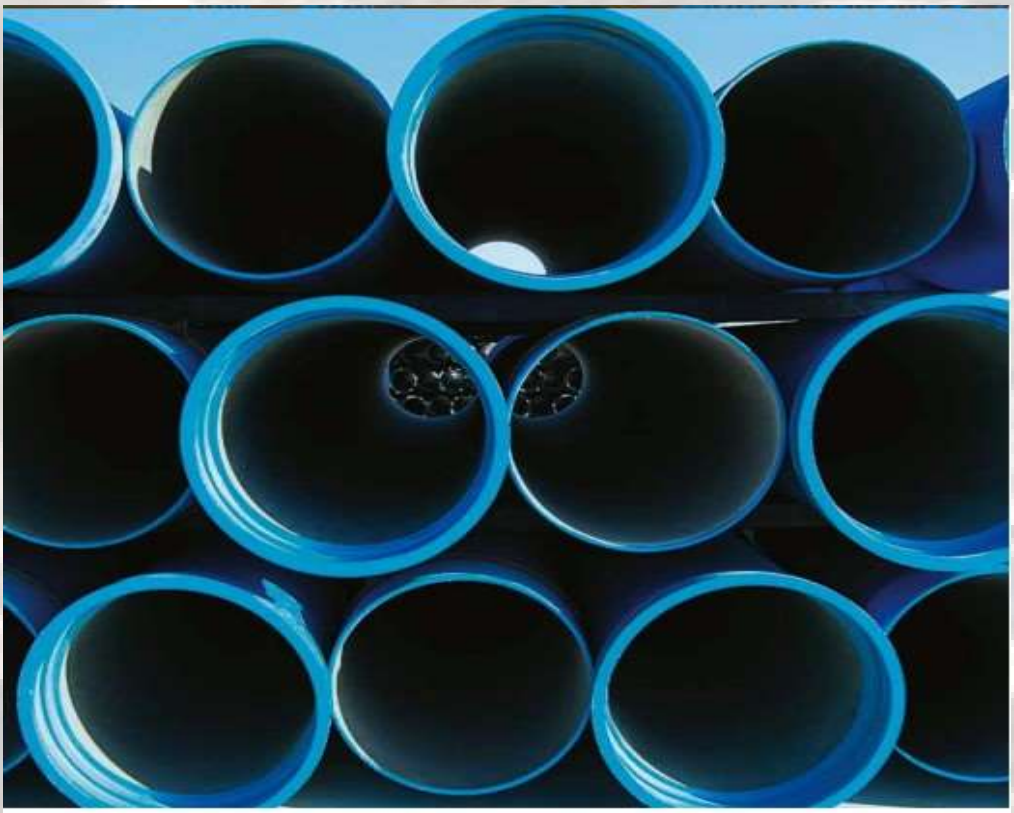
EPD® THE INTERNATIONAL EPD® SYSTEM

EPD® INDIA THE INTERNATIONAL EPD SYSTEM

ECO PLATFORM EPD VERIFIED

JINDAL SAW LTD.

TOTAL PIPE SOLUTIONS



PROGRAMME

The International EPD® System

PROGRAMME OPERATOR

The Indian Regional Hub of International EPD System

GEOGRAPHICAL SCOPE

Global

EPD REGISTRATION NUMBER

S-P-12013

PUBLICATION DATE

2024-02-14

REVISION DATE

2024-05-31

VALID UNTIL

2029-02-13

ENVIRONMENTAL PRODUCT DECLARATION

Of Ductile Iron Pipe

In accordance with ISO 14040:2006, ISO 14044:2006, ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

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

Program Information

Programme:	The International EPD® System
Address:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden.
Website:	www.envirodec.com; www.environdecindia.com
E-mail:	Info@envirodec.com

Information about verification and reference PCR:

CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product category rules (PCR):

PCR 2019:14 Construction products, version 1.3.2

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 Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process verification ✔ EPD verification

Third party verifier	Approved by
Sunil Kumar, SIPL Pvt Ltd, New Delhi, India sunil@sipl-sustainability.com	International EPD System Technical Committee, supported by the Secretariat

LCA Study & EPD Design Conducted by

Suraj Shekhar,
Sustainability Consultant, KoActs
suraj@koacts.com; www.koacts.com

Jindal SAW Limited has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company Information

Jindal SAW Limited is the part of O.P Jindal Group, started its operation in the year 1984 and is now the undisputed leader in the pipe market. The company is in a commanding position in India's tubular market with integrated multiple locations, Jindal SAW plays a leading role in developing cities across the world. The entire range of Jindal SAW pipes are marked by genuine quality, international accreditation and superior performance. The state-of-the-art manufacturing facilities offer complete control over quality standards at every stage Jindal SAW continues to support Svayam, an initiative towards creating an inclusive society and a barrier free environment, Svayam believes that every individual in society has the right to live with dignity and the society itself must come forward to make this possible.

Our customers include major oil and gas companies and authorities dealing in irrigation and water resources engaged in construction of oil and gas exploration, transportation, power generation, supply of water for drinking and irrigation purposes, and other industrial applications.

Having identified the immense potential offered by wastewater, logistics, and transportation Jindal SAW has ventured into different areas of business.

Jindal SAW manufactures SAW Pipes (Submerged Arc Welded Pipes) and spiral pipes for the energy transportation sector; carbon, alloy, and seamless pipes and tubes for industrial applications; and Ductile Iron (DI) pipes & Fittings for water and wastewater transportation.

Jindal SAW Limited is a leading global manufacturer and supplier of Iron & Steel pipe products, fittings, and accessories with manufacturing facilities in India, USA, Europe, and UAE (MENA). Our customers include the world's leading oil and gas companies, engineering companies, and authorities dealing in irrigation and water resources engaged in construction of oil and gas exploration, transportation, power generation, supply of water for drinking and irrigation purposes, and other industrial applications. Our mission is to match the expectations of our customers through product development, quality manufacturing, and supply chain management. We have robust systems developed for overall excellence and management to support our customers globally.

We have a unique business model well diversified in terms of strategic locations, markets, products, industries and customers. This business model is built to hedge the organization against various risks which allows us to operate and perform well in difficult economic and geopolitical circumstances. Our domestic and export markets are well balanced, and our businesses operate through four strategic business divisions including SAW Pipes, DI Pipes & Fittings, Seamless Pipes & Tubes, and Mining & Pellets.

Product Information

Ductile Iron (DI) pipes have good mechanical properties, in addition to high durability and strength, making them ideal for high-pressure applications. Ductile Iron pipes are used extensively in systems transporting potable water, industrial water, irrigation water, and pressure sewage. Metallic pipes, primarily Cast Iron had been used for over two centuries for water and wastewater transportation. Ductile Iron pipes which belong to the family of Cast Iron have been developed by treating the molten low-sulphur base iron with magnesium under closely controlled conditions. The startling change in the metal is characterized by the free graphite in Ductile Iron being deposited in the spheroidal or nodular form, leading to maximum continuity of the metal matrix thereby forming a stronger and tougher ductile material with high ductility and impact strength.

With protective linings and coatings like cement mortar, Bitumen, Epoxy, and Polyurethane, Ductile Iron pipes provide an exceptionally long life to serve the water and sanitation networks.

The flexible and leak tight jointing systems in Ductile Iron pipes, which can be easily push fitted (or mechanically joined) provide ease in the transportation of pipes as well as laying works. The pipeline and jointing system can withstand the vagaries of nature, thereby ensuring sustainable and quality piping solutions to the customers.

Jindal SAW commissioned its first Integrated Greenfield Project for a Ductile Iron pipe and Pig Iron unit at Samaghogha, Mundra, Gujarat, India in the year 2005, close to Mundra and Kandla ports. This port based facility includes:

- Coke oven battery plant (installed capacity: 380,000 MT per annum)
- Waste Heat Recovery power plant (Installed Capacity 30 MW)
- Blast furnace (installed capacity: 500,000 MT per annum)
- DI pipe manufacturing facility – Size Range DN 80- DN 1200 (installed capacity: 500,000 MT per annum)

In its quest to be a global leader, Jindal SAW has also taken over the assets of Sertubi Spa in Trieste, Italy. The subsidiary by the name Jindal SAW Italia, Spa caters to the requirements of Europe and other Western countries. In line with its vision to be a Total Pipeline Solution provider, Jindal SAW has also set up a Ductile Iron fittings plant in Sholapur, Maharashtra, India.

Looking into the tremendous market potential in the Gulf region as well as in the African continent, Jindal SAW has put up a DI pipe manufacturing facility at Abu Dhabi, United Arab Emirates, through its subsidiary 'Jindal SAW Gulf LLC'. The manufacturing capacity of the plant in 3,50,000 MT per annum, producing pipes ranging from 100mm to 2200mm.

Quality is the key mantra at Jindal SAW. Quality checks are carried out at every stage of the manufacturing process to meet the requirements as per international standards.

'Nurture with Nature' is the guiding principle for Jindal SAW. To ensure eco-friendly and sustainable growth, all the plants of Jindal SAW are equipped with advanced pollution control units and ecology conservation systems. Ductile Iron pipes manufactured by the company conform to both Indian and International Standards like IS8329, ISO: 2531, ISO 7186, BSEN 545 and BSEN 598 and AS/NZS 2280.

Content Declaration

Content declaration of Ductile Iron Pipe

Product Components	Content, kg	Renewable material, %	Biogenic carbon, %
Ductile Iron	833	0	3-4
Zinc Coating	3.8	0	0
Epoxy/Bitumen Coating	4.2	0	0
Cement Lining	155.8	0	2
Gasket	3.2	0	0

Packaging

	Content, kg	Renewable material, %	Biogenic carbon, %
Dunnage	2.15	100	45

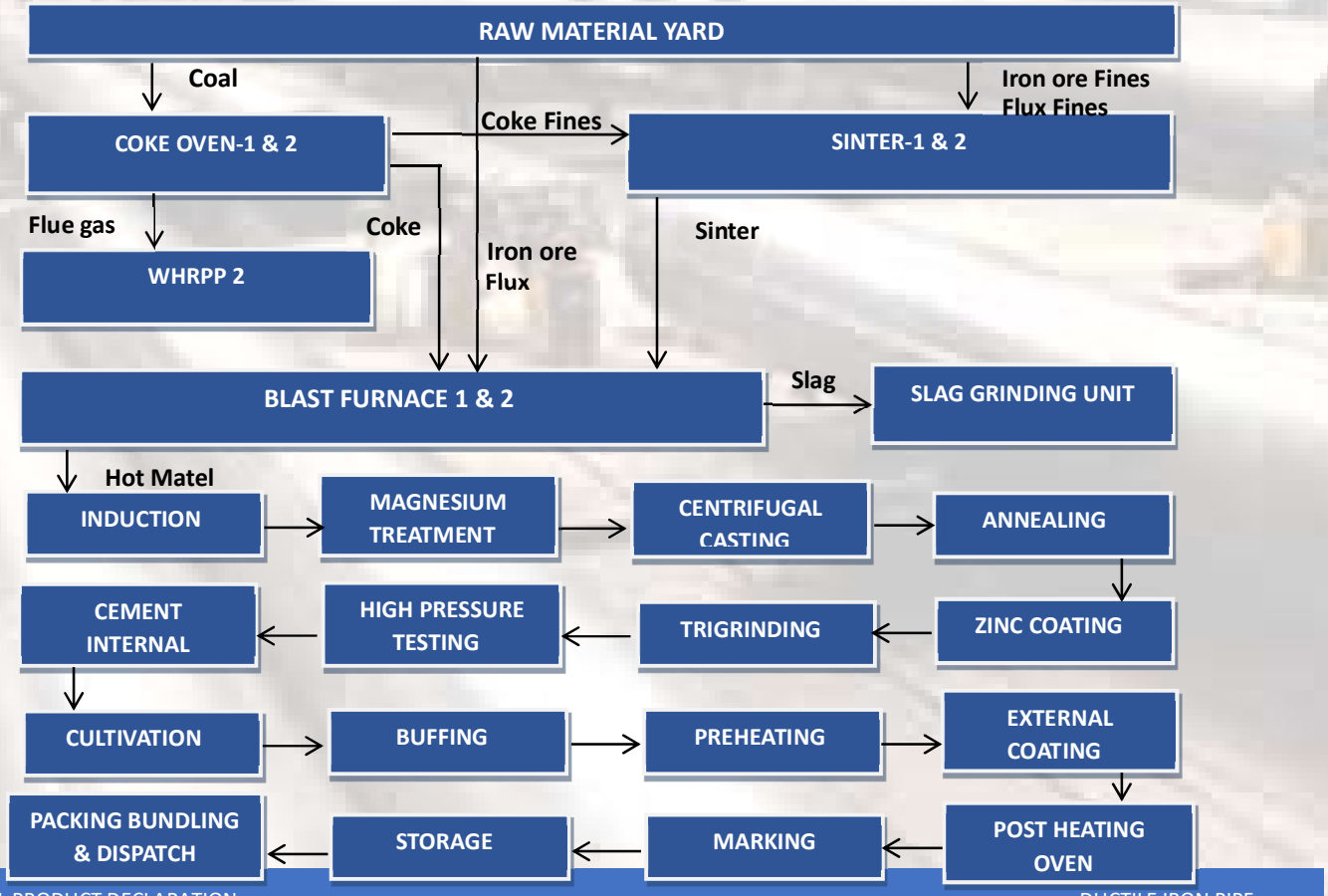
Life Cycle Assessment

Geographical scope:	India
Declared unit:	1000 Kg
Reference service life:	According to PCR 2019:14, as this LCA is Cradle to gate, modules C1–C4, module D and (A1–A3 + C + D), the declaration of the RSL is not possible. The RSL is declared as: “not specified”.
Time representativeness:	Primary data from the manufacturing site, suppliers and the electricity mix collected for the period starting from January 2023 to December 2023.
Database(s) and LCA software used:	Ecoinvent v3.9 (allocation, cut-off by classification) database and SimaPro v9.5 software have been used for the LCA calculations. LCA methods used are EN 15804: A2 compliant.
Description of system boundaries	Cradle to gate (A1-A3) with options, modules C1-C4, module D.
Data quality and data collection:	According to EN 15804:2012+A2:2019/AC:2021 specific data was used for module A3 (Processes the manufacturer has influence over) and was gathered from Jindal SAW Manufacturing unit at Samaghogha Mundra India.. Specific data includes actual product weights, amounts of raw materials used, product content, energy consumption, transport figures, water consumption and amounts of wastes.
Allocation:	In this study, allocation has not been applied.
Cut-off rules:	Life Cycle Inventory data for a minimum of 99 % of total inflows to the life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied. Impacts caused by treatment operations have been calculated lower than 1% environmental relevance.

Modules Declared, Geographical Scope, Share of Specific Data and Data Variation

X: Declared **ND:** Not declared.	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Recycling potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	IN	IN	IN	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>90%			-	-	-	-	-	-	-	-	-	<10%				
Variation – products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ductile Iron Pipe Manufacturing Flow Chart



A1-3 - Cradle to gate – *Mandatory Module*

The aggregation of the modules A1, A2 and A3 is allowed by EN 15804:2012+A2:2019. This rule is applied in this EPD and denoted by A1-3. This module represents the extraction and processing of raw materials, the transport to production sites and the manufacture and packaging.

C1 - De-construction

The dismantling of Ductile Iron Pipe has a very low impact considering the impact throughout the life of the installation. It is assumed that, in C1 module, 245 MJ energy is consumed. Ecoinvent dataset has been used for dismantling of Ductile Iron pipes.

C2 - Transport to waste processing

An average distance of 100 km has been assumed for the transport to sorting facility. Transport is calculated on the basis of a scenario with the parameters described in the attached table. After sorting 25kms distance is assumed for recycling plant.

Parameters C2 Module	
Transport by Truck	Lorry >11 metric ton
Distance (km)	100 & 25
Database	Ecoinvent 3.9

C3 - Waste processing for reuse, recovery and/or recycling

100% of used product after the lifetime will be collected and recycled into the manufacturing system. It is assumed that 5% of the product is lost during de-construction and 95% is reaches recycling system. The recycling rate of steel products is assumed to be 95% based on Annex C of the Product Environmental Footprint Guidance of European Commission. 833 kg is ductile iron in 1 ton of pipe, 5% is lost in demolition remaining 95% goes for recycling. 791.35 Kg ductile iron is recycled.
The material and energy expenses required for Module C3 are modelled.

C4 - Final disposal

It is assumed that 5% of Ductile Iron pipes are lost in dismantling which are sent to landfill. Cement lining, zinc and epoxy coatings are also landfilled. 41.65 kg ductile iron and 167 Kgs cement lining and coating are sent to landfilling site at a distance of 25 Kms.

D - Reuse, recovery or recycling*

Scrap inputs to the production stage are subtracted from scrap to be recycled at end of life in order to obtain the net scrap output from the product system. This remaining net scrap is then sent to recycling. Module D reports the environmental aspects of recycled scrap generated at the end of life minus that used at the production stage.
53.9 Kg scrap is used in hot metal production.

833 Kgs ductile iron is recovered after use phase. 5% is sent to landfill and remaining 95% goes to recycling. 833*0.95 = 791.35 ductile iron is recycled. 791.35-53.9 = **737.45** Kgs benefit considered in module D.

Electricity Modelling

Jindal saw produces electricity from waste heat coming from coke oven plant. About 40% of electricity used is from coke oven gas based plant and remaining 60% electricity is taken from Western Grid of India.
Climate impact as kg CO2 eq./kWh using the GWP-GHG indicator for Coke owen based electricity is 0.563 kg CO2 eq./kWh and western grid is 1.17 kg CO2 eq./kWh

Environmental Performance

Potential environmental impact – mandatory indicators according to EN 15804:2012+A2:2019/AC:2021

Indicator	Unit	Total A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	1041.73	3.41	52.29	4.53	1.34	-24.42
GWP-biogenic	kg CO_2 eq.	-4.22	0.01	0.03	5.21	0.00	0.56
GWP- luluc	kg CO_2 eq.	0.74	0.00	0.03	1.23	0.00	-0.04
GWP- total	kg CO_2 eq.	1039.00	3.42	52.36	4.78	1.34	-23.90
ODP	kg CFC 11 eq.	0.00	0.00	0.00	0.00	0.00	0.00
AP	mol H+ eq.	9.79	0.02	0.14	0.03	0.01	-0.25
EP-freshwater	kg P eq	2.45	0.00	0.00	0.01	0.00	-0.01
EP- marine	kg N eq.	2.92	0.00	0.04	0.01	0.00	-0.06
EP-terrestrial	mol N eq.	27.86	0.03	0.38	0.07	0.04	-0.64
POCP	kg NMVOC eq.	7.58	0.01	0.17	0.02	0.01	-0.19
ADP-minerals&metals*	kg Sb eq.	0.01	0.00	0.00	0.00	0.00	0.00
ADP-fossil*	MJ	28551.49	253.87	691.14	56.27	32.03	-287.42
WDP	m^3	30200.90	0.44	3.12	207.11	1.42	-3.86
GWP-GHG[1]	kg CO_2 eq.	1018.95	3.37	51.94	3.57	1.33	-23.08
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

[1] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Potential environmental impact – additional mandatory and voluntary indicators

Results according to EN 15804+A2 for 1000 kg of Ductile Iron Pipe							
PM/RI	[disease inc.]	0.00	0.00	0.00	0.00	0.00	0.00
IRP	[kBq U235 eq]	59.98	1.67	0.74	0.13	0.04	-0.99
ET-freshwater	[CTUe]	48980.94	135.26	333.72	177.20	21.79	-151.26
HT-cancer	[CTUh]	0.00	0.00	0.00	0.00	0.00	0.00
HT-non-cancer	[CTUh]	0.00	0.00	0.00	0.00	0.00	0.00
SQP	[pt]	6682.24	3.04	263.68	74.51	17.71	-505.52
Acronyms	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; IRP = Ionizing radiation, human health; ET-freshwater = Eco-toxicity (freshwater); HT-cancer = Human toxicity, cancer effects; HT-non-cancer = Human toxicity, non-cancer effects; SQP = Potential soil quality index (SQP)						

Use of resources

Results for 1000 kg of Ductile Iron Pipe							
Indicator	**Unit**	**Total A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	758.42	0.74	10.40	36.06	0.70	-39.02
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	758.42	0.74	10.40	36.06	0.70	-39.02
PENRE	MJ	29956.99	270.01	689.90	59.46	45.10	-307.05
PENRM	MJ.	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	29956.99	270.01	689.90	59.46	45.10	-307.05
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	867.82	0.02	0.08	7.07	0.01	-0.10
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste production

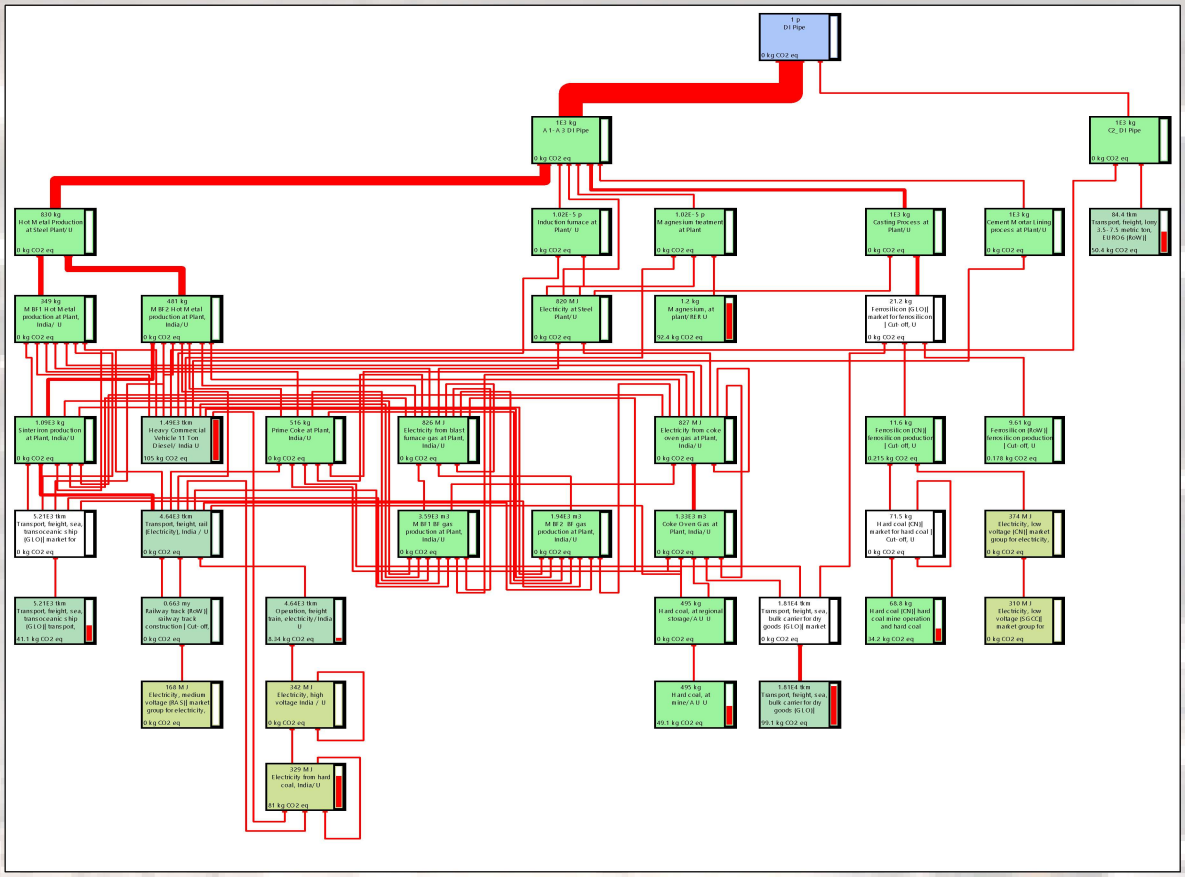
Results for 1000 kg of Ductile Iron Pipe							
Indicator	**Unit**	**Total A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3.27	0.54	0.04	0.00	0.00	0.00
Non-hazardous waste disposed	kg	102.79	0.04	19.85	0.55	1.33	-9.02
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00

Output flows

Results for 1000 kg of Ductile Iron Pipe							
Indicator	**Unit**	**Tot.A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	**Kg**	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	Kg	0.00	0.00	0.00	737.45	0.00	0.00
Materials for energy recovery	**Kg**	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	**MJ**	0.00	0.00	0.00	0.00	0.00	0.00

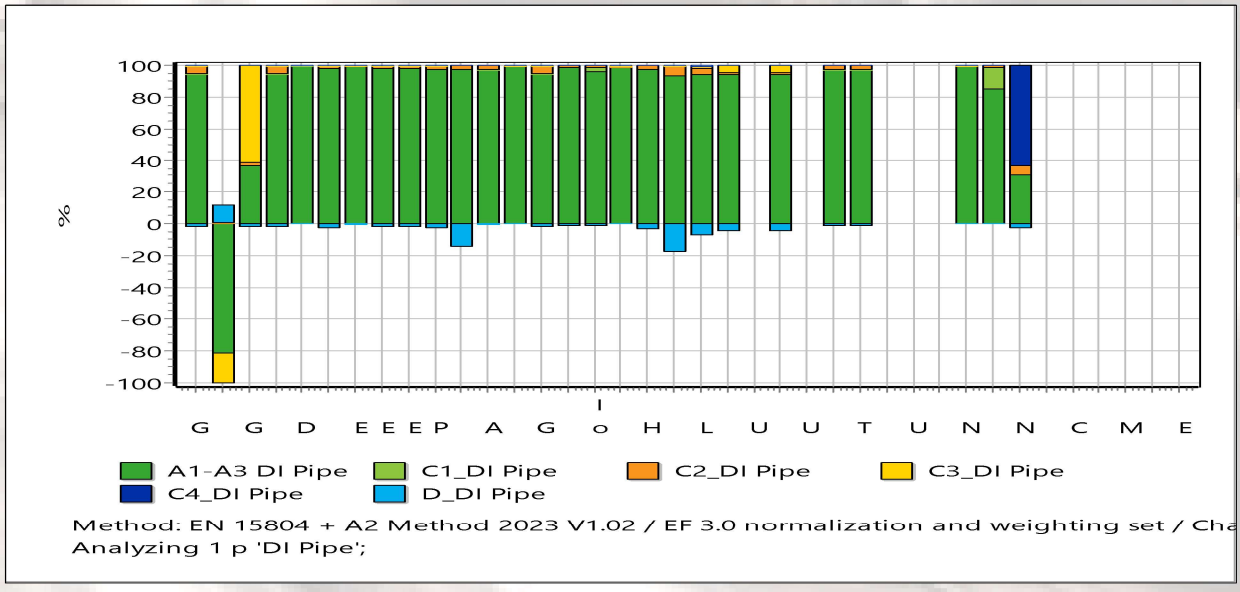
LIFE CYCLE INTERPRETATION

The Process flow of SimaPro network is presented in Figure for Global Warming Potential impact.



Network flow for 1000Kg of Ductile Iron Pipe

The relative impacts of all life cycle stages for 1000 kg of Ductile Iron pipe are presented in Figure below for each impact category. Manufacturing stage of the raw material life cycle is appeared as the highest impact contributor.



Potential environmental impact per module for 1000Kg of Ductile Iron Pipe

Environmental indicators caused by per LCA stage is presented in Figure 3. Environmental impacts caused by the A1-3 Module is appeared to be the dominant for climate change and also it is the main hotspot in all other environmental impact indicators.

Revision Details:

- Following Typographical errors are corrected in Page No. 1 & 2

  i) ISO 1400:2006 is corrected as ISO 14040:2006 (Page No.1)

  ii) thecontinued is corrected as the continued (Page No.1)

  iii) Jindal Saw Lim. is corrected as Jindal saw Limited (Page No.2)

References

- ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework
- ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines
- ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products
- The International EPD® System / www.environdec.com
- The International EPD® System / The General Programme Instructions v3.01 / https://www.environdec.com/contentassets/95ee9211a9614f1faa7461ff32cecc91/general-programme-instructions-v3.01.pdf
- The International EPD® System / PCR 2019:14 Construction products v1.2.5 (EN 15804:A2) /
- https://api.environdec.com/api/v1/EPDLibrary/Files/04600e1f-ab96-4e05-9040-08dabb52e166/Data
- Product Environmental Footprint Category Rules Guidance / https://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_guidance_v6.3.pdf
- Ecoinvent 3.9 / http://www.ecoinvent.org/
- SimaPro LCA Software / https://simapro.com/
- Jindal SAW Limited/ https:// https://www.jindalSAW.com/index.php/ /

Third Party Verifier

Sunil Kumar
SimaPro partners for India & Sri Lanka,
SIPL Pvt Ltd https://www.sipl-sustainability.com/
sunil@sipl-sustainability.com

LCA and EPD Consultant

KoActs
Flat No 10, 3rd flr, 'Avadhpuri' Hsg Soc,
Opp. Karishma Soc, Near Karishma Traffic Signal , 127-Karve Road,
Kothrud, Pune- 411029
suraj@koacts.com; www.koacts.com

Owner of the EPD

Jindal SAW Limited,
Jindal Centre,
12 Bhikaiji Cama Place,
New Delhi 110066
Guruprasad C.M
guruprasad.cm@jindalsaw.com