



ENVIRONMENTAL PRODUCT DECLARATION VALLOUREC TUBULAR SOLUTIONS WORLDWIDE

DATE OF REVISION:
2021/12/15

VALID UNTIL:
2026/06/30

DECLARED UNIT:
1 ton of tube delivered to final
customer

OWNER OF THE DECLARATION:
Vallourec

ISSUE DATE:
2021/12/15

AUTHORS:
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CONSIDERED STAGES:
Cradle to Gate including
transport to customer

BASED ON:
PCR 2012:01 version 2.2
"construction products
and construction service"

EPD REGISTRATION NUMBERS:
S-P-04313

IN ACCORDANCE WITH
ISO 14025 AND EN 15804+A1

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GENERAL INFORMATION

Owner of the declaration:

Vallourec SA
12 rue de la Verrerie
92190 Meudon, France

Product:

VALLOUREC TUBULAR SOLUTIONS

Place of production:

Steel plant, tube mills and finishing lines in France, Germany, USA, Brazil and China
Finishing lines in Ukraine, United Kingdom, Nigeria, Canada, Mexico, Saudi Arabia, Singapore and Indonesia

UN CPC Code 4128

PCR review was conducted by : The technical Committee of the International EPD® system

Chair: Massimo Marino

Contact via: info@environdec.com

Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010

EPD process certification (Internal) EPD verification (External)

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Program:

Program: The International EPD® System

Program operator: EPD International AB, Box 210 60

SE-100 31 Stockholm

Sweden

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Third party verifier:

Renuables Ltd

Dr Andrew NORTON as verifier

United Kingdom

Approved by: The International EPD® System

Procedure for follow-up during EPD validity involves third party:

Yes

No

Technical support for Life Cycle Analyses:

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REGION
Middle East/Asia

PRODUCTION CAPACITY OF TUBULAR PRODUCTS
600,000 tons

MAIN FEATURES
4 tube mills

CERTIFICATIONS
ISO 9001, ISO 14001, ISO 45001 or OHSAS 18001

- R&D CENTERS
- ROLLING MILLS
- FINISHING UNITS
- VAM® FIELD SERVICES AND SALES

INTERNATIONAL NETWORK OF VAM® LICENSEES

*Hüttenwerke Krupp Mannesmann (HKM) in Germany, 20% held by Vallourec.

1-COMPANY AND PRODUCT PRESENTATION

COMPANY DESCRIPTION

Vallourec is a world leader in premium tubular solutions. With a worldwide presence in over 20 countries, integrated production sites and state-of-the-art Research and Development (R&D), the Group provides its customers with innovative global solutions tailored to the energy challenges of the 21st century.

Building on more than **100 years** of expertise, Vallourec supplies a **full range of tubular solutions for the Oil & Gas** (OCTG, line pipes), Petrochemicals, Industry (mechanical, automotive, construction), as well as Low-Carbon Energies (nuclear, renewables) markets. Its product portfolio includes seamless and welded tubes, connections and accessories, available in a wide range of sizes and grades.

Benefiting from its extensive experience in the **energy sector**, Vallourec is preparing for the future by developing **sustainable solutions** to answer new opportunities generated by the energy transition, especially for geothermal energy, offshore wind, carbon capture utilization and storage, as well as hydrogen applications.

With over **50 production units and finishing lines** around the world, Vallourec is at the forefront of the American, Brazilian, European, Middle Eastern and Asian markets.

As of December 31st, 2019, Vallourec facilities included:

- 3 steel mills, including Huttenwerke Krupp Mannesmann (HKM) in Germany which 20% is held by the Group, one in the United States and one in Brazil;
- 14 tube mills in Europe, the United States, Brazil and Asia;
- 26 finishing units;
- a group of forest assets and an iron mine in Brazil.

Vallourec has an annual worldwide production capacity of **3 million tons of tubular products**.

In 2019, Vallourec produced **2,291 metric tons of hot-rolled seamless tubes**.

98% of Vallourec sites are OHSAS or already DIN EN ISO 45001 certified representing 100% of production in metric tons. Moreover, 96% of all the Group's sites are ISO 14001 certified, representing more than 99% of production, and its primary sites are certified ISO 50001 representing 40% of production. Other requirements taken into account include ISO 9001, ISO/TS 16949, API and ASPE.

COMPANY MARKETS

OIL & GAS



From exploration and production to transport and processing of oil and gas, Vallourec provides a full range of tubular solutions, including OCTG casing and tubing, VAM® premium connections and accessories for Oil & Gas well equipment; flowlines, onshore line pipes and specialized tubes for umbilicals; carbon steel and steel alloy seamless tubes for oil refineries.

INDUSTRY

(mechanical engineering, transportation and construction)



Vallourec's hot-rolled seamless steel tubes are used in a variety of the most demanding applications, from daring architectural projects to extremely high performing mechanical equipment. Our products, including hollow bars (semi-finished tubes for subsequent processing into products meeting the needs of a specific market), and sections (circular, square, rectangular or octagonal sections for a vast array of applications), are manufactured in a large range of sizes and steel grades to fit any of our customers' requirements.

LOW-CARBON ENERGIES



Vallourec provides increasingly integrated products and services for innovative low-carbon and renewable energy projects. Nuclear power plants, geothermal wells, long-span structures for photovoltaic panels, offshore wind turbines, and hydrogen refueling stations are among the various projects benefiting from our expertise in tubular solutions.

SCOPE & TYPE OF EPD

Generic and specific data used for calculation are representative of the product in accordance with sections 6.3.6 and 6.3.7 of EN 15804+A1 (2014).

The approach used in this EPD is "Cradle to Gate"

SOFTWARE:

SimaPro 9.1.1.1

MAIN DATABASE:

Ecoinvent v3.6

LCA STUDY HAS BEEN

REALIZED BY:

WeLOOP

254 Rue du Bourg

59130 Lambersart - France

DATE OF LCA STUDY:

2021/07/09

VALLOUREC DATABASE:

Environmental and energy data of all facilities collected with the CR360 tool

PERIOD OF DATA

COLLECTION:

Full year 2019

REPORT LCA:

Life Cycle Assessment (LCA) applied to tubular steel products for EPD® purposes

GEOGRAPHICAL SCOPE:

World according to sales market condition type of EPD®

ENVIRONNEMENTAL IMPACT

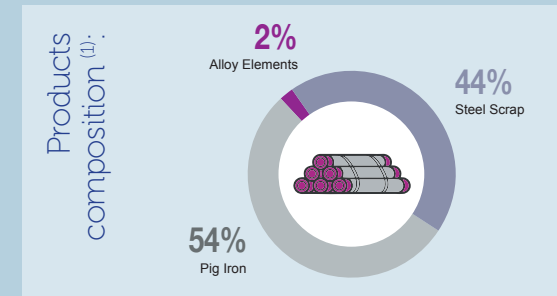
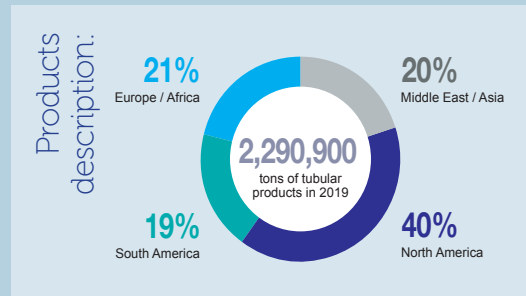
PRODUCTION STAGE			CONSTRUCTION AND INSTALLATION STAGE		USE STAGE							END OF LIFE STAGE				BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport from mill to mill	Manufacturing	Transport from mill to customer	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy use	Operational water use	Deconstruction / Demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X: Included in the EPD - **MND:** Module Not Declared

DETAILED PRODUCT DESCRIPTION

Vallourec provides customers with a wide range of premium tubular products combined with innovative and value-added digital solutions to help them meet their operational challenges with safety as a top priority. The Group's offer includes:

- one of the most extensive range of seamless tubes in the world, including sizes and proportions (length, diameter, thickness) of up to 711 millimeters in outside diameter (OD), and a variety of more than 250 steel grades (high-grade and low-grade carbon steel alloys, stainless steels, nickel alloys, etc.);
- world-renowned premium connections, including VAM® connections and accessories;
- specialty tubes;
- and a complete offer of innovative and digital services.



(1) The products do not contain any SVHC (Substance of Very High Concern) exceeding 0,1%w/w.

	OUTSIDE DIAMETER (OD)	WALL THICKNESS (WT)	YIELD STRENGTH (YS)	GRADES	
PLP	From 60mm to 711mm	From 6.3mm to 100mm	-	ASTM, API up to X65S DNV up to X80Q	
OCTG	From 2 3/8" to 26"	From 3/16" to 1"	From 55 to 150 ksi	API standards (API 5CT) High collapse High strength Sour Service Carbon Steel Super 13CR	13CR Corrosion resistant alloys (including Nickel-based, Austenitic, Duplex, Super Duplex)
Industry	Circular: 21.3mm to 711mm Square: 40x40 mm to 400x400 mm Rectangular: 50x30 mm to 500x300 mm Shaped tubes in above mentioned dimensional range	Circular: 2.9mm to 150mm Square: 2.9mm to 25mm Rectangular: 2.9mm to 25mm Shaped tubes in above mentioned dimensional range	From 51.5 to 220 ksi (355-1,500 Mpa)	Basic Structural Grades according to EN 10210, Mechanical Grades and Multicert® series Engineering Grades Forterior® and Spirafort® series Advanced Engineering Grades Avadur® series and Bearing grades, alloyed heat treatable steels, case hardening steels, unalloyed heat treatable steels Offshore Grades Oceanfit® series Fine-Grain High Strength Grades FineXcell® series Ballistic Protection Grades Durascilt® series	

GENERAL MANUFACTURING SPECIFICATION

STEEL PRODUCTION

The steel used by Vallourec to manufacture tubes is prepared in part by the Group's steel mills, and in part by outside purchases of steel ingots and bars. Internally, two processes are used: the **blast furnace** process in Jeceaba (Brazil) and the **electric process** in Jeceaba and in Youngstown (United States). The HKM steel mill in Europe and the majority of Vallourec's Chinese suppliers use the "blast furnace" process. Scrap, cast iron and pig iron (depending on the mill) are melted in the furnaces and then poured into the ladle. The continuous casting method then transforms the liquid steel into round solid bars for rolling.

In Brazil, the Group extracts iron ore from its Pau Branco mine to supply the blast furnace and the pellet plant at Jeceaba. Vallourec also owns **230,000 hectares of eucalyptus plantations and forests**, for the production of charcoal, which is used to convert the iron ore into pig iron in the blast furnace.

ROLLING MILLS

The **hot-process production** of seamless steel tubes, invented in 1886 by the Mannesmann brothers, is a fundamental technology for Vallourec, and is constantly being improved thanks to research. Vallourec offers a wide range of steel, containing up to 13% of chromium.

The hot bars are then transferred to the hot rolling mill in order to carry out the piercing process, thickness rolling and diameter sizing. Vallourec mills use different methods of hot rolling such as the **forge method** in France, **Plug and Pilger rolling mills** and Erhardt presses in Germany, the **PQF® continuous rolling mill** in Tianda, China. Once the piercing process is done, the hollow is created and sent to the lamination mill in order to obtain the desired final dimensions.

HEAT TREATMENTS

A large share of the Group's premium products is heat-treated to reach **exceptional levels of performance**. The heat treatment process is continually being improved, in order to meet the needs of the Group's customers, in particular in terms of respect for the environment, deformation resistance or breaking strength, corrosion resistance and tube weldability.

FINISHING

Tubes are then finalized depending on the market and customer requirements. **Non-destructive tests** enable the assessment of the integrity of structures or materials with no degradation at various stages of life. Cutting edge non-destructive test benches, capable of detecting imperfections independently of direction, are used on a daily basis to inspect premium products. Threading technologies provide **API or VAM® premium connections**. Other finishing processes may apply such as coating, markings, machining, etc. upon customer request.

PACKAGING

The environmental impact of packaging used for product delivery is considered negligible in accordance with the cut-off criteria established in PCR. Typical packaging includes steel strapping and plastic protectors on tube ends. Some products and accessories are also delivered in wooden boxes.

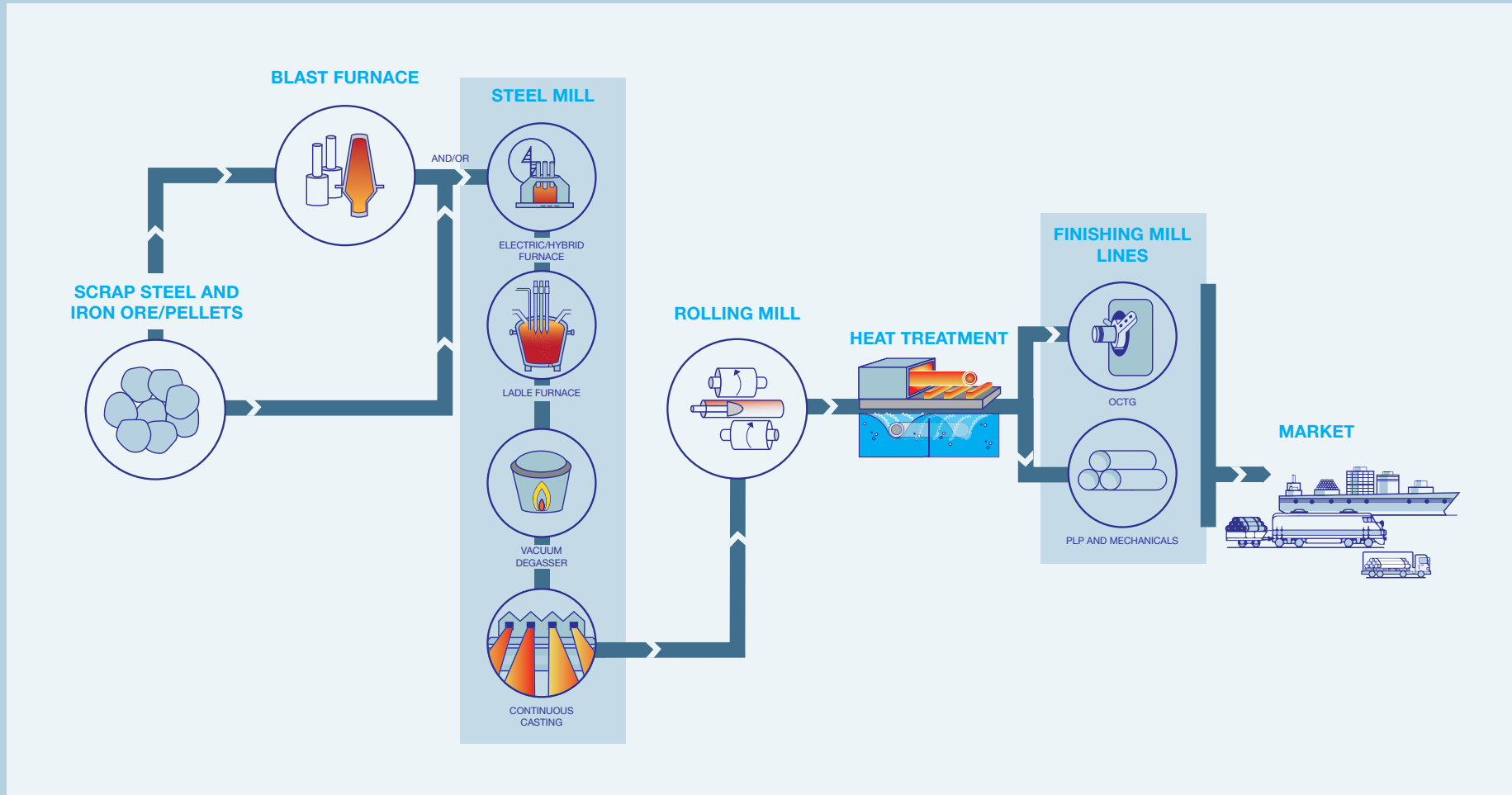
Vallourec is continuously searching to innovate in terms of sustainable development. Currently, the Group is developing a **new protector recycling service** for customers which consists in recovering, inspecting, cleaning and reconditioning worn protectors. Vallourec is also developing a **recovery cycle** for non-compliant and unused protectors that reintroduces them into the manufacturing process after a grinding operation, thus reducing the purchase of plastics. Finally, Vallourec teams are developing protectors made from resistant biobased plastics to reduce its environmental impact.

VALLOUREC IN BRAZIL A NEW SUSTAINABLE PRODUCTION MODEL

Vertical integration has been an asset for Vallourec's subsidiary in Brazil since the very beginning. Vallourec Tubos do Brasil supplies its Jeceaba steel mill's blast furnace with charcoal from its own eucalyptus forests and iron ore from its mine in Pau Branco. The Group owns and operates a 230,000-hectare forest estate, of which approximately half of the surface is preserved in its natural state and the other half is cultivated (110,000 hectares across 22 farms). The eucalyptus trees absorb CO₂, from the trunks, the stumps and the roots, forming a giant carbon sink and thus significantly reducing the Group's carbon footprint. In the search for new business models, the Group is considering ways to utilize its Brazilian forest and to lead the industrial fabric in turning over a new green leaf.



VALLOUREC PRODUCTION PROCESS





2-ENVIRONMENTAL RESULTS

LCA RESULTS

CRADLE TO GATE

The following tables present the detailed environmental performance in terms of potential environmental impacts, use of resources and waste generation per ton of tubes produced and delivered to the final customer. Results are presented for the three considered stages of “Cradle to Gate” analysis (A1 Upstream process, A2 and A3 Core processes) plus the transport from mill to customer (A4) and their total (A1+A2+A3+A4).

DECLARED UNIT (D.U.)

Results are expressed per ton of fabricated tube delivered to final customer.

LCA inventory was produced for tubular products manufactured worldwide. Grouping of inventories for each plant has been done according to the share of each one on the total production of tubular products worldwide.

GWP Global Warming Potential (Climate Change)	POCP Photochemical Ozone Creation potential
ODP Ozone Depletion Potential	ADPE Abiotic Depletion Potential – Elements
AP Acidification Potential for Soil and Water	ADPF Abiotic Depletion Potential – Fossil Fuels
EP Eutrophication Potential	

POTENTIAL ENVIRONNEMENTAL IMPACTS

	UNITS / DU	A1	A2	A3	A4	TOTAL
GWP - Fossil	kg CO ₂ eq	1 161	30	454	45	1 690
GWP - Biogenic (*)	kg CO ₂ eq	1.06E+02	1.07E-03	3.71E-01	1.40E-03	107
GWP - Total	kg CO ₂ eq	1 267	30	454	45	1 796
ODP	kg CFC -11 eq	8.00E-05	4.59E-06	4.99E-05	6.79E-06	1.41E-04
AP	kg SO ₂ eq	5.14E+00	1.49E-01	1.07E+00	5.37E-01	6.89E+00
EP	kg PO ₄ eq	6.81E-01	2.59E-02	1.56E-01	6.71E-02	9.30E-01
POCP	kg C ₂ H ₄ eq	2.34E+00	1.00E-02	1.74E-01	2.77E-02	2.55E+00
ADPE	kg Sb eq	1.47E-02	4.13E-05	9.55E-05	4.36E-05	1.49E-02
ADPF	MJ, net CV	16 478	441	7 387	635	24 940
Water pollution	m ³	602	19	252	29	903
Air pollution	m ³	754 537	3 633	31 051	6 6657	795 878

(*)In Brazil, the CO₂ emissions from carbonization of eucalyptus wood to make charcoal and its combustion for steel making are calculated in A1 (raw materials stage). They are compensated by the CO₂ sequestered by the trees throughout their growth and used to make charcoal as a raw material also calculated in stage A1. This rule is not applicable to the CH₄ emissions from the carbonization process that are consequently fully declared in A1 stage. Consequently, carbon sequestration related to forestry activities is provided as additional information (see page 18). No carbon offsetting is considered in the quantification of GWP impacts in this EPD.

USE OF RESOURCE

	UNITS / DU	A1	A2	A3	A4	TOTAL
PERE	MJ, net CV	11 881	6	516	7	12 409
PERM	MJ, net CV	0	0	0	0	0
PERT	MJ, net CV	11 881	6	516	7	12 409
PENRE	MJ, net CV	19 258	450	9 289	644	29 640
PENRM	MJ, net CV	0	0	0	0	0
PENRT	MJ, net CV	19 258	450	9 289	644	29 640
SM	kg	0	0	0	0	0
RSF	MJ, net CV	0	0	0	0	0
NRSF	MJ, net CV	0	0	0	0	0
FW	m ³	1.07E+01	3.48E-02	6.13E+00	4.35E-02	1.69E+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 material

RSF

Use of renewable secondary fuels

NRSF

Use of non-renewable secondary fuels

FW

Net use of fresh water



WASTE CATEGORIES AND OUTPUT FLOWS

	UNITS / DU	A1	A2	A3	A4	TOTAL
HWD	kg	3.51E+02	3.89E-01	5.56E+00	5.09E-01	3.57E+02
NHWD	kg	1412	23	98	31	1 565
RWD	kg	6.18E-02	2.60E-03	3.46E-02	3.83E-03	1.03E-01
CRU	kg	0	0	0	0	0
MFR	kg	0	0	0	0	0
MER	kg	0	0	0	0	0
EEE	MJ	0	0	0	0	0
EET	MJ	0	0	0	0	0

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
recoveries

EEE
Exported electrical
energies

EET
Exported thermal
energies



3-CALCULATION RULES



A1 RAW MATERIAL SUPPLY UPSTREAM PROCESS

Module A1 (Raw material supply) includes the extraction and processing of all raw materials and energy carriers necessary for the production of the final product, as well as the upstream processes needed for the production and processing of all other inputs (ex. packaging).

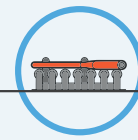
- Forestry (Florestal Eucalyptus forest) with biogenic CO₂ and CH₄ emissions from charcoal carbonization (Brazil), with emissions of CO₂ compensated by forest sequestration;
- Biofuels combustion of biogenic charcoal in pelletization plant and blast furnace (Jeceaba, Brazil) with emissions of CO₂ compensated by forest sequestration;
- Purchased steel bars/ingots and tubes;
- Extraction and Processing of raw materials, specifically for Iron & Steel production, such as steel scrap, pig iron, coke, coal, lime, limestone, ferroalloys, all supplied for Youngstown (USA) and Jeceaba (Brazil) integrated sites with steel mills;
- Steel manufacturing processes: Eucalyptus forest, charcoal production and iron mine both in Brazil, pelletization plant in Brazil, steel mills.



A2 TRANSPORT FROM MILL TO MILL CORE PROCESS

The transport of all raw materials from the provider to the production site is included.

- Transportation of purchased steel to rolling mills (in Europe and China);
- Transportation of raw materials to Youngstown (USA) and Jeceaba (Brazil) integrated sites with steel mills;
- Relevant means of transport: rail, truck, barge, sea freight.



A3 MANUFACTURING CORE PROCESS

The manufacturing process, including energy and water consumption, direct emissions and waste treatment arising from this stage, is taken into account in module A3 (Manufacturing).

- Tubes manufacturing processes: rolling mills, heat treatment and finishing plants worldwide;
- Production and consumption of natural gas for energy production;
- Production and consumption of fuels (gasoline, diesel, propane) for internal transportation;
- Generation, transportation and consumption of electricity purchased from public and private providers;
- Transportation of steel bars and of semi-finished tubular products between Vallourec facilities;
- Water intake for the manufacturing processes (mainly for cooling of machines and of products) and discharge of wastewater;
- Treatment process of waste generated by the manufacturing processes.



A4 TRANSPORT TO FINAL DESTINATION DOWNSTREAM PROCESS

It includes the transport of final products to the clients in module A4 (Transport).

- Transport of tubular products to final customer destination;
- 4 regions from which Vallourec operates were considered: North America, South America, Europe/Africa and, Middle East/Asia;
- Means of transport can combine rail, trucks, barges and sea vessels.

ADDITIONAL TECHNICAL INFORMATION

Vallourec's manufacturing policy is to minimize the impact of its activities on the environment. In 2013, Vallourec created a multi-year environmental roadmap for the sites of each of its industrial divisions.

These roadmaps, which are monitored and updated each year, constitute a strategic Environmental plan and identify targeted environmental projects (energy, water, waste, chemical hazards and noise) whose purpose is to minimize the Group's environmental footprint.

They focus on defining objectives, determining the necessary resources (including capital expenditures to be made), promoting progress and cost savings, and setting priorities.

SCRAP AND RAW MATERIAL

In 2020, scrap iron accounted for 69% of Vallourec's steel making process, totaling around 760,000 tons, of which 19% was internally recycled.

It should also be noted that all sites recycle metallic waste from machining as a result of the manufacturing processes (turnings, chips, etc.) and then send this waste to channels external to the Group. By-products from the steel making process, such as slag and scale are also recycled.

ENERGY CONSUMPTION

Vallourec is committed to responsible performance and aims to improve the energy efficiency of its equipment and reduce carbon emissions from its manufacturing processes.

The largest facilities are ISO 50001 certified.

WASTE

As is the case with all industrial activities, Vallourec generates significant quantities of various types of waste.

Around 700,000 tons of waste are produced yearly, which includes the mine and the pelletization unit. Only 3.9% are hazardous.

A major economic and environmental concern for Vallourec, waste is now considered a resource to be exploited rather than an unavoidable consequence of production. Depending on its origin and type, waste is managed and treated differently in accordance with local regulations, with maximum emphasis on material recycling and energy recovery.

TYPE OF TRANSPORTATION



TRUCK

up to 2,000 km



RAIL

up to 2,100 km



BARGE

up to 500 km



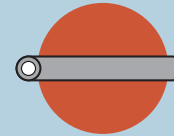
SEA VESSEL

up to 20,000 km





4-ADDITIONAL ENVIRONMENTAL INFORMATION



VALLOUREC KEY FIGURES (2020)

88%

of electricity consumed from low carbon

96%

of production by ISO 14001 certified sites

69%

of total steel produced from scrap

78%

of resources consumed were from a renewable source

97%

of waste recycled

VALLOUREC ENVIRONMENTAL COMMITMENTS

Vallourec is committed to minimizing the impact of its activities on the environment as clearly stated in its Sustainable Development Charter and in its Environmental and Carbon Policies. In 2019, Vallourec further strengthened its commitment to the environment by cosigning, along with 98 other French companies, a new version of the French Business Climate Pledge to contribute to a low-carbon economy.



Water management

Vallourec has set itself the goal of reducing its water intake by 10%, particularly through the use of rainwater, and the recycling and reuse of wastewater.



Circular Economy

Vallourec promotes sustainable production methods by significantly limiting the need for natural resources. In 2020, 78% of resources consumed were from a renewable source. The 3R rule (Reduce, Reuse, Recycle) is deployed in all industrial plants. Regarding waste, Vallourec is targeting a recovery rate of 98%, particularly by reducing landfill.



Climate

Vallourec aligns its carbon emissions reduction targets with the provisions of the Paris agreement. These objectives have been approved by the Science Based Targets initiative (SBTi). Vallourec is committed to:

- Reduce its direct emissions by 20% (scopes 1 and 2).
- Reduce both direct and indirect emissions by 25% (scopes 1, 2 and 3).

The Group's Sustainable Development policy is regularly recognized by non-financial rating agencies. Our performances, in particular in the three main areas of energy, water and waste management, underline Vallourec's contribution as a responsible market player.

AA

is the updated rating given by MSCI ESG Ratings to Vallourec.

TOP 20

Vallourec is ranked among the 20 best performing companies in the Sustainalytics Energy Services segment (Out of 132 peers).

90/100

is Vallourec's Environmental score in the Ecovadis rating, placing it in the top 1% of the highest scoring companies.

A LIST

In 2019, the CDP Organization placed Vallourec on its "A" list for climate change management, placing the Group among the top 2% of the best performing companies in the world.

ADDITIONAL INFORMATION - VALLOUREC'S FOREST CARBON SEQUESTRATION (FLORESTAL, BRAZIL)

During growth, eucalyptus trees absorb carbon dioxide (CO₂) from the atmosphere through the process of photosynthesis and convert it into carbon-based compounds that constitute various components of a tree, including wood that is then pyrolyzed to make biomass charcoal used in the Jeceaba blast furnace and pelletization plant.

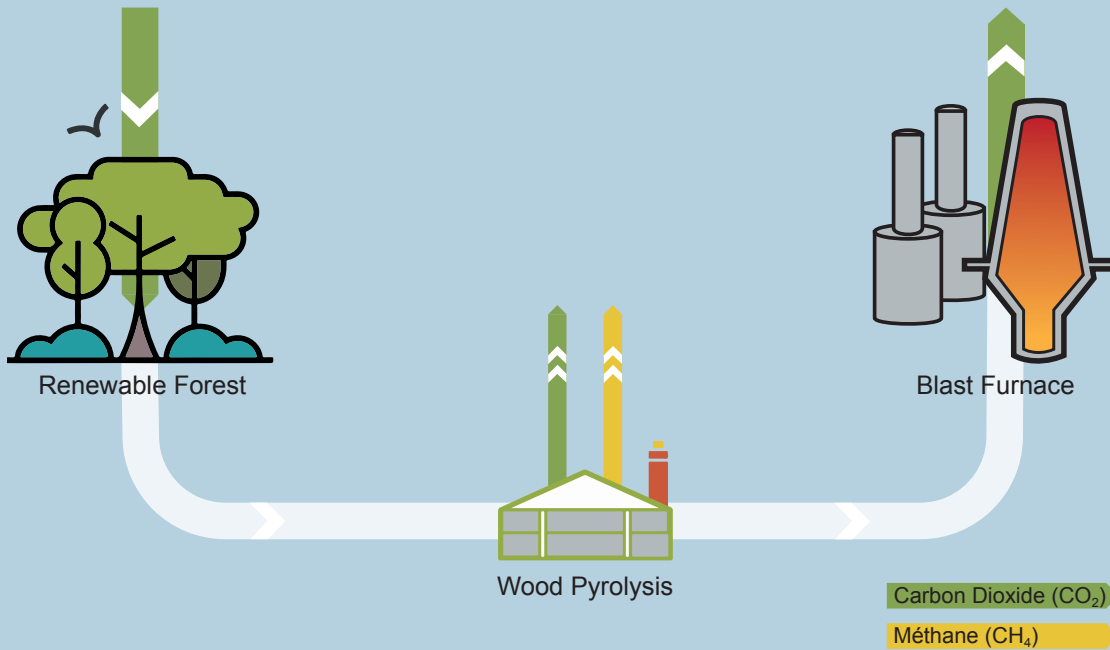
The method for calculating amounts of CO₂ sequestered yearly by Vallourec's forest resulted from numerous studies conducted in cooperation with several scientific

authorities. The reference study had a 30-year (1983 – 2013) observation period, in order to consider the amount of charcoal produced, the amount of carbon absorbed by the wood (trunks, stumps and roots).

It was thus possible to calculate the ratio of CO₂ sequestered per ton of charcoal produced and finally the annual amount of CO₂ sequestered by the forest.

Biogenic CO₂ emissions were found to be neutral in terms of biogenic Global Warming

Potential in accordance with the PCR. Under this approach, the CO₂ from the Jeceaba blast furnace carbonization and combustion of charcoal are considered equal to the forest's carbon dioxide intake during tree growth. This rule is not applicable to the CH₄ emissions from charcoal carbonization. But the amount of annual CO₂ tons sequestration exceeds the total amount of biogenic CO₂ and CH₄ emissions. The calculations show that Vallourec's Brazilian eucalyptus forests act as a large carbon sink.



• Emission factors per ton of produced or used charcoal (tons CO_{2e} per ton charcoal - 2019 data):

CO₂ sequestered by forest during eucalyptus trees production cycle (7 years): 10.872

CO₂ emitted during charcoal carbonization (wood pyrolysis): 3.718 to 3.803 (depending on type of furnace)

CH₄ emitted during charcoal carbonization (wood pyrolysis): 0 to 1.242 (depending on type of furnace)

CO₂ emitted during charcoal combustion in blast furnace: 3.032

• Example of year 2019 biogenic carbon balance (from 2019 Vallourec Universal Registration Document):

Charcoal production: 261,572 tons

Charcoal and charcoal dust consumption: 223,123 eq. tons in blast furnace + 44,352 eq. tons in palletization unit

CO₂ sequestered by forest (261,572 X -10.872) = 2,843,931 CO_{2e} tons

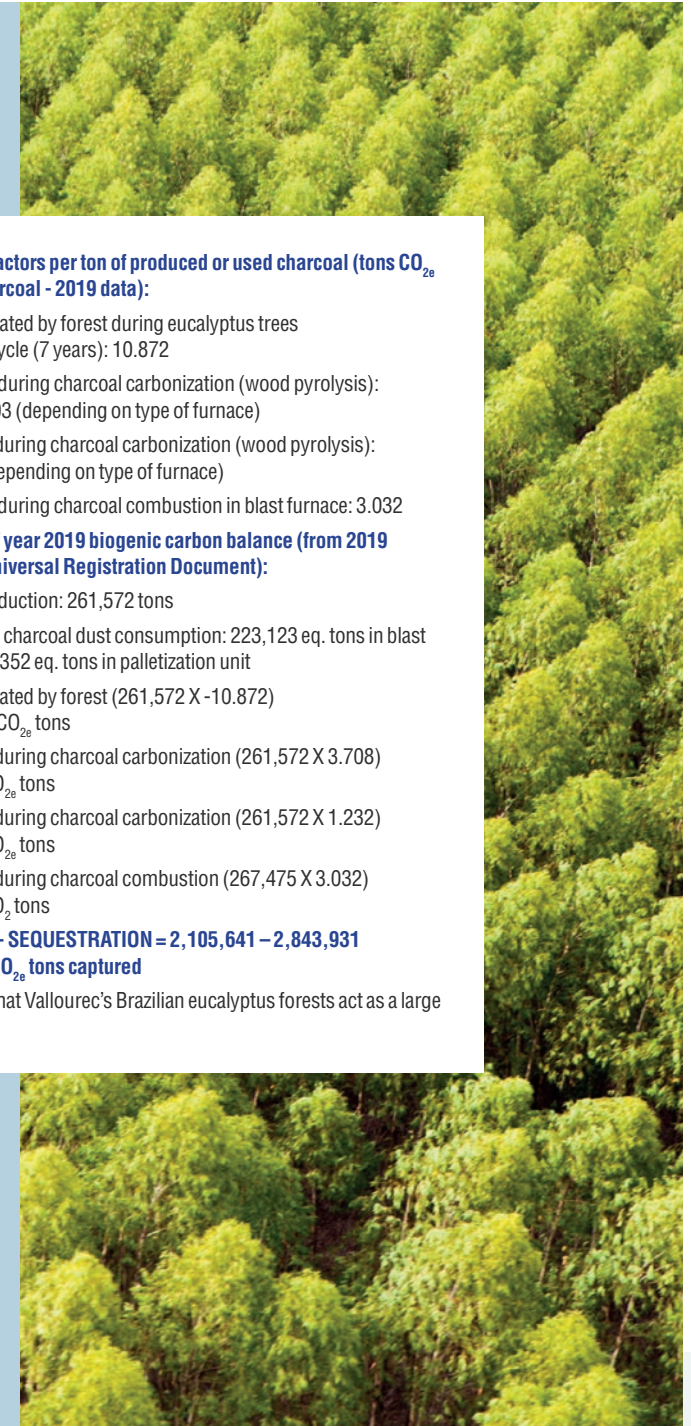
CO₂ emitted during charcoal carbonization (261,572 X 3.708) = 972,491 CO_{2e} tons

CH₄ emitted during charcoal carbonization (261,572 X 1.232) = 322,165 CO_{2e} tons

CO₂ emitted during charcoal combustion (267,475 X 3.032) = 810,985 CO₂ tons

EMISSIONS - SEQUESTRATION = 2,105,641 – 2,843,931 = -738,290 CO_{2e} tons captured

This shows that Vallourec's Brazilian eucalyptus forests act as a large carbon sink.



5-NORMATIVE REFERENCES

For its Brazilian production, Vallourec Florestal LTDA produces its own charcoal from a sustainably managed forest (Cerflor Certificate n°XSQ/0237-01/BH).

In order to be compliant with the EN 15804 standard, the biogenic CO₂ emissions due to charcoal production and combustion are neutralized by the CO₂ capture in the Eucalyptus wood. No benefits have been accounted for other indicators. CO₂ emissions due to charcoal production and combustion are accounted in the A1 (raw materials) stage and CO₂ sequestration is accounted in the A1 stage too. This rule is not applicable to the CH₄ emissions from carbonization process that are consequently fully declared in A1 stage.

ISO 14040:2006:

Environmental Management-Life Cycle Assessment-Principles and framework.

ISO 14044:2006:

Environmental Management-Life Cycle Assessment-Requirements and guidelines.

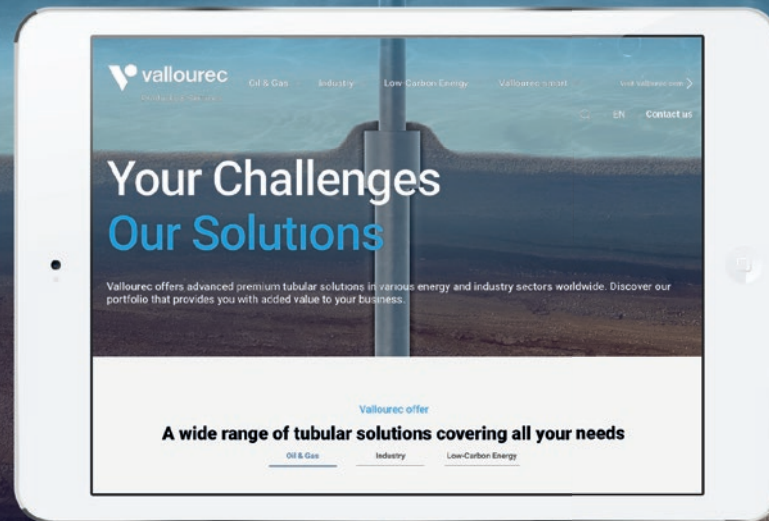
ISO 14025:2010:

Environmental labels and Declarations-Type III Environmental Declarations-Principles and procedures.

EN 15804+A1: 2014 :

Sustainability of construction works. Environmental product declaration.

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