FABRICATED DOM TUBING

SHARON TUBE, A DIVISION OF ZEKELMAN INDUSTRIES FARRELL, PA



Fabricated DOM (Drawn Over Mandrel) Tubing is used for a wide variety of applications including but not limited to agriculture, automotive, fluid power, and mining.



Flexibility to adapt. Consistency across orders. Predictability for on-time delivery. These are the values that drive reliability here at Sharon Tube, the recognized service leader in the precision mechanical tubing industry. We manufacture DOM (drawn over mandrel) mechanical tubing and ERW (electricresistance welding) tubing with a keen understanding of your requirements so you always get what you need, when you need it. As a division of Zekelman Industries, we're doing our part to MAKE IT eZ.

The North American steel industry is the cleanest of all the major steel producing areas of the world. Of the seven largest steel producing countries, the U.S. has the lowest CO_2 emissions per ton of steel produced and the lowest intensity (AISI, 2024). Sharon Tube is committed to maintain this fact by constantly improving our processes. For more information about Sharon Tube and the products we offer, please visit www.sharontube.com.





SHARON TUBE Fabricated DOM Tubing Farrell, PA



According to ISO 14025 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 Pfingsten Rd, Northbrook	www.ul.com < IL, 60062 www.spot.ul.com				
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v.2.7	7 2022				
MANUFACTURER NAME AND ADDRESS	Sharon Tube Company 100 Martin Luther King Jr. Blv Farrell, PA 16121	vd				
DECLARATION NUMBER	4791523933.109.1					
DECLARED PRODUCT & DECLARED UNIT	Fabricated DOM (Drawn Over	r Mandrel) Tubing; 1 metric ton				
REFERENCE PCR AND VERSION NUMBER		ment Calculation Rules and Report Requirements, v4.0 (2022) oduct EPD Requirements, v2.0 (2020)				
DESCRIPTION OF PRODUCT APPLICATION/USE		r Mandrel) Tubing is used for a wide variety of applications riculture, automotive, fluid power, and mining.				
MARKETS OF APPLICABILITY	North America					
DATE OF ISSUE	May 5 th 2025					
PERIOD OF VALIDITY	5 Years					
EPD TYPE	Product-specific Type III					
EPD SCOPE	Cradle to gate					
YEAR(S) OF REPORTED PRIMARY DATA	October 2021 – September 20	022				
LCA SOFTWARE & VERSION NUMBER	Sphera LCA for Experts 10.7	(formerly GaBi)				
LCI DATABASE(S) & VERSION NUMBER	Sphera Managed LCA Conter	nt Database 2024.1 (formerly GaBi Database)				
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1, IPCC AR5 GWP10	100, CML 2001-Jan 2016 ADP _{fossil}				
Part A PCR review was conducted by:		Lindita Bushi, PhD, Chair Hugues Imbeault-Tétrault, Eng., M.A. Sc. Jack Geibig				
The sub-category PCR review was conducted by:	Dr. Tom Gloria (Chair) Brandie Sebastian James Littlefield					
This declaration was independently verified in accord The UL Environment "Part A: Calculation Rules for the Requirements on the Project Report," v4.0, based on and ISO 21930:2017, serves as the core PCR, with the USGBC/UL Environment Part A Enhancement (2)	acting atom					
□ INTERNAL	Cooper McCollum, UL Solutions					
This life cycle assessment was conducted in accord reference PCR by:	WAP Sustainability Consulting					

Limitations:

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of construction works and construction products using EPD information shall be based on the product's use and impacts at the construction works level. In general, EPDs may not be used for comparability purposes when not considered in a construction works context. Given this PCR ensures products meet the same functional requirements, comparability is permissible provided the information given for such comparison is transparent and the limitations of comparability explained.

When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.



SHARON TUBE Fabricated DOM Tubing Farrell, PA

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1. Product Definition and Information

1.1. Description of Organization

Flexibility to adapt. Consistency across orders. Predictability for on-time delivery. These are the values that drive reliability here at Sharon Tube, the recognized service leader in the precision mechanical tubing industry. We manufacture DOM mechanical tubing and ERW tubing with a keen understanding of your requirements so you always get what you need, when you need it. As a division of Zekelman Industries, we're doing our part to MAKE IT eZ.

Sharon Tube was founded in 1929 and quickly established a reputation for delivering what customers need, when they need it. In 2007, Sharon Tube became part of JMC Steel Group, which is now Zekelman Industries. Sharon Tube's customer focus perfectly aligns with Zekelman's mission to MAKE IT eZ for customers in the steel pipe and tube industry.

1.2. Product Description

Sharon Tube manufactures precision Drawn Over Mandrel (DOM) mechanical tubing in a range of sizes to meet customer needs. Sharon Tube's advanced operations maintain precision quality control with the tightest tolerances. Sharon Tube performs comprehensive, automated non-destructive inspection and analysis to verify integrity. Additionally, DOM tubing has the following specifications and properties:

- Tempers: As drawn, stress relief annealed (SRA), full annealed
- Standard carbon steel / alloy grades 1010AK, 1020AK, 1026AK, ST52.3, 4130
- Variety of hardness levels and physical properties

This EPD covers fabricated DOM tubing produced and sold from Farrell, PA.

Fabricated DOM tubing falls under CSI divisions 05 00 00, 11 00 00, 11 20 00, 31 00 00, 34 00 00, 40 00 00, and 41 00 00. DOM tubing falls under UNSPSC codes 40181800.

Product Specification

This product is defined by the following standards:

- **ASTM A513 Type 5** Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing, Type 5 (drawn over a mandrel)
- **ASTM A513 Type 6** Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing, Type 1 (special smooth inside diameter)



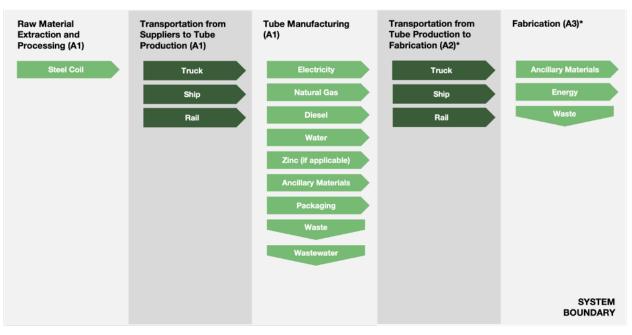




SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

Flow Diagram and System Boundary



All A1 steps represent manufacturing of unfabricated tube by Sharon Tube. Stages with an asterisk rely on data from the AISC & STI industry average EPD for fabricated HSS (AISC & STI, 2022). Use of these data is deemed appropriate for tubing since these fabrication data do not differentiate between fabrication of structural sections, steel plate, hollow structural sections, or non-structural steel. The AISC & STI EPD does not declare the modes of transportation used in A2, so it is assumed all common modes (truck, ship, rail) are used.

1.3. Application

Applications can be, but are not limited to, commercial and residential construction, piers and piling, solar, heavy truck components, mining, and other industrial and structural applications.

1.4. Material Composition

Steel tube products are made of carbon steel with a small percentage of alloy elements included. The products do not contain any hazardous substances according to the Resource Conservation and Recovery Act (RCRA), Subtitle 3. The products do not release dangerous substances to the environment, including indoor air emissions, gamma or ionizing radiation, or chemicals released to air or leached to water and soil.

1.5. Declaration of Methodological Framework

This LCA uses an attributional approach.

1.6. Manufacturing

Tubes are manufactured by cold-forming steel coils into tubes. Hot-rolled coils are first slit by an outside processor or at Atlas Tube's Harrow, ON, facility into sections for the appropriate Tube diameter.



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According to ISO 14025 and ISO 21930:2017

After the coils are slit, they are received at Sharon Tube's Niles, OH, facility or Atlas Tube's Harrow, ON, facility and stored. The slit coils are then uncoiled and passed through a series of rollers that form the continuous sheet into tubes. Then, the material is formed into tubes by an electric-resistance welding (ERW) process. These tubes, also called ERW hollows, are then shipped to Sharon's Farrell, PA, facility.

At Farrell, ERW hollows are lubed, in which raw material is dunked to be acid washed, zinc phosphate coated, and lube coated. The lubed hollows are point drawn in a drawn-over-mandrel process and stress-relieved in a furnace. Then, the drawn tube is sent to the finishing line to be straightened, tested, cut to length, stenciled, and oiled. Finally, DOM tubing is bundled and packaged for shipment.

Results in this LCA are presented as a weighted average based on production volume for each pathway described above.

The primary input into tube production is the steel itself, although small amounts of process materials are needed. Electricity is used for manufacturing and to move the materials. Manufacturing produces some metal scrap. This scrap is recycled by an external recycler.

Fabrication requires 1.08 metric tons of tube per 1 metric ton of fabricated product (AISC & STI, 2022). A1 includes production of all 1.08 metric tons of tube, A2 represents transportation to the fabrication facility, and A3 represents the fabrication activities.

1.7. Packaging

Environment

Tubes are packaged and shipped using wood dunnage, steel banding, and plastic film.

As required per ISO 21930 and the Part A PCR, information on packaging is provided to specify the end-of-life scenarios used for packaging or to support development of the end-of-life scenarios for packaging at the construction works level where the A5 module is not declared. These data are provided in the table below per metric ton of fabricated tube.

Table 1. Packaging Waste Details for A5 Scenario Development, per Declared Unit of Fabricated Product

PACKAGING WASTE	VALUE	Unit
Plastic Packaging Waste to Landfill	4.63E-02	kg
Plastic Packaging Waste to Incineration	1.13E-02	kg
Plastic Packaging Waste to Recycling	9.07E-03	kg
Steel Packaging Waste to Landfill	2.98E-01	kg
Steel Packaging Waste to Incineration	7.00E-02	kg
Steel Packaging Waste to Recycling	1.03E+00	kg
Wood Packaging Waste to Landfill	4.21E+00	kg
Wood Packaging Waste to Incineration	1.02E+00	kg
Wood Packaging Waste to Recycling	1.92E+00	kg
GWP based in biogenic carbon content of packaging	1.13E+01	kg CO₂e







SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

1.8. Transportation

Transportation distances from suppliers to Sharon Tube's Farrell, PA, facility in A1 were calculated based on the supplier location and the location of manufacturing and modeled using primary data on the mode of transport.

Transportation from the tube producer to the fabricator (A2) is included in the analysis and comes from the American Institute of Steel Construction (AISC) and Steel Tube Institute (STI) EPD for fabricated HSS (AISC & STI, 2022).

1.9. Product Installation

Because the declared system boundary is A1-A3, product Installation is not declared in this EPD.

1.10. Use

Because the declared system boundary is A1-A3, use of product is not declared in this EPD.

1.11. Reference Service Life and Estimated Building Service Life

Because the declared system boundary is A1-A3, a reference service life is not declared.

1.12. Reuse, Recycling, and Energy Recovery

Because the declared system boundary is A1-A3, reuse, recyling and energy recovery of product is not declared in this EPD.

1.13. Disposal

Because the declared system boundary is A1-A3, disposal of the product is not declared in this EPD. 2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The declared unit of calculation is one metric ton of fabricated tube (1,000 kg).

Table 2. Functional Unit

NAME	VALUE	Unit
Declared Unit	1	metric ton
Density	7,850	kg/m ³

2.2. System Boundary

The declared system boundary is cradle-to-gate. This includes the PCR life cycle modules A1, A2, and A3. Module A1 represents cradle-to-gate impacts for unfabricated tube, including raw material supply, transport of raw materials to Sharon Tube, and manufacturing of tube by Sharon Tube. Module A2 represents transport of unfabricated tube to fabricators, and module A3 represents fabrication of tube. The declared system boundaries are shown in Table 3.





SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

2.3. Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The primary energy and ancillary material data were collected as annual totals including all utility usage and production information. For the LCA, the energy and ancillary usage information was divided by the production to use per metric ton.

Assumptions and limitations to the study have been identified as follows:

- Supplier EPDs utilized in this LCA reported all LCA results as site-specific values. In the case of some suppliers, results for resource use indicators and waste and output flows are reported as production weighted-average results over multiple mills. The site-weighted average results are used in this LCA's results since they are the best data available.
- In absence of fabricator-specific data, industry average results from the AISC & STI EPD for Fabricated HSS were used to represent impacts of transport to fabrication (A2) and fabrication (A3) portions of the life cycle.
- Steel scrap generated in production is accounted for in A1 (raw materials) and A2 (transportation of raw materials), where impacts are modeled for sourcing and transporting the materials that are lost in production.
- Availability of geographically more accurate background LCI datasets would have improved the accuracy of the study.
- Since this LCA uses the cut-off approach to model recycled material in the product, no credit is given to the product system. Instead, the manufacturer realizes reduced environmental impacts through the absence of the burden of extracting virgin material.
- Only known and quantifiable environmental impacts are considered.
- Due to the assumptions and value choices listed above, The LCA does not reflect real-life scenarios and hence cannot assess actual and exact impacts, but only potential environmental impacts.

2.4. Cut-off Criteria

Input and output flows of mass and energy greater than 1% (based on total mass final product and total energy usage of the product system) or greater than 1% of environmental impacts were included within the scope of analysis. Flows less than 1% were included if sufficient data were available to warrant inclusion and/or the flow was thought to have significant environmental impact. Cumulative excluded flows and environmental impacts are less than 5% per module based on total mass, energy usage, and impacts of the product system. Where data gaps were identified, they are filled by conservative assumptions with average, generic, or proxy data and assumptions are documented.

No known flows relevant to the product system are deliberately excluded from this LCA and EPD. Some material inputs may have been excluded within the MLC datasets used for this project. All MLC datasets have been critically reviewed and conform to the exclusion requirement of the PCR, Part A: "Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report."

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and were used for all manufacturing processes for fiscal year 2022, defined as October 2021 to September 2022. Whenever available, supplier data were used for raw materials used in the production process. Supplier EPDs were utilized for steel coils purchased by Sharon Tube, when available. When primary data do not exist, secondary data for raw material production were utilized from the AISI industry average dataset for hot rolled coil in North America (AISI, 2020). Secondary data for tube manufacturing energy and materials were sourced from Sphera Managed LCA Content (fka GaBi) Database 2024.1. LCA results for transport to





SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

fabricators (A2) and fabrication (A3) were taken from the AISC & STI EPD for fabricated HSS. This data in this EPD represents fabrication activity in 2019 and 2020, intended to represent production in 2020.

2.6. Data Quality

The geographical scope of the tube manufacturing portion of the life cycle is North America. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered very good.

The primary data provided by Sharon Tube represents all information for October 2021 to September 2022. Using this data meets the PCR requirements. Time coverage of this data is considered very good. Primary data provided by Sharon Tube are specific to technology used in manufacturing their product. They are site-specific and considered of good quality.

Supplier EPDs were utilized for representing steel coil production, where available. This data represents the technology specific to the suppliers and technological representativeness of this data is considered very good. This data represents the site-specific results for the suppliers and geographic coverage of this data is considered very good. Time coverage of EPDs ranges from 2019 to 2021 and is considered of very good quality. Supplier EPD consistency is considered good. A majority of steel supplier EPDs reported product- and site-specific results for LCIA impact categories. Supplier EPDs used consistent PCRs and LCIA methodologies for global warming potential (IPCC AR5 GWP₁₀₀) and other LCA impact categories (TRACI, with CML 2001-2016 for ADP_{fossil}). However, the LCA modeling software and databases used were not consistent across all supplier EPDs. Supplier EPD results were modeled in a range of life cycle assessment modeling softwares, including LCA FE using MLC datasets, SimaPro using ecoinvent datasets, or openLCA using ecoinvent datasets. Use of consistent LCA software and background LCA data would improve the consistency of this LCA.

When supplier EPDs were not available, this study utilized the AISI industry average dataset for hot rolled coil produced in North America (AISI, 2020). This dataset represents industry average production for 2017 in the relevant region. In absence of supplier data, time, technological, and geographical coverage of this data is considered good.

Secondary data for transport to fabricators and fabrication from AISC & STI represent fabrication activities in 2019. It represents industry average technology in the relevant region. According to AISC & STI, these fabrication data do not differentiate between fabrication of structural sections, steel plate, hollow structural sections, or non-structural steel. Therefore, use of these data is deemed appropriate for tubing. In absence of primary fabrication data, technological and geographical coverage of this data is considered good.

It is worth noting that the electricity and water used in tube manufacturing includes overhead energy such as lighting and heating. Sub-metering would improve the technological coverage of data quality. Data necessary to model cradle-to-gate unit processes were sourced from Sphera Managed LCA Content (fka GaBi) datasets and critically reviewed LCAs.

2.7. Period under Review

The period under review is the manufacturer's 2022 fiscal year, defined as October 2021 to September 2022.

2.8. Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. No co-product allocation was applied to the primary manufacturing data. As a default, Sphera Managed LCA Content datasets use a physical mass basis for allocation.

For fabrication, allocation based on shop hours was used to separate the manufacturing of fabricated structural steel from that of fabricated non-structural steel, according to the AISC & STI industry average EPD.

Of relevance to the defined system boundary is the method in which recycled materials were handled. Throughout the study recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated



SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

with the previous life of a raw material from recycled stock are excluded from the system boundary. Additionally, impacts and benefits associated with secondary functions of materials at end of life are also excluded (i.e., production into a third life or energy generation from the incineration plant). The study does include the impacts associated with reprocessing and preparation of recycled materials that are part of the bill of materials of the products under study.



SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

3. Life Cycle Assessment Results

Table 3. Description of the system boundary modules

PRC	DDUCT S	TAGE		TRUCT- COCESS AGE		USE STAGE			END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY			
A1	A2	A3	A4	A5	B1	B2	В3	B4	В5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Instal I	nse	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
х	х	х	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X=module is declared, MND=module not declared

3.1. Life Cycle Impact Assessment Results – Fabricated Product

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

Table 4. North American Impact Assessment Results: 1 metric ton of Fabricated DOM Tubing

IPCC AR5 GWP100, TRACI, AND CML 2001-2016	A1	A2	A3	A1-A3
GWP [kg CO ₂ eq]	3.88E+03	4.46E+01	9.67E+01	4.02E+03
ODP [kg CFC 11 eq]	1.64E-06	8.67E-14	1.62E-09	1.65E-06
AP [kg SO ₂ eq]	6.60E+00	1.83E-01	1.52E-01	6.94E+00
EP [kg N eq]	4.92E-01	1.64E-02	1.23E-02	5.21E-01
SFP [kg O₃ eq]	1.09E+02	4.44E+00	2.23E+00	1.16E+02
ADP _{fossil} [MJ, LHV]	4.49E+04	7.16E+01	1.04E+02	4.51E+04

Comparability: Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.





SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

3.2. Life Cycle Indicator Results – Fabricated Product

Table 5. Resource Use: 1 metric ton of Fabricated DOM Tubing

PARAMETER	A1	A2	A3	A1-A3
RPR _E [MJ, LHV]	3.10E+03	6.24E+01	2.16E+02	3.38E+03
RPR _M [MJ, LHV]	1.46E+02	0.00E+00	0.00E+00	1.46E+02
NRPR _E [MJ, LHV]	5.50E+04	6.91E+02	1.47E+03	5.72E+04
NRPR _M [MJ, LHV]	5.19E+01	0.00E+00	1.26E+01	6.45E+01
SM [kg]	6.21E+02	0.00E+00	7.62E-01	6.22E+02
RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m ³]	1.51E+01	1.81E-01	6.82E-01	1.60E+01

Table 6. Output Flows and Waste Categories: 1 metric ton of Fabricated DOM Tubing

PARAMETER	A1	A2	A3	A1-A3
HWD [kg]	4.88E+00	0.00E+00	3.32E-01	5.21E+00
NHWD [kg]	1.58E+01	0.00E+00	9.66E+00	2.55E+01
HLRW [kg]	3.93E-03	3.16E-05	1.18E-04	4.08E-03
ILLRW [kg]	3.28E+00	2.64E-02	9.85E-02	3.41E+00
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	4.14E+02	0.00E+00	7.71E+01	4.91E+02
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ, LHV]	2.51E+00	0.00E+00	0.00E+00	2.51E+00
EET [MJ, LHV]	1.18E+00	0.00E+00	0.00E+00	1.18E+00



SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

3.3. Life Cycle Impact Assessment Results – Unfabricated Product

Table 7. Cradle-to-Gate Global Warming Potential (GWP100) per IPCC AR5: 1 metric ton of Unfabricated Tube

PRODUCT	CRADLE-TO-GATE, MILL PRODUCT	Unit
Unfabricated DOM Tubing	3.59E+03	kg CO ₂ eq

4. Life Cycle Assessment Interpretation

For all the impact categories and products included in this EPD, tube manufacturing (A1) has the highest contribution, 94% or more, to cradle-to-gate impacts. Transportation of tube to fabricators (A2) and tube fabrication (A3) each contribute contributes less than 10% to all impact categories.

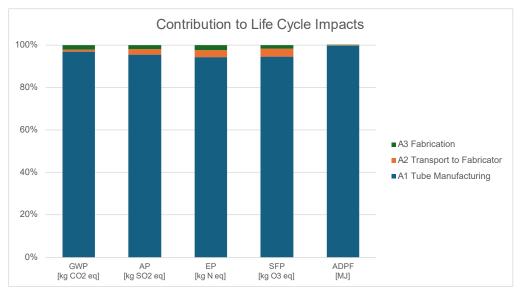


Figure 1: Fabricated DOM Tubing

5. Additional Environmental Information

5.1. Environment and Health During Manufacturing

Sharon Tube maintains an SDS of the product which contains specific Environmental, Health and Safety information of finished goods as it relates to local and international regulations. An SDS database is a centralized location in which recommended handling and regulatory exposure limits and recommended control measures can be found.

Sharon Tube always implements compliance focused measures with regulatory requirements in mind. A proactive compliance approach is used as a guidance tool at all Sharon Tube facilities. Each facility is accountable and held to a proactive compliance standard.

5.2. Environmental Activities and Certifications







SHARON TUBE Fabricated DOM Tubing Farrell, PA

According to ISO 14025 and ISO 21930:2017

Waste/Recycling: Sharon Tube facilities generate very little hazardous waste streams. All locations are classified as being a small quantity generator or very small quantity generator. Where feasible, Sharon Tube recycles what would otherwise be deemed a waste, with a goal of diverting wastes from landfill. All facilities have a procedure in place to extend the life expectancy of coolant minimizing overall generated industrial waste while reducing the introduction of virgin coolant. Contaminants are continuously removed from the process allowing coolants to be reused in a closed loop system for an extended period of time.

Emissions: The process at Sharon Tube generates minimal air emissions. Rust inhibitors used are generally water based with a very low organics content. All cleaners are either water based or federally exempt organic based materials.

Safety: Zekelman Industries understands that health and safety of its teammates are critical to the success of the organization and strives to provide a safe and healthy workplace that exceeds the most established health and safety standards. Our consistent improvements to safety and health are accomplished through the integration of safety in all teammates' daily duties and responsibilities. This has resulted in a sustainable level of safety, engagement, empowerment, and accountability throughout the organization.



SHARON TUBE Fabricated DOM Tubing Farrell, PA

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