



ENVIRONMENTAL PRODUCT DECLARATION

HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS AND COILS



Based on:

PCR 2012:01
Construction products and
Construction services,
v 2.01, 2016-03-09

EN:15804:2014

ISO 14025

Certification N°:

S-P-00254

Date of issue:

2011-03-22

Valid until:

2020, February 28

Date of revision:

2018/07/06 - revision 3

GENERAL INFORMATION

EPD REFERENCES

EPD OWNER: ALFA ACCIAI, VIA SAN POLO 152, 25134, BRESCIA – ITALY; MANUFACTURING PLANT IS LCOATED IN THE SAME SITE

PROGRAM OPERATOR: THE INTERNATIONAL EPD® SYSTEM - SWEDEN

INDEPENDENT VERIFICATION

This declaration has been developed referring to the International EPD® System, following the General Programme Information; 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).

CEN standard EN 15804 served as the core PCR (PCR 2012:01 v 2.0)
PCR review conducted by the technical committee of the International EPD® System

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

Third party verifier: ICMQ SpA, via De Castilia, 10 20124 Milano (www.icmq.it)

☐ EPD process certification
(Internal)

☒ EPD verification
(External)

Accredited by: Accredia

Environmental declarations published within the same product category, though originating from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804.

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ALFA ACCIAI

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



1. ALFA ACCIAI GROUP

Alfa Acciai Group comprises several well-established companies specialized in various areas in the production of steels for reinforced concrete, a guarantee of products and services qualifying the Brescia-based group as an excellent business partner in a wide range of sectors, first and foremost in building construction.

Being involved in the entire steel production chain, with an integrated system upstream and downstream of the parent company, the Alfa Acciai Group is able to meet its customers' operating requirements and to guarantee a superior standard of quality at all stages of the production process.



ALFA ACCIAI, the Brescia-based parent company, is one of the largest EAF steel mills in Italy. There is a steel shop department with 2 EAF (electric arc furnaces), 2 LF (ladle furnaces) and 2 continuous casting machines (10 lines). The hot rolling department is equipped with 3 rolling mills for rebars, coils and wired rod; the cold rolling department has 12 cold rolling mills and 5 welded mesh machines. This EPD is specifically about steel bars and coils for concrete produced in Brescia parent plant.



ACCIAIERIA DI SICILIA is the only steel mill operating in Sicily. High production capacity, state-of-the-art technology and a wide range of products have earned the company a good position in the European steel making industry and help it make good use of its strategic location for serving south Mediterranean markets.



THYSSEN SONNENBERG RECYCLING, in Bottrop, Germany, is run as a joint venture and has become one of world's leading companies producing and selling ferrous and non-ferrous scrap.



ALFA MONTIRONE, which was set up in June 2016, has recently took over the Montirone-based steel-making line of business of the Stefana Group. The steel mill, which has been decommissioned for some time, is located in the province of Brescia. The site will be reclaimed and renovated in the coming years for its new intended use. The acquisition entailed for Alfa Acciai the taking on of all the existing 70 workers.



TECNOFIL, acquired by Alfa Acciai in September 2016 is one of Italy's leading wire drawing mills specialising in galvanized, copper-coated, annealed and plastic-coated wire and wire band for use in building construction, household appliances, automotive and numerous other everyday life applications. Over the years, TECNOFIL has developed its vocation to innovation of its production processes and constant search for tailored solutions for its national and international customers.



FERROBERICA is the largest company in Italy involved in the pre-shaping and laying of reinforcing steel for all kinds of structural work, for roads, railway, and maritime infrastructures, as well as public, industrial and civil buildings. The company handles the final stage of the group's production chain and guarantees a high standard of quality for the end users, i.e. leading building contractors.

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
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

SOFTWARE: SimaPro ver. 8.5.0.0

MAIN DATABASE: Ecoinvent 2.2

REPORT LCA: Life Cycle Assessment (LCA) for hot and cold rolled reinforcing steel for concrete produced by Alfa Acciai for EPD® purposes - Final Report

GEOGRAPHICAL SCOPE OF THE EPD: World according to sales market conditions

TYPE OF EPD: specific for hot rolled steel products

2. THE PRODUCT



HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS AND COILS

This EPD refers to construction products, hot rolled structural steel bars and coils, produced at Alfa Acciai plant placed in Brescia (Italy), with electric arc furnace route, starting from post and pre consumer steel scraps. The homogeneous and

repeatable mechanical features of steel guarantee excellent performance in any type of construction and geographical area, since they have high ductility.

EPD reference products have a chemical composition in compliance with national regulation of destination countries where they are sent. In general, the main materials of the final product are: *iron > 96%; alloy elements* (e.g. manganese, silicon, carbon) *2% c.a.; other elements* (e.g. copper, nickel, chromium), *complementary to 100%.*

Declared Unit






According to EN:15804, the declared unit is **1 ton of hot rolled product**

INFORMATION	DESCRIPTION
Product identification	Hot-rolled reinforcing steel for concrete in bars and coils
Product features	<p>Bars: Diameters from 6 mm to 32 mm Length up to 18 m Weight: 2 300 kg</p> <p>Coils: Diameters from 6 to 16 mm Weight from 1 450 to 3 000 kg</p>
Product properties (under EN10080:2005)	<p>Steel coming from post and pre consumer steel scraps produced in electric arc furnace route (EAF) and further hot rolling process.</p> <p>Adherence and surface geometry f_R or f_p :</p> <ul style="list-style-type: none"> - for $5 \leq \emptyset \leq 6$ mm f_R or f_p 0.035; - for $6 < \emptyset \leq 12$ mm f_R or f_p 0.040; - for $\emptyset > 12$ mm f_R or f_p 0.056. <p>Weldability: $C_{eq} < 0.52$</p> <p>Typical yield stress: $400 \text{ MPa} \leq C_v \leq 600 \text{ MPa}$</p> <p>Elongation: $A_{gt} > 5\%$</p> <p>Successful in bend and rebend test</p> <p>Successful in strength test and oligocyclic strength test</p>
Plant features	<p>Total production of EPD covered products, year 2017: 621 785 t</p> <p>Total production, for selling purpose, year 2017: 1 148 668 t</p> <p>On-site air emission control system</p> <p>On-site waste water control system</p> <p>On-site system to recycle water used in process</p> <p>In/out materials/products and melting process monitored to prevent nuclear radiation</p> <p>Plant air emissions accounted under ETS (Emission Trading System)</p>

ENVIRONMENTAL PERFORMANCE

The detailed environmental performance (in terms of use of resources, pollutant emissions and waste generation) is presented for the three phases, Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4).

The numbers reported in the following tables are the outcome of rounding. For this reason total results could slightly differ from the sum of contributions of the different phases.

ENVIRONMENTAL IMPACTS						
 POTENTIAL ENVIRONMENTAL IMPACTS	UNITS / D.U.	UPSTREAM	CORE PROCESS			TOTAL
		A1 	A2 	A3 	A4 	
GWP	kg CO ₂ eq	538	42	129	52	761
ODP	g CFC 11eq	<1	<1	<1	<1	<1
AP	kg SO ₂ eq	1.7	0.2	0.3	0.3	2.4
EP	kg PO ₄ ³⁻ eq	0.1	<0.1	<0.1	0.1	0.3
POCP	kg C ₂ H ₄ eq	<0.1	<0.1	<0.1	<0.1	0.1
ADPE	g Sb eq	<0.1	<0.1	<0.1	<0.1	0.1
ADPF	MJ	9 914	556	348	677	11 495

GWP Global warming potential

ODP Depletion potential of the stratospheric ozone layer

POCP Formation potential of tropospheric ozone photochemical oxidants

AP Acidification potential of land and water

EP Eutrophication potential

ADPE Abiotic depletion potential for non-fossil resources

ADPF Abiotic depletion potential for fossil resources

RESOURCE USE PER DECLARED UNIT						
 USE OF RENEWABLE MATERIAL RESOURCES	UNITS / D.U.	UPSTREAM	CORE PROCESS		DOWNSTREAM	TOTAL
		A1 	A2 	A3 	A4 	
PERE	[MJ]	467	2	26	2	497
PERM	[MJ]	0	0	0	0	0
PERT	[MJ]	467	2	26	2	497
PENRE	[MJ]	10 464	566	508	689	12 227
PENRM	[MJ]	285	0	0	0	285
PENRT	[MJ]	10 750	566	508	689	12 513
SM	[kg]	1 182	0	0	0	1 182
RSF	[MJ]	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0
FW	[m³]	2.3	<0.1	2.1	<0.1	4.6

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

 WASTE GENERATION AND TREATMENT	UNITS / D.U.	UPSTREAM	CORE PROCESS			DOWNSTREAM	TOTAL
		A1 	A2 	A3 	A4 		
HWD	[kg]	0	0		<0.1	0	<0.1
NHWD	[kg]	0	0		16	0	16
RWD	[kg]	0	0		0	0	0
CRU	[kg]	0	0		0	0	0
MFR	[kg]	0	0		209	0	209
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 recovery

EEE Exported electrical energy

EET Exported thermal energy

3. CALCULATION RULES

The environmental burden of the product has been calculated according to EN 15804:2014 and PCR 2012:01 v 2.0.

This declaration is a cradle to gate with options EPD type, based on the application of Life Cycle Assessment (LCA) methodology to the whole life-cycle system.

In the whole LCA model, infrastructures and production equipments are not taken into account.

Hot rolled steel products at plant level, were described by using specific data from manufacturing facility (Brescia, Italy) for year 2017.

Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials contents and specifications, pre treatments, process efficiencies, air and water emissions, waste management), in order to provide a complete picture of the environmental burden of the system from raw materials supply (A1) to Transport (A2) and Manufacturing (A3).

The use phase and end of life were not considered according to EN:15804 and PCR 2012:01 V 2.0, while transport to final destination was considered (A4).

According to ISO 14040 and 14044, allocation is avoided whenever possible by dividing the system into sub-systems. When allocation cannot be avoided physical properties are used to drive flow analysis.

Data quality has been assessed and validated during data collection process.

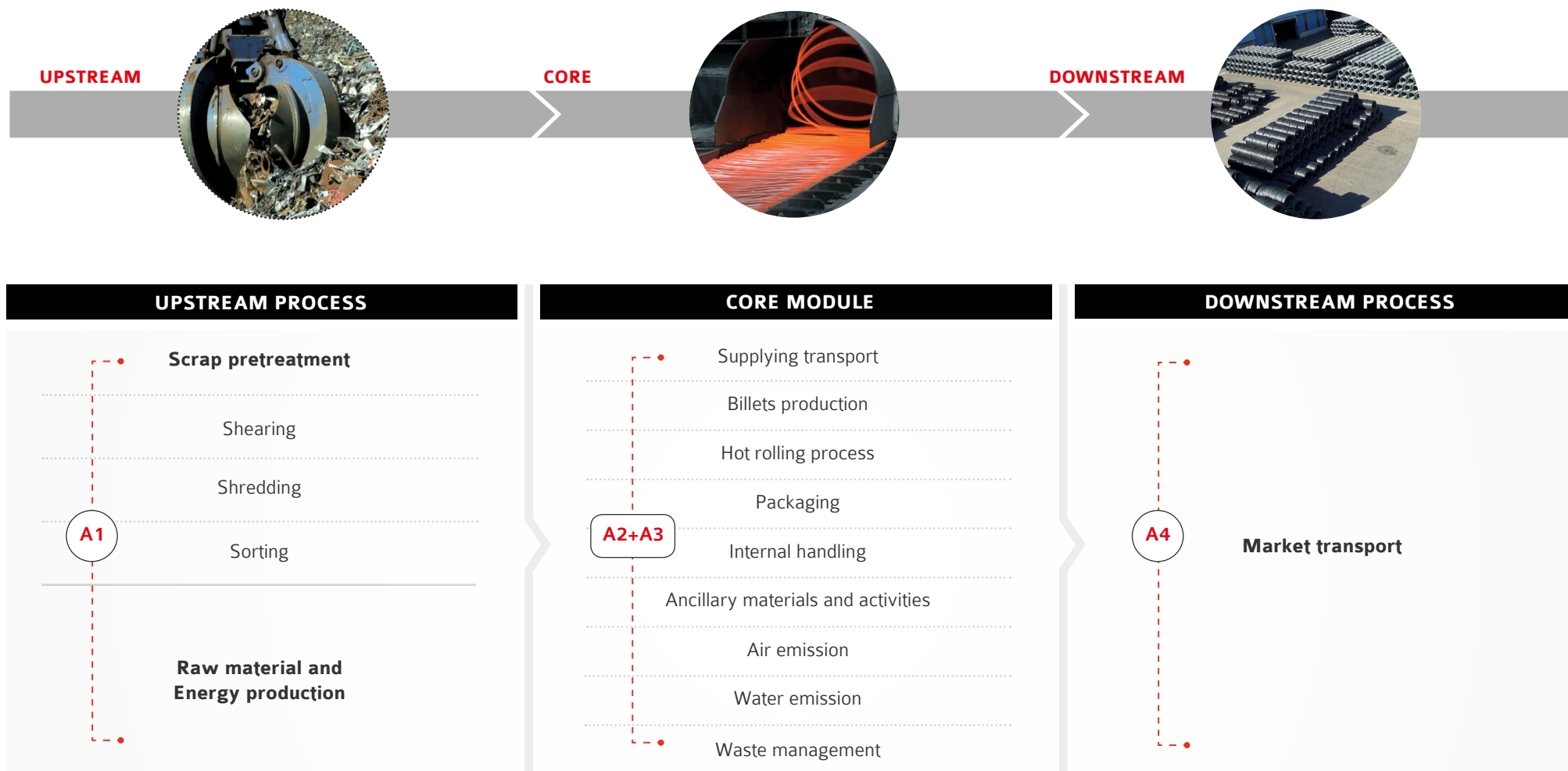
According to EN:15804 the applied cut-off criterion for mass and energy flows is 1%.

¹EN 15804 (2012) Sustainability of construction works - Environmental product declarations
Core rules for the product category of construction products.

²The LCA methodology is standardized at international level by ISO 14040 and ISO 14044.

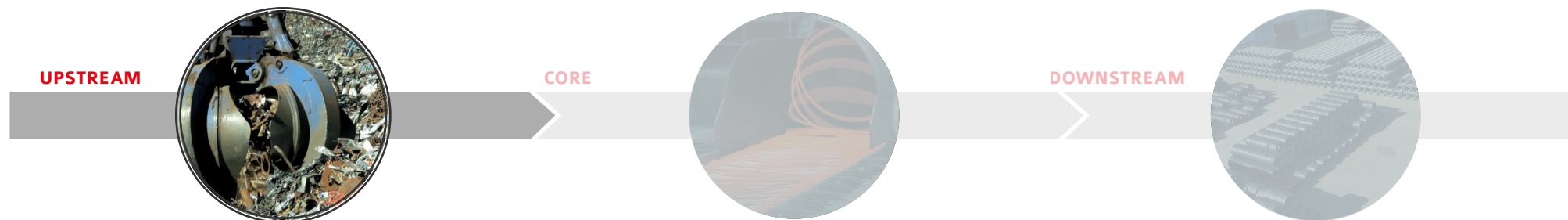


4. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION



Broad scheme of hot-rolled reinforcing steel for concrete production, in which the main activities included in the system boundaries, are listed and divided in the three subsystems: **UPSTREAM** Process, **CORE** Module and **DOWNSTREAM** Process.

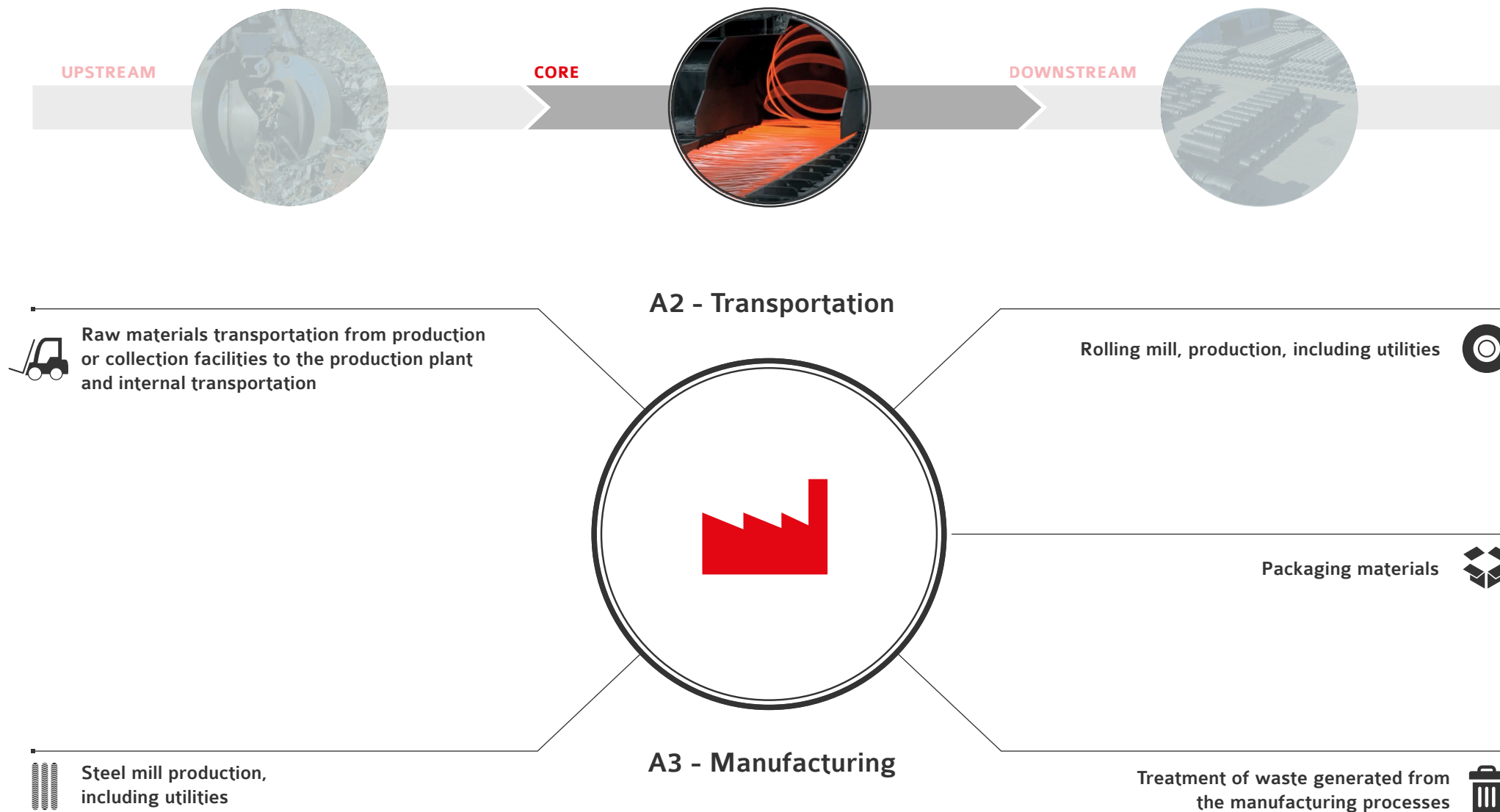
UPSTREAM PROCESS



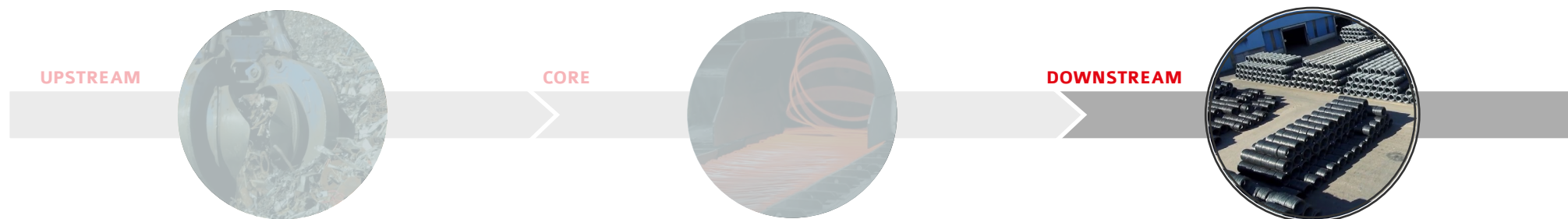
Scheme of the considered system boundaries (upstream processes).



CORE PROCESS



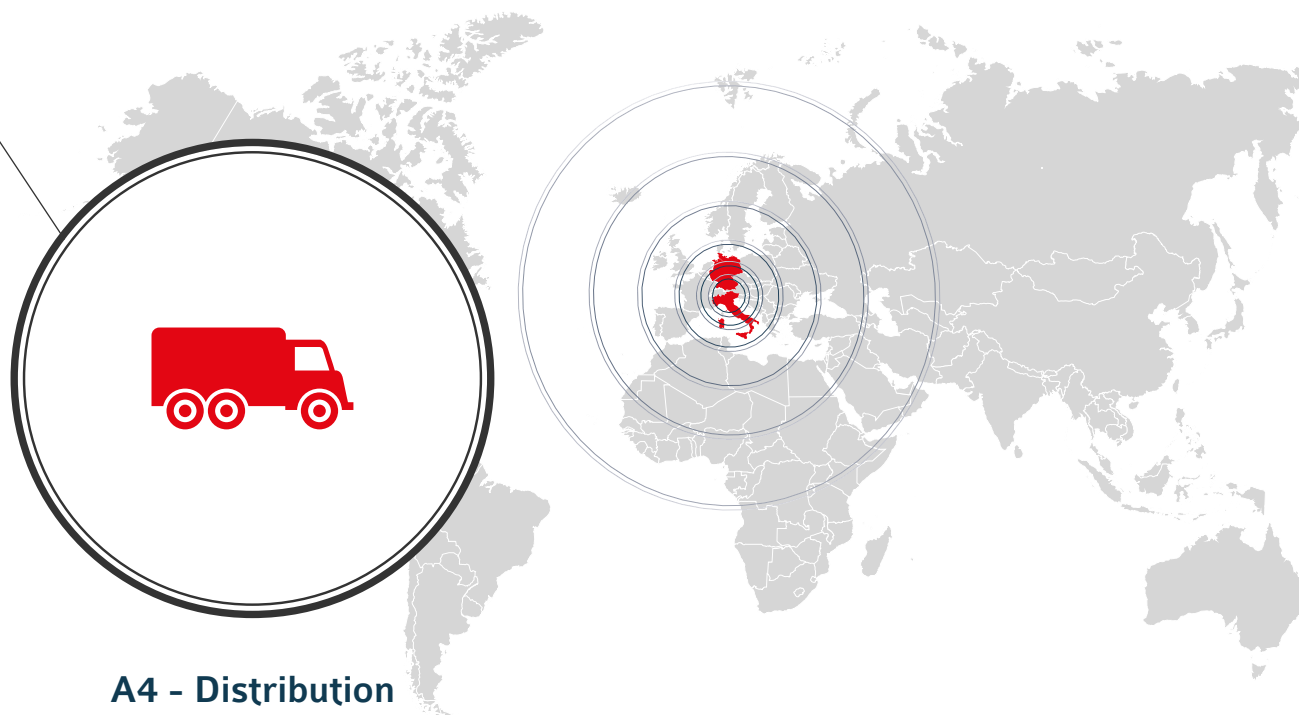
DOWNSTREAM PROCESS



Transport to the customers (general market average).
Distances estimated considering the transported quantities and the distances from Brescia's plant to the client.

From Brescia (in the North of Italy) final products are delivered to many national (68% of the total sold product) and international areas such as Algeria (around 12%), France, Germany and Algeria, mentioning the main countries.

The means of transport used to deliver steel bars and coils are truck, train and freight ship. On average, finished product is transported for 326 km by road, 37 km by train and 62 km by ship.



5. OTHER OPTIONAL ADDITIONAL ENVIRONMENTAL INFORMATION

Content of recycled materials $\geq 97\%$
(Certificate IGQ n. C057 following ISO 14021)



OTHER ENVIRONMENTAL CHARACTERISTICS OF ALFA ACCIAI PLANT

Alfa Acciai in Brescia is equipped with a scrap park (in which the steel scrap is sorted for the following crushing phase) and a section where steel scrap is prepared; there are also two casting lines, provided with air and water emissions treatment systems. The plant has also a production line dedicated to long products. Alfa Acciai has committed to improve the environmental performance of its production process with different measures such as the ALFA 2000 project (an environmental mitigation measures under supervised by the Brescia Town Council), the installation of a new more powerful off-gas filtering system for furnace 1 and active carbons filters along the suction lines of both furnaces to further reduce the organic micro pollutants in air emissions. Alfa Acciai plant in Brescia is equipped with prevention and reduction systems for (PCDD /F) and PCB emissions, a recirculating loop cooling to minimize water consumption and a waste management plan to prevent and reduce waste generation.

OTHER ENVIRONMENTAL INDICATORS		UNIT	UP	CORE	DOWN	TOTAL
AIR EMISSIONS	Dust from electric-arc furnace	[g]	-	6.08	-	6.08
	CO ₂ from electric-arc furnace	[kg]	-	34.79	-	34.79
	NO _x from hot rolling process	[g]	-	82.65	-	82.65
	SO _x from hot rolling process	[g]	-	1.71	-	1.71
WATER EMISSIONS	Total Suspended Solids	[g]	-	0.37	-	0.37

Other environmental indicators per 1 t of hot-rolled reinforcing steel

In accordance with requirements the LCA study used specific, generic and other generic data. These last data are contributing to the environmental indicators less than 10%.

6. REFERENCES

- EN 15804:2014
- ISO 14040
- ISO 14044
- Life Cycle Assessment (LCA) for hot and cold rolled reinforcing steel for concrete produced by Alfa Acciai for EPD® purposes - Final Report
- General Programme Instructions, v2.5
- PCR 2012:11 - construction products and construction services - v 2.01