Life Cycle Analysis

In accordance with ISO 14040:2006 and ISO 14044:2006

TUBOS REUNIDOS GROUP

O-Next® SEAMLESS 9 – 13% Cr STEEL TUBE FOR OIL COUNTRY TUBULAR GOODS (O.C.T.G.) APPLICATIONS, PLAIN END (NOT THREADED)

REV0. JANUARY 2025

CONTACT DETAILS

Sagarribai s/n 01470 Amurrio, Álava, Spain
(+34) 945 89 71 00
www.tubosreunidosgroup.com

Geographical scope: Spain

DESCRIPTION OF THE ORGANISATION

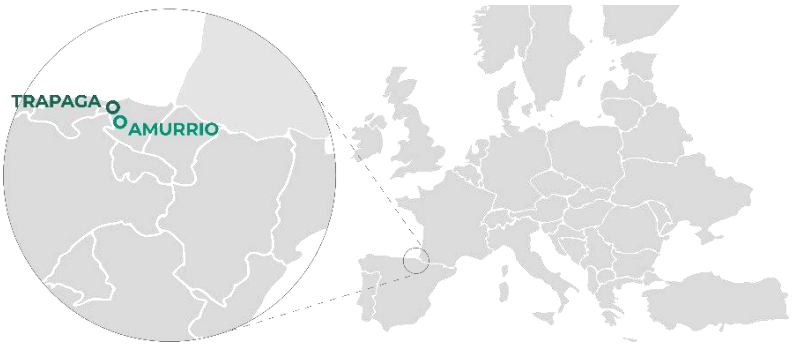
Next Generation Tubes

We develop and produce seamless steel tubes with special and complex requirements, designed and tailor-made for each and every customer in stainless steel as well as in high alloys, carbon grades and in Special finishings.

We meet and even exceed all the industrial processes and requirements of the energy sector (bioenergy, solar, wind, CCUS, hydrogen...), and we are also present in other sectors such as handling and lifting machinery, mobility and other industrial mechanical applications.

Our international presence in more than 100 countries and our vocation for excellence in service allows us to be closer to the needs of each client. We also combine 130 years of experience with an outstanding desire for innovation in products as well as in flexible and in integrated processes and management.

We are committed to sustainable development and work towards reducing our environmental footprint and to boosting our process circularity while providing solutions aimed to promote projects for the transition towards a decarbonized economy.



TUBOS Mill (Amurrio site)

Manufactures hot-rolled and cold-drawn seamless carbon and alloy steel tubes up to 13% Cr., for Energy industries like Oil&Gas, Petrochemical, Chemical, Power generation and energy transition industries as Hydrogen, CCUS, Biothermal, Biofuels. As well as other applications like Mobility, Construction and Mechanical Engineering.

Range of products

- **Hot rolled**, 26,7 mm to 180 mm in Ø and up to 25,1 m in length.
- **Cold drawn**, 15 mm to 118 mm in Ø and up to 20,1 m in length.

We also provide special finishing operations / conditions as: "U" bent, studded, finned tubes, coatings, etc.

This LCA refers to the product manufactured in Tubos Mill.

PRODUCTOS Mill (Sestao and Trápaga site)

Manufactures stainless, alloy and carbon steel seamless tubes.

We are manufacturers of Hot rolled Seamless Steel Tubes specialized in big sizes and heavy wall, mainly for structural and mechanical engineering, oil and gas, hydrogen, powergen, refineries, chemical, petrochemical and fertilizer plants, nuclear, offshore wind, among other.

Range of products

- **Outside diameter** 193 mm - 711 mm. 7 1⁄2 " - 28"
- **Wall Thickness** 6,35 mm - 125 mm. 1/4 " - 5"

Our International Network

4
R&D Centers

6
Countries with Sales Office

14
Countries with Sales Agency

Our Markets

ENERGY

Bioenergy | Hydrogen | Nuclear | Carbon Capture | Geothermal | Oil & Gas

INDUSTRY

Offshore Wind | Solar | Construction | Mobility | Engineering

Product information

PRODUCT NAME

O-Next® Seamless 9 – 13% Cr Steel Tube for Oil Country Tubular Goods (O.C.T.G.) Applications, plain end (no threaded)

PRODUCT IDENTIFICATION

Seamless 9 – 13% Cr steel tubes for O.C.T.G.

PRODUCT DESCRIPTION

This LCA describes the seamless steel tube for oil country tubular goods applications, plain end (no threaded) produced by TRG with **renewable energy**.

The product corresponds to a 9 – 13% Cr steel tube continuously cast, seamless, and quenched and tempered. It covers the tubes for oil country tubular goods applications.

The technical characteristics of the products are according to standard specification **API 5CT**:

> This standard specifies the technical delivery conditions for steel pipes (casing, tubing) and coupling stock.

CONSTRUCTIONAL DATA

NAME	VALUE	UNIT
Yield strength at room temperature	>552	MPa
Tensile strength at room temperature	>655	MPa
Hardness	<=34	HRC
Impact test: absorbed energy	> 18	J

OUTSIDE DIAMETER	WALL THICKNESS	GRADE	
60,3 - 200 mm	**4 - 24,5 mm**	**API 5CT**	**Specification grades**
			L80 9% Cr
			L80 13% Cr
			Proprietary grades
			TR 13Cr95
			TR 13Cr110

LCA information

DECLARED UNIT

1 ton (1000 kg) of fabricated tube

TIME REPRESENTATIVENESS

Primary data originated by TRG S.L.U., corresponds to the year 2023.

The declared unit of "1 ton (1000 kg) of fabricated tube" has been calculated having into account all the annual inputs and outputs of the manufacturing process in the steel mill and rolling mill in Amurrio. This production represents a quality of tube with a specific path of manufacturing steps, which are inventoried in the Core of the present study.

DATABASE(S) AND LCA SOFTWARE USED

The database used was Ecoinvent 3.9.1 and the software used was SIMAPRO 9.5.01.

DESCRIPTION OF SYSTEM BOUNDARIES

The system boundaries established in this study have been defined following the guidelines of the PCR 2023:01 version 1.0.2 Fabricated metal products, except construction products, applying the "cradle-to-gate" criterion.

SYSTEM DIAGRAM

The scope of life cycle of assessment (LCA) is cradle-to-gate, and therefore, this study includes the information from the Upstream and Core stages.

UPSTREAM

- Extraction and production of raw material for all main parts of the product including packaging
- Recycling process of recycled material used in the product
- Transportation of raw material to the upstream process (default information included in the indicators used)
- Generation of electricity and production of fuel (default information included in the indicators used)

CORE

- Manufacturing process; including the inflow of auxiliary materials and energy consumptions needed for the manufacturing of the product. **The manufacturing process includes the use of 100% renewable electricity and biogas.**
- Transportation of the steel raw materials and other materials and components to the core process where the final manufacturing takes place.
- Transportation between manufacturing facilities, including external facilities.
- End-of-life treatment of manufacturing waste.
- Generation of electricity and production fuels, steam and other energy carries used.

EXCLUDED LIFECYCLE STAGES

The Downstream phase has not been included as the scope used for the study is “cradle-to-gate”; therefore, the transportation of the tube to the retailer/consumer, the use and the end-of-life of the product have not been included.

Additional technical information

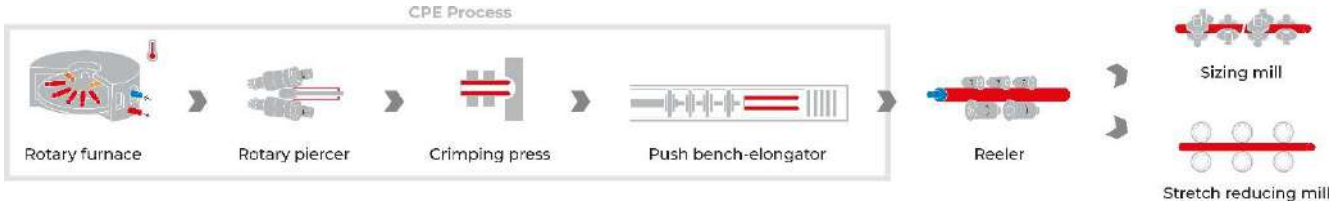
General Manufacturing Specification

STEEL PRODUCTION

The steel used by TRG is produced in our own steel shops and comes from the melt of high-quality scrap; we have an electric process with EAF. From the furnace, the steel is transported to a ladle furnace to obtain the billets that feed the rolling facility.

ROLLING FACILITY

The billet gets to the furnace to achieve the appropriate temperature to follow the process: rotary piercer, crimping press, push bench elongator, reeler and finally to the walking beam furnace. After passing through the calibration press, we obtain the thickness rolling and diameter sizing in order to obtain the desired final dimensions.



FINISHING AND PACKING

Finally, the tube undergoes a heat treatment in an electric furnace and then moves to the finishing line, where it is inspected, sandblasted and lacquered.

The data for electricity generation for production were obtained from the specific electricity mix of the retailer, obtained from information published by the Comisión Nacional de los Mercados y la Competencia (CNMC), https://gdo.cnmc.es/CNE/accesoEtiquetado.do, and represent the company's energy consumption profile.

Content declaration

The tube is made from 100% steel, with following chemical composition for the qualities taking into account:

PRODUCT COMPONENT	SYMBOL	WT %
Carbon	C	<= 0,22
Manganese	Mn	0,25 – 1
Silicon	Si	<= 1
Sulphur	S	<= 0,01
Phosphorus	P	<= 0,02
Chromium	Cr	8 – 14
Nickel	Ni	<= 0,5
Cupper	Cu	<= 0,25
Molybdenum	Mo	<= 1,10

The product does not contain, or release substances classified as hazardous according to Regulation (EC) No. 1907/2006 (REACH), and no component of the product is classified as hazardous according to Regulation (EC) No. 1272/2008 (CLP)

RECYCLED MATERIAL

TRG uses scrap steel as a raw material for this product, and the content of recycled material taking into account the steel qualities included in the EPD is 80,8% - 82,0%.

The packaging of the product does not contain recycled material.

Results of the environmental performance indicators

IMPACT CATEGORY INDICATORS

Results for the life cycle assessment per declared unit: "1 ton (1000 kg) of fabricated tube"

ENVIRONMENTAL IMPACT	UNIT	UPSTREAM	CORE	TOTAL
Global warming potential (GWP) - Fossil	kg CO2 eq	9,68E+02	6,10E+02	1,58E+03
Global Warming Potential (GWP) - Biogenic	kg CO2 eq	1,18E+00	6,11E-01	1,80E+00
Global warming potential (GWP) - Land use	kg CO2 eq	1,21E+00	6,82E+00	8,02E+00
Global warming potential (GWP) - Total	**kg CO2 eq**	**9,70E+02**	**6,18E+02**	**1,59E+03**
Acidification (AP)	mol H+ eq	4,77E+00	3,49E+00	8,26E+00
Eutrophication (EP), freshwater	kg P eq	5,29E-02	2,26E-02	7,55E-02
Eutrophication (EP), marine	kg N eq	9,20E-01	8,26E-01	1,75E+00
Eutrophication (EP), terrestrial	mol N eq	1,06E+01	9,38E+00	1,99E+01
Photochemical ozone creation potential (POCP)	kg NMVOC eq	4,32E+00	3,12E+00	7,44E+00
Ozone depletion (ODP)	kg CFC-11 eq	1,50E-05	1,36E-05	2,86E-05
Abiotic depletion potential (ADP) - minerals and metals*	kg Sb eq	6,77E-02	4,75E-03	7,25E-02
Abiotic depletion potential (ADP)- fossil fuels*	MJ	1,10E+04	8,78E+03	1,97E+04
Water deprivation potential (WDP)*	m3 eq depriv.	5,29E+01	5,18E+02	5,71E+02

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

The results for the Total Global Warming Potential (GWP) impact for 1 ton of fabricated tube are:

ENVIRONMENTAL IMPACT	UPSTREAM	CORE	TOTAL
Global warming potential (GWP) - Total	**970,25**	**617,61**	**1.587,86**
Climate warming potential (GWP) - Total (%)	61,10%	38,90%	100,00%

The total Global warming potential of 1 ton of fabricated tube is 1588 kg CO2 eq.

RESOURCE USE INDICATORS

PARAMETER		UNIT	UPSTREAM	CORE	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	1,06E+03	9,44E+03	1,05E+04
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
	TOTAL	**MJ, net calorific value**	**1,06E+03**	**9,44E+03**	**1,05E+04**
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	1,10E+04	8,78E+03	1,97E+04
	Used as raw materials	MJ, net calorific value	1,05E+00	0,00E+00	1,05E+00
	TOTAL	**MJ, net calorific value**	**1,10E+04**	**8,78E+03**	**1,97E+04**

References

- TRG: https://www.tubosreunidosgroup.com/es/home
- ISO 14040:2006. Environmental management — Life cycle assessment — Principles and framework.
- ISO 14044:2006. Environmental management — Life cycle assessment — Requirements and guidelines.
- Product Category Rules (PCR) 2023:01 Version 1.0.2: Fabricated Metal Products, Except Construction Products: UN CPC 4128 – Tubes, pipes and hollow profiles of steel

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