

Press release

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Roll forming improves eco-balance

Economic and ecological challenges due to climate change, the global scarcity of resources and insufficient power supply from renewable energies are shedding a new light on the production technology of roll forming and the material steel. The sheet metal forming process is extremely energy-efficient and thus makes a contribution to reducing of CO₂ and achieving climate neutrality.

Roll forming, also known as roll profiling, is one of the established bending forming processes for profile production. Basic materials are strips and sheets mainly made of steel, which are processed into different profile shapes by cold forming in several steps. They are characterised by a special strength and dimensional accuracy as well as a very high surface quality. Roll-formed components are increasingly replacing other products made from plastics or energy-intensive hot-rolled materials. For reasons of the energy efficiency of the roll forming process and the unique recyclability of steel, cold-formed steel profiles make an important contribution to climate neutrality.

Energy-saving and climate-friendly

Roll forming processes have an extremely positive environmental balance. With classic roll forming, for example, the utilisation of material is very high due to the process and comes close to 100 per cent. With regard to the energy requirement, the cold forming process also has the advantage that the process takes place at room temperature and the sheet or strip does not have to be heated. Apart from the forming energy, energy is only required for the transport and acceleration processes of profile masses, tools and machine parts. There are no secondary processes. The low rolling friction losses due to the small friction surfaces also have positive effects. The energy efficiency is therefore extremely high and the process can overall be classified as climate-friendly.

Cost-effective and applicable in many industries

In particular, roll-formed steel profiles are a very economical and ecological alternative to extruded aluminum profiles, PET or composite materials such as e.g. Polyurethanes. With specially developed high-strength steel including thin-walled steel grades, cold profiles can be produced with a very favorable ratio of material weight to strength. This is not only interesting for lightweight construction. From the automotive industry to the construction industry and to the electrical and furniture industry, almost all segments of industry use products made by roll forming. Galvanised and final painted surfaces are also ideally suited for the profiling process and are very easy to process. Roll-formed profiles do not need to be post-treated but are usually ready for installation.

Recycling improves the ecological balance of steel

Steel is by far the most frequently recycled material. It retains its quality properties even after recycling and can therefore be melted down for an unlimited number of times. Steel scrap is already being reused worldwide by an established scrap and recycling industry. The more often steel is recycled, the smaller its ecological footprint becomes, because the CO₂ emissions in the production of one ton of steel are around 50 per cent lower with multi-recycling than with primary production. A study by the Technical University of Berlin¹ comes to the conclusion that one ton of steel causes less than 1,000 kilograms of CO₂, based on its total life cycle. If one compares the ecological balance of different raw materials during the primary production, aluminium causes about four times the amount of CO₂, carbon fibre reinforced plastic (CFRP) even five to six times the amount of CO₂ compared to steel². In 2013, the Tata Steel Group examined the sustainable use of steel in vehicles³ and points to the need for a holistic view of energy and CO₂ balances: "In comparison to aluminum and composite materials, steel is characterised by its competitive weight, lower costs and in a holistic view by its lower environmental impact. "

Roll forming offers future potential

A constant cross-section over the length of the profile is characteristic of the classic roll forming. Both highly complex and particularly stiff profiles can be produced economically if additional manufacturing processes such as punching,

embossing, folding, welding or lasering are carried out before, during or after the profiling process. In particular, punching and forming into extremely tight radii can be compared with the origami paper folding technique. This creates profiles in an endless process that cannot be produced with other processes or only with great effort. Digital innovations of Industry 4.0 also contribute to the further flexibility of roll forming. Fully automated, multifunctional profiling systems already enable production in batch size one or the production of different parts one after the other in a mixed sequence. The potential of this technology is far from being exhausted. With the so-called flexible roll profiling, also called 3D roll profiling, discontinuous cross-sections can also be produced over the longitudinal axis using adjustable roll stands. In this way, load-optimised profiles can be produced and further weight savings of over 20 per cent can be achieved.

The roll forming process not only meets all the requirements for an energy-saving and environmentally friendly manufacturing process, it is also cost-effective and extremely flexible. Above all, strips and sheets made of steel offer an excellent ecological balance, far ahead of aluminum, plastics and composite materials.

[Sources]

¹ Cf. Prof. Dr. Matthias Finkbeiner, Sabrina Neugebauer (2012). Studie. Ökobilanz nach ISO 14040/44 für das Multirecycling von Stahl. TU Berlin, Wirtschaftsvereinigung Stahl/ Stahlinstitut VDEh Düsseldorf

² Cf. Dr. Reinhard Winkelgrund (2013). Themenpapier. Recycling-Weltmeister Stahl, Stahl-Zentrum Düsseldorf

³ Cf. Nachhaltiger Stahleinsatz im Fahrzeug (2013). Case study. Tata Steel Europe Ltd. Automotive, IJmuiden/Niederlande

[Photos]

Picture 1



Roll-formed special profiles and sheets are cost-effective to manufacture, energy-efficient and environmentally friendly. With multifunctional profiling systems, batch size one is also possible.

Source: Tillmann Profil

Background information

The ECRA - European Cold Rolled Section Association - has existed since 1999 and is the trade association for European cold rolled section manufacturers. It represents the interests of the roll forming branch as part of the steel processing industry. This very medium-sized industry has around 5,000 employees in around 35 companies in Germany with a total turnover of around 1.6 billion euros (2019, source: German Federal Statistical Office).

Cold profiles are roll formed from flat-rolled raw material at room temperature on profiling systems by progressive bending. The main customer sectors are the automotive, electrical, furniture and construction industries.

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