

Environmental Product Declaration

In accordance with ISO 14025 Low Carbon Steel Shot

from **Tosçelik Granül**



The International EPD® System, www.environdec.com

EPD REGISTRATION NUMBER S-P-06760

PUBLICATION DATE 2022-11-28

Global

VALID UNTIL 2027-11-28



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



Programme Information

Programme Information

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Information about verification and reference PCR:

Product category rules (PCR) PCR 2015:03 Basic iron or steel products & special steels, except construction steel products, version 2.0, UN CPC 412

PCR review was conducted by

The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Gorka Benito Alonso, IK INGENIERIA, g.benito@ik-ingenieria.com

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



EPD verification

| Third party verifier | Approved by |
|--|--|
| Sunil Kumar | The International EPD® System Technical Committee, |
| SimaPro partners for India & Sri Lanka, SIPL Pvt Ltd | supported by the Secretariat |

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

Yes

No

LCA Study & EPD Design Conducted by

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Tosçelik Profil ve Sac End. A.Ş. has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. For more information on comparability see ISO 14025.

Company Information

Owner of the EPD

Tosçelik Profil ve Sac End. A.Ş

Sarıseki Org. San. Böl. Noksel Girişi Cad. 31204 Sarıseki / İskenderun / HATAY www.toscelikgranul.com.tr

Equipped with cutting-edge technology, Tosçelik Granül is established in 2006 with the principle to produce high quality steel shot out of most appropriate scrap aiming to meet global steel shot demand.Production capacity is increased up to 50.000 tons following the second phase investment in 2010. It is the biggest low carbon steel shot producer in Turkey whereas ranked amongst the top producers globally.We decided to produce high quality steel shot considering the technical advantages offered by low carbon steel shot against high carbon that does not get enough attention in the world of metallic abrasives industry.

Our mission is to produce the best low carbon cast steel shot ensuring our customers to benefit from our consistent and efficient technical support.Based on this mission and as a result of our detailed R&D studies, we introduced ournew product KOTAR in Contact: Mrs. Özlem KÖYBAŞI ÖZUÇAK ozlem.koybasi@toscelik.com.tr

2017. As we see the good results brought by our new product KOTAR, we feel encouraged to develop other value added products and serve best our clients.As growing bigger and more advanced every other year, we're proud to send our product to 35 countries in 5 different continents.

Production Site

Tosçelik Granül

Sarıseki Org. San. Böl. Noksel Girişi Cad. 31204 Sarıseki / İskenderun / HATAY



Product Information

Product Name:

Low Carbon Steel Shot

Kotar is the result of our long term experience and detailed R&D studies. As we all know, one of the most important element of shotblasting process is hardness. Keeping that in mind, we primarily led our R&D studies on finding how we can increase our actual hardness level without comprimising our product quality. As a result, Kotar has been developed with higher hardness compared to standard low carbon steel shot while maintaining its strong side of not breaking during the whole shotblasting process. Its longer lifetime has been proved firstly in our test center and onsite through different shotblasting processes applied by our customers. Onsite experiences showed us that higher hardness levels greatly contribute to shorter shotblasting times.

When produced, Kotar steel shot has 43 - 44 HRC initial hardness and this level reaches up to 49 - 50 HRC during the use due to manganese as well as contribution of other elements which is maintained until shot becomes unusable.

Next priority considered during the R&D studies of Kotar was to have a working mix that does not change for a long time in order to have a more effective cleaning. Especially in foundries, parts with different sizes and shapes are usually shotblasted in the same machine using the same size steel shot. Kotar sizes are arranged based on new sieve distribution in accordance with SAE standards. Each Kotar size covers more area on the part by activating at least 30% more shot particles in unit time and volume. That guarantees both better cleaning of parts with different sizes and shapes as well as a working mix that keeps its distribution for a longer period.

Production

The production starts with loading the iron scraps into the furnaces, then melted in four induction furnaces and the iron scraps turn into liquid metal after melting. After that, some alloying elements are added to achieve the goal of chemical analysis and as a result, it becomes low alloyed. After chemical analysis, casting takes place and the liquid metal turns into granulated form through a water jet. Finally, the low-carbon steel shot is packaged and ready for delivery at the factory gate.

Intended use of the product

Kotar steel shot offers a very long lifetime without breaking thanks to its bainitic microstructure. Produced at high initial hardness level (43-44 HRC) Kotar transfers high energy on the surface shotblasted which makes it work faster than competitor products.

Our experience says that steel shot with customary sieve distribution is hardly cleaning the pieces with complex shape and angles. However, Kotar features a fine tuned sieve distribution aiming the best coverage in order to achieve required surface quality in short blasting time.

Due to its low carbon, high manganese content, Kotar reaches up to 46-49 HRC hardness levels in very short time during shotblasting. Kotar is initially prepared with the working mix desired to be inside shotblasting machine and the same working mix remains unchanged during operation. Increased hardness in short period and working mix kept unchanged are essential advantages which leads to continuing surface quality.

Proudly presented by Toscelik Granul, Kotar steel shot performs very well in corrosion, oxidation, sand removal, deburring, surface preparation and shot peening operations thanks to its long lifetime and high hardness level. Kotar is appropriate to be used in foundries, steel shops, forging, rolling mills, machinery and steel production, automotive, aircraft and structural steel industries.

During shotblasting, low carbon steel shot does not break in parts but instead, shot particles are peeled off similar to thin onion layers up to 80% of their lives as a result of material fatigue. Since Kotar shot particles are not broken in big parts, inner linen of shotblasting machine and turbine parts are less damaged. We are conducting comparison tests against competitor products and see the condition of our product frequently not to compromise on these benefits. Shotblasting machine in our test center gives us the opportunity to make trials under industrial conditions.

Technical Specifications

CHEMICAL ANALYSIS (Molten Metal)

Carbon: 0.10-0.15 %

Manganese: 1.20-1.50 %

Silicon: 0.10-0.25 %

Sulphur: 0.035 % max.

Phosphorus: 0.035 % max.

Hardness

Hardness of KOTAR LOW CARBON STEEL SHOT is 43-44 HRC at the beginning.

During blasting, it reaches to 50-51HRC in a short time.

Density

Standards require minimum density must be 7.0 gr/cm3. KOTAR LOW CARBON STEEL SHOT minimum density is 7.3 gr/cm3

Microstructure

As a result of its bainitic microstructure, TOSÇELİK LOW CARBON STEEL SHOT features high level of hardness,long service life and strength in optimum combination.

General Look

Steel Shot is required to be in spherical form as much as possible. Extended or compound particles, tails,hollows,broken pieces, slag and dirt have to be at minimum level.

Application

Sectors;

They are mainly used in foundries, steel mills, forging shops, rolling mills, machine shops, structural steel mills that are servingautomotive, construction, ship building, aircraft, agriculture and many other industries.

Processes;

Sand Removal, Deburring, Descaling, Oxide Removal, Surface Treatment, Stress Relieving, Shot Peening

Packaging

25kg polyethylene bags on 1 ton wooedn pallet wrapped with cardboard and shrink packed.Packaging materials are %100 recyclable and eco-friendly.1000kg big bags and 900 kg metal barrels are also available for shipment

UN CPC Code: 412, products of iron or steel

LCA Information

Declared unit

1 tonne (1000kg) of Low Carbon Steel Shot product manufactured in Iskenderun, Hatay facility (TR).

Reference service life

Not applicable

Time representativeness

The production data in this LCA study represents the period of 1^{st} January 2021 and 31^{st} December 2021.

Database(s) and LCA software used Ecoinvent v3.7.1 and Simapro v9.2

Description of system boundaries Cradle to gate

Data quality and data collection

According to General Program Information specific data was used for module Core (Processes the manufacturer has influence over) and was gathered from Tosçelik Profil ve Sac Endüstri Iskenderun plant. Specific data includes actual product weights, amounts of raw materials used, product content, energy consumption, transport figures, water consumption and amounts of wastes. For Upstream modules, according to General Program Information, generic data was applied and was obtained from Ecoinvent v3.7.1.

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 three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied.



System Diagram

System Boundaries



Description of declared modules

Upstream

This stage takes into account raw material extraction, processing and energy used in the production process and includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as roadway.

Core

This stage includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered by this stage. Followed production processes are as;

- Induction Furnace
- Melting
- Casting
- Drying and Elemination
- Packaging

| Content Declaration of Low Carbon Steel Shot | | | | | |
|--|-----------------------------------|-----------------------------------|------------------------------------|---------------------------------|--|
| Product | Pre-consumer iron scrap, weight-% | Alloying elements, weight-% | Renewable material, weight-% | Biogenic car- bon, weight-kg | |
| Low Carbon Steel Shot | 99.0-99.9 | <1 | 0 | 0 | |

* The product does not contain "Candidate List of Substances of Very High Concern (SVHC)" compounds.

| Low Carbon Steel Shot | Weight, % | Biogenic carbon, kg |
|-----------------------|-----------|---------------------|
| Wooden Pallet (p) | <1 | 1-5 |
| Polyethylene Plastic | <1 | - |
| Polypropylene Plastic | <1 | - |
| Paper and Cardboard | <1 | - |
| Steel | <1 | - |

Content Declaration

Environmental Performance

Potential Environmental Impact

| Results for 1000 kg of Low Carbon Steel Shot | | | | | |
|---|----------------------------------|-------------------------|----------|----------|----------|
| Parameter | | Unit | Upstream | Core | TOTAL |
| Global warming potential (GWP) | Fossil | kg CO ₂ eq | 70.9 | 584 | 655 |
| | Biogenic | kg CO ₂ eq | 1.57 | -12.8 | -11.3 |
| | Land use and land transformation | kg CO ₂ eq | 0.114 | 4.15 | 4.27 |
| | TOTAL | kg CO ₂ eq | 72.6 | 575 | 648 |
| Acidification potential (AP) | | kg mol H+ eq | 0.430 | 3.49 | 3.92 |
| Eutrophication potential (EP) | Aquatic freshwater | kg P eq | 3.32E-03 | 5.84E-02 | 6.18E-02 |
| | Aquatic marine | kg N eq | 7.21E-02 | 0.482 | 0.554 |
| | Aquatic terrestrial | mol N eq | 0.810 | 5.34 | 6.15 |
| Photochemical oxidant creation potential (POCP) | | kg NMVOC eq | 0.253 | 1.50 | 1.76 |
| Ozone layer depletion (ODP) | | kg CFC 11 eq | 4.18E-06 | 1.95E-05 | 2.37E-05 |
| Abiotic depletion po- tential (ADP) | Metals and minerals | kg Sb eq | 5.77E-04 | 8.78E-04 | 1.46E-03 |
| | Fossil resources | MJ, net calorific value | 830 | 6596 | 7426 |
| Water deprivation potential (WDP) | | m ³ world eq | 11.2 | 430 | 441 |

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

Use of Resources

| Results for 1000 kg of Low Carbon Steel Shot | | | | | |
|--|-----------------------|-------------------------|----------|------|-------|
| Parameter | | Unit | Upstream | Core | TOTAL |
| Primary energy resources – Renewable | Use as energy carrier | MJ, net calorific value | 117 | 1486 | 1603 |
| | Used as raw materials | MJ, net calorific value | 0 | 0 | 0 |
| | TOTAL | MJ, net calorific value | 117 | 1486 | 1603 |
| Primary energy resources – Non-renewable | Use as energy carrier | MJ, net calorific value | 880 | 7228 | 8108 |
| | Used as raw materials | MJ, net calorific value | 0 | 0 | 0 |
| | TOTAL | MJ, net calorific value | 880 | 7228 | 8108 |
| Secondary material | | kg | 1130 | 0 | 1130 |
| Renewable secondary fuels | | MJ, net calorific value | 0 | 0 | 0 |
| Non-renewable secondary fuels | | MJ, net calorific value | 0 | 0 | 0 |
| Net use of fresh water | | m ³ | 3.35 | 51.0 | 54.4 |



Waste Production

| Results for 1000 kg of Hot rolled steel coil | | | | | |
|--|------|----------|------|-------|--|
| Parameter | Unit | Upstream | Core | TOTAL | |
| Hazardous waste disposed | kg | 0 | 0 | 0 | |
| Non-hazardous waste disposed | kg | 0 | 0 | 0 | |
| Radioactive waste disposed | kg | 0 | 0 | 0 | |

Output Flows

| Results for 1000 kg of Hot rolled steel coil | | | | | |
|--|------|----------|------|-------|--|
| Parameter | Unit | Upstream | Core | TOTAL | |
| Components for re-use | kg | 0 | 0 | 0 | |
| Materials for recycling | kg | 0 | 181 | 181 | |
| Materials for energy recovery | kg | 0 | 0 | 0 | |
| Exported energy, electricity | MJ | 0 | 0 | 0 | |
| Exported energy, thermal | MJ | 0 | 0 | 0 | |



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
- ISO 14020 2000 Environmental labels and declarations General principles
- The International EPD® System www.environdec.com
- The International EPD[®] System The General Programme Instructions v3.01
- The International EPD[®] System PCR 2015:03 Basic iron or steel products and special steels, except constructions product v2.
- Ecoinvent v3.7.1 www.ecoinvent.org
- SimaPro LCA Software www.simapro.com
- Toscelik Granul www.toscelikgranul.com.tr

Contact

Third party verifier

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Owner of Declaration

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LCA Study & EPD Design Conducted By Semtrio Sustainability Consulting BUDOTEK Teknopark, No 4/21, Umraniye / Istanbul Turkey









