**	-2,51E+03
SM	kg	1,26E+03		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**1,26E+03**	0,00E+00
RSF	MJ	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
NRSF	MJ	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
FW	m^3	3,64E+01		1,83E-02	3,55E-03	9,38E-04	2,71E-03	7,05E-06	**3,64E+01**	-3,92E-01

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM Use of renewable primary energy resources used as raw materials
PERT Total use of renewable primary energy resources
PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM Use of non-renewable primary energy resources used as raw materials
PENRT Total use of non-renewable primary energy resources
SM Use of secondary raw materials
RSF Use of renewable secondary fuels
NRSF Use of non-renewable secondary fuels
FW Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES PER DECLARED UNIT

WASTE GENERATION AND TREATMENT	UNITS / D.U.	UPSTREAM PROCESS	CORE PROCESS	DOWNSTREAM PROCESS					TOTAL	
		A1:A3		A4	C1	C2	C3	C4		D
HWD	kg	1,91E+01		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**1,91E+01**	0,00E+00
NHWD	kg	7,63E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**7,63E+00**	0,00E+00
RWD	kg	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
CRU	kg	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
MFR	kg	2,66E+02		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**2,66E+02**	0,00E+00
MER	kg	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00
EE	MJ	0,00E+00		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**	0,00E+00

HWD Hazardous waste disposed
NHWD Non-hazardous waste disposed
RWD Radioactive waste disposed
CRU Components for re-use
MFR Materials for recycling
MER Materials for energy recovery
EE Exported energy

The environmental impacts associated with waste disposal to landfill and incineration are accounted in the indicators related to the potential environmental impact (page 12).

Calculation Rules

According to the PCR 2019:14 v. 1.1 the main activities are listed and divided n three subsystems:
UPSTREAM Process, CORE Module, Downstream Process

LCA METHODOLOGY

The environmental burden of the product has been processed according to the general rules of the EPD (Environmental Product Declaration) International Programme and the N.PCR 2019:14 (versions 1.1), construction products - Multiple UN CPC codes (Cradle to gate with options).

This declaration is based on the application of Life Cycle Assessment (LCA) methodology to the whole life-cycle system. Seamless pipe product at plant level, was described by using specific data from Dalmine manufacturing facility for year 2019.

Packaging used for product delivery and pollutant concentration in wastewater is considered negligible in accordance with the cut-off criteria established in PCR 2019:14 v.1.1 (ch. 7.6).

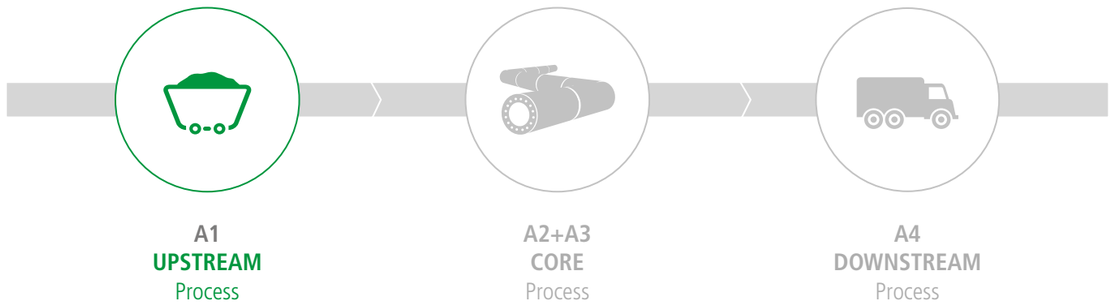
Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials specifications, pre-treatments, process efficiencies, air emissions, waste management), ultimately providing a complete picture of the environmental burden of the system:

Raw materials supply (A1), Transport (A2), Manufacturing (A3) and transport to final destination was considered (A4).

End of life is included as well

Upstream Process

(A1 Raw material supply)



Core Process

(A2 Transportation + A3 Manufacturing)

NATURAL GAS COMBUSTION FOR ENERGY PRODUCTION

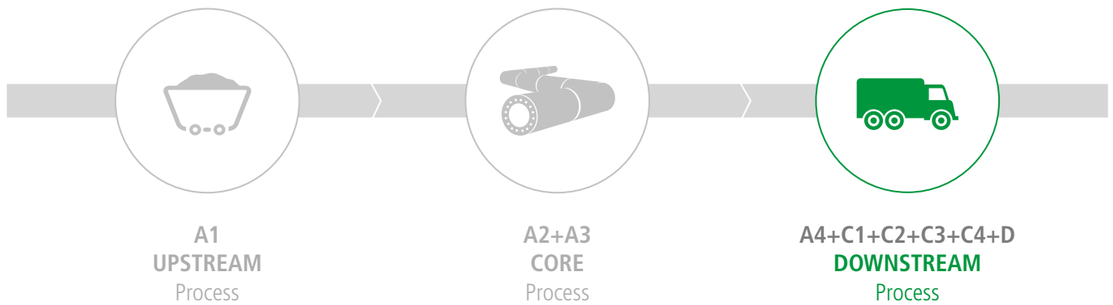
TREATMENT PROCESS OF WASTE GENERATED BY THE MANUFACTURING PROCESS

MANUFACTURING PROCESS INCLUDING STEEL MILL, ROLLING MILL, FAS EXPANDER, THERMAL TREATMENT AND FINISHING PROCESS

ANCILLARY PRODUCTION

Downstream Process

(A4 Transport to final destination)



A4 Distribution

Transport to the customers (general market average). Distances estimated considering the transported quantities and the distances from Dalmine plant to the client. From Dalmine (in the North of Italy) final products are delivered to many national and international areas.

C1 De-construction demolition

Dismantling and demolition operations required to remove the product from the building. Initial onsite sorting of the materials is included as well.

Based on Tenaris experience, 14% of line pipes is estimated to be collected for recycling.

C2 Transport

Transportation of the discarded product as part of the waste processing (to recycling site or to a final disposal site).

In the LCA model representative distances of 250 km by truck and 500 km by ship (for offshore applications) have been considered.

C3 Waste processing

Waste processing, including collection of waste fraction from deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery.

C4 Disposal

Waste disposal including physical pre-treatment and management of the disposal site.

D Reuse - Recovery Recycling potential

Environmental impacts associated to waste use after the investigated system (including recycling).

In the model the impacts of steel recycling via EAF are considered as generated, while the impacts of primary steel produced via BOF are considered as avoided.

Additional Information

Other environmental characteristics of Dalmine plant are:

TenarisDalmine mill, as the whole Tenaris industrial system, is committed to reduce the intensity and overall level of CO_2 emissions by using energy resources efficiently, implementing best available technologies, and using carbon-efficient sources of energy.

In the last years TenarisDalmine installed:

1. A new capturing and treatment system for the Electric Arc Furnace[1] dust emissions, which doubled the aspiration capacity over the previous one, achieving the upper limits provided by BREF[2].

2. An activated carbon injection system to control POPs emissions from the steel shop. This equipment has been running since 2010 with concentrations at stack lower than limits imposed by EU for 2016 (< 0,1 ngITEQ[3]/ Nm3 on all existing stacks).

3. A new capturing and treatment system for its main rolling mill dust emissions. This can reduce up to 5 times the dust air emissions.

4. Low-NOX regenerative burners in its main rotary heating furnace (RHF FTM[4]). This allowed the mill to increase the production capacity without increasing gas consumption and NOx emissions. An HRSG[5] boiler was also installed in order to use the RHF FTM fumes to generate steam for industrial use.

5. At TenarisDalmine the main raw material used to feed the Electric Arc Furnace is ferrous scrap, which represents 90% of the metallic charge. At the steel scrap yard steel scraps are separated in different classes to allow the most efficient charge bucket preparation.

6. TenarisDalmine has a grinding and sieving plant to process the slag produced by the EAF and transforming it into Ecograin®, a material for construction industry which obtained the CE marking and it is used as a replacement for natural gravel in concrete and asphalt industry.

7. TenarisDalmine has a closed loop recirculating system for industrial water. Filtering and oil separation allow water re-use, water consumption is therefore limited to evaporation.

8. TenarisDalmine operates a combined cycle power plant. It produces 120 MWe, 12 MWt mainly for internal industrial use and feeds a district heating net for internal and external users (40 MWt).

9. TenarisDalmine is continuously aiming to improve its process and product environmental performance. The ISO 14001 compliant Environmental Management System main goals are: periodic renovation of air and water emission systems, continuous improvement of installed monitoring systems, periodic training and communication for the operators on environmental management.

10. The minimum content of recycled material in 2019 is 93%, according to UNI EN ISO 14021.

1 EAF Electric Arc Furnace
2 BREF Best available techniques REFerence document
3 TEQ Toxic Equivalency Factor
4 RHF FTM Rotary Hearth Furnace - Medium Pipe Mill
5 HRSG Heat Recovery Steam Generator

Tenaris

www.tenaris.com

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