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# Build more cost-effectively with aluminium profile technology

Building kit systems in industry

# CONTENTS



# How this guide can help

Flexibility and the ability to meet deadlines are key requirements when dealing with customised constructions, but they come under intense cost pressure. In the mechanical engineering sector, frames are often built by welding together steel components, which at first glance seem cheap and are readily available.

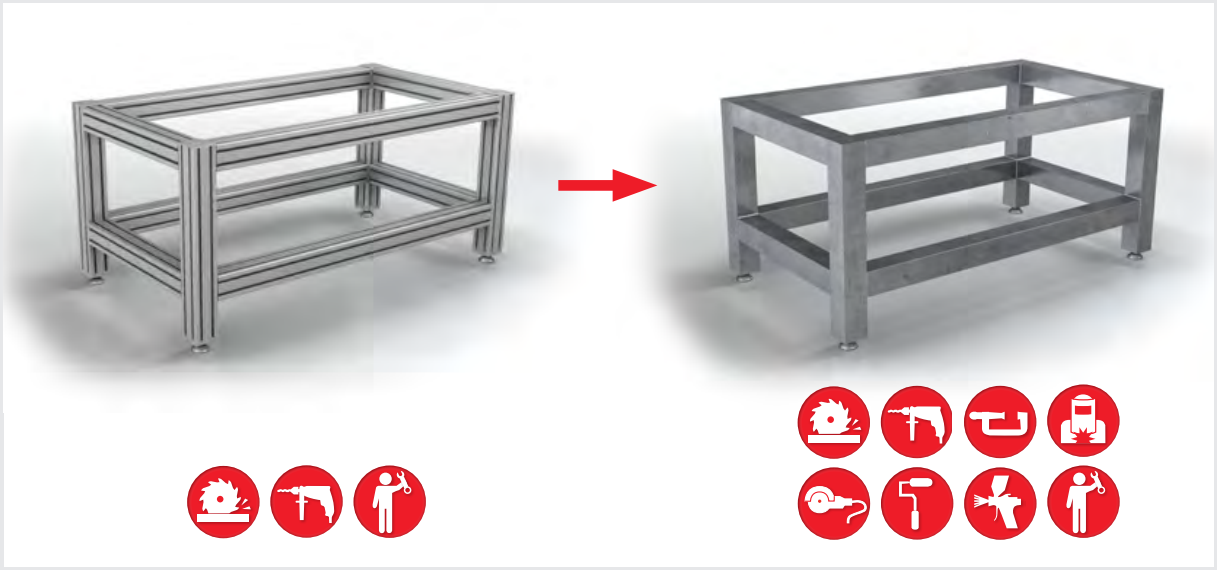
However, the benefits of aluminium profile technology become clear as soon as we factor in the processing work that has to be carried out on steel once it has been procured. The following text highlights and explains these benefits along the entire process chain.

Aluminium accommodates high loads while also being low in weight

# Introduction

The benefits of a profile system made from aluminium start with the basic properties of the material itself. For example, aluminium is much lighter than steel but still extremely strong. Thanks to its natural surface finish, aluminium is also much less susceptible to corrosion than steel is, which eliminates the need for complex coating procedures and other material protection measures. Consequently, companies can avoid the costs associated with applying coatings and carrying out regular maintenance. What's more, aluminium is very easy to shape whether hot or cold, is exceptionally conductive and can be extruded.

Thanks to its specific properties, aluminium is the optimum basis for profile technology and a building kit system. The potential applications for aluminium profiles vary widely, ranging from machinery and plants featuring single and multiple axis linear motion to safety partitions and work bench systems. As the profiles can be machined with outstanding precision, they can be used to build structures to very precise specifications. Due to low tolerances down to 0.1 millimetres, aluminium profiles also offer a user-friendly solution for building linear slides. Aluminium profile technology is the ideal basis for efficient solutions in mechanical engineering.



# High cost savings in all project stages

The advantages of aluminium profile technology benefit all the stages in a project. From the initial project engineering for a solution and its assembly right through to after-sales activities, all the various stages must be as cost-effective and time-efficient as possible. Indeed, efficiency is not judged solely on the basis of engineering considerations. Many end customers factor more than just procurement costs into their investment calculations, paying particular attention to all the additional costs that arise over the service life of equipment and structures.

## Bidding stage

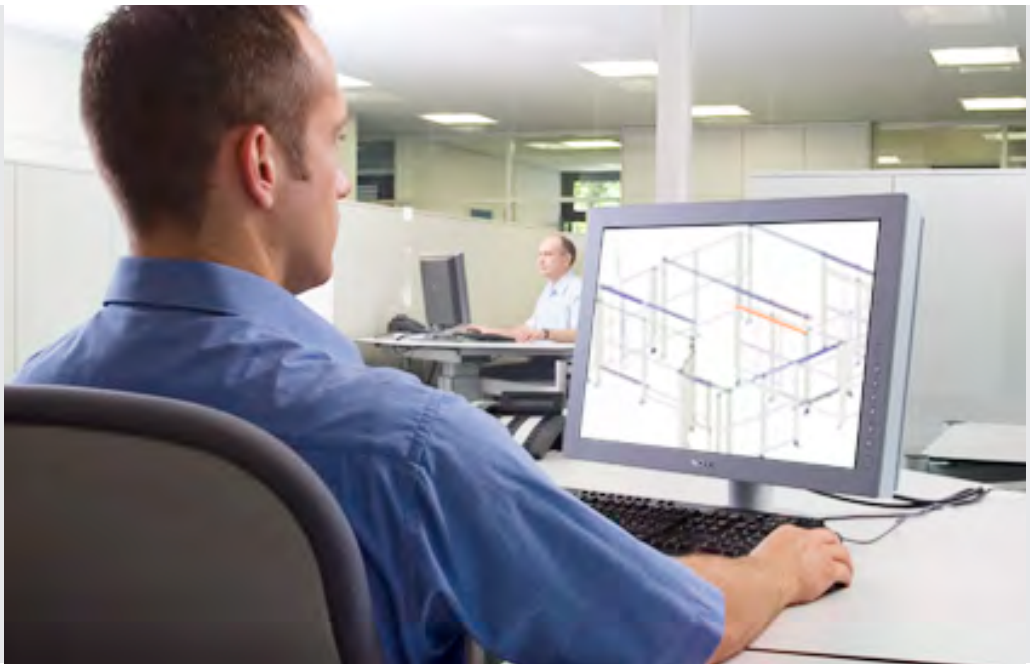
Today, bids have to be compiled and submitted quickly if they are to result in an order. As a consequence, the bidding stage is hugely important in the mechanical engineering sector, where it plays a decisive role in the overall success of a project. At the same time, it is heavily influenced by factors such as response time, price and delivery time.

When dealing with a simple steel construction, companies have to take into account up to eight manufacturing stages if they are to ensure the commercial success of a project. These stages include sawing, machining, fixing, welding, cleaning, priming, coating and finishing. Depending on whether these processes are conducted in-house or are outsourced, production times need to be calculated, prices obtained and delivery times factored in. Time pressure and the multitude of process stages generate much higher throughput times and costs.

By contrast, when using a building kit system based on profile technology, companies only need to incorporate three process stages into their costing – sawing, machining and assembly. Thanks to the straightforward machining stages associated with aluminium profiles, companies can calculate their prices and delivery times quickly and accurately. In other words, they can minimise the high degree of uncertainty that production planners working with steel face due to the numerous and complex processing steps they have to factor in.

## Planning stage

When working on basic frames made of steel, engineers need to produce detailed drawings in the planning stage, specifying and labelling weld seams and surface qualities for instance. Making alterations to an existing design and/or drawing due to a change in circumstances can often require a great deal of extra work. For example, what might initially be regarded as a minor change to the maximum load-bearing capacity of a basic frame can have a huge impact on the documentation.



Retrospective design modifications can be made quickly and easily when using aluminium profiles

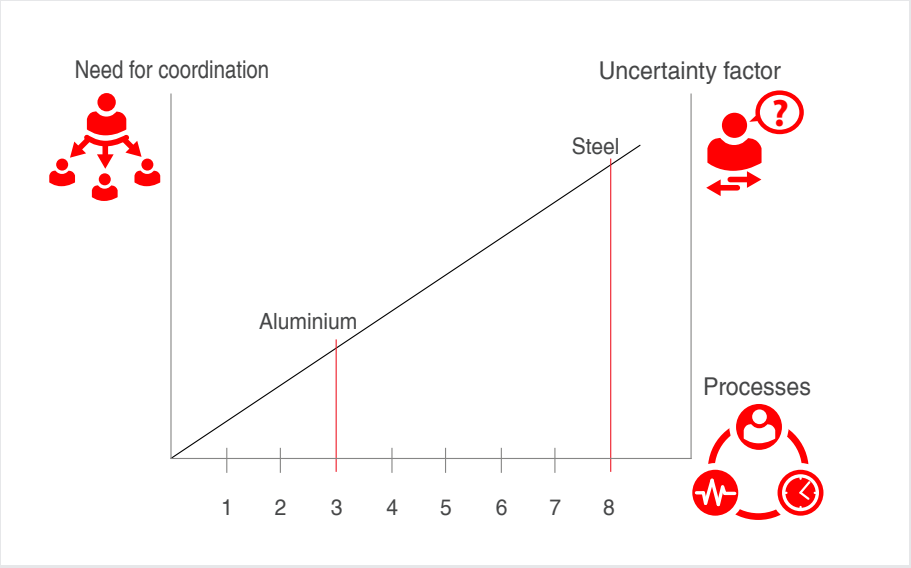
Weld seams would need to be checked and potentially altered in all of the manufacturing drawings or documentation. What's more, changes to the structure's strength could require additional modifications to the surface finishing on the frame. Even reusing or modifying a previously completed project can take more time than initially anticipated. Planned attachments that are to be bolted to the basic frame have to be included on the frame, with an appropriate thread depicted in a specific drilled hole drawing. If a component changes due to technical requirements, modifying this drilled hole drawing involves a great deal of work.

By contrast, aluminium profile technology makes it much easier to build and modify constructions. A previously planned load-bearing aluminium profile strut can be replaced at any time with a stronger aluminium profile in the same dimensions, without having to change the fixings. The high-strength grooves that run the entire length of the profiles can be bolted together easily using the same fasteners. That makes weld seams unnecessary. Depending on their design, the profiles can accommodate tensile forces up to 10,000 Newtons. What's more, no matter what component is to be bolted to a frame, it can be attached at any point, thanks to the continuous groove. The T-Slot Nuts that are used for this purpose are available in a range of thread sizes and can be positioned anywhere along the groove.

## Production stage

Globalisation is gathering pace and the markets are becoming ever more transparent when it comes to market players and prices, so it isn't surprising that many companies face tough competition. Internal corporate structures and certain national regulations mean that some companies are unable to offer their product at a price that is both profitable and appropriate for the market. In scenarios like that, it is essential that the company can at least highlight a unique selling point for its product, i.e. something that offers the customer an attractive added value and therefore justifies a higher price that will be profitable. If the product has no unique selling point, then it is all the more important for the company to focus on processes that will add value during production. A process can only add value if it refines or upgrades the solution or product at every stage.

This is precisely the process chain that has been studied in minute detail for decades in modern industry under the principle of "creating value without waste" (lean manufacturing). The aim is to avoid waste as much as possible and the motivation is obvious – processes that don't add value increase costs and decrease the profit margin. Such wasteful processes include first and foremost long routes in logistics, high throughput times in production and intermediate storage facilities because of poor production planning.




The more processes are involved, the greater the need for coordination and the higher the uncertainty factor

## Complex processing steps with steel

Steel frames have to go through a whole range of complex processing steps before they can actually be installed. Sawing is followed by fixing and welding, grinding or sandblasting. After that, the steel has to be primed and painted or coated before drilling work can then be carried out. This long list of steps, all of which need to be coordinated, only adds to uncertainty. What's more, checking the quality of external orders eats up even more time and costs. In basic terms, the following applies: The more processes there are in production, the greater the likelihood of errors and the bigger the workload for coordination. For example, buffer zones have to be set up between the various production processes so there are no unnecessary waiting times at these points. However, such waiting times don't just add zero value, they actually generate high capital tie-up costs. Buffer zones create a deceptive sense of security that wouldn't be necessary if processes and throughput were optimised. In the lean manufacturing philosophy, any intermediate steps such as these that are needed are classed as waste and have to be avoided. Machine stoppages and faulty parts impact on all downstream processes. Waiting times start to build up and can become a huge cost factor, in extreme cases putting the timely completion of the project at risk.

High throughput times are standard when using steel, which results in high production costs

Changes can be made in a few simple steps thanks to separable screw connections

## Fewer processing steps with aluminium

By comparison, building structures from aluminium profiles involves just three production steps – sawing, machining and assembly. These manufacturing processes can be carried out by a single mechanic and do not require a large collection of machinery and tools that need operators with special training

There are far fewer processing steps when using aluminium profile technology

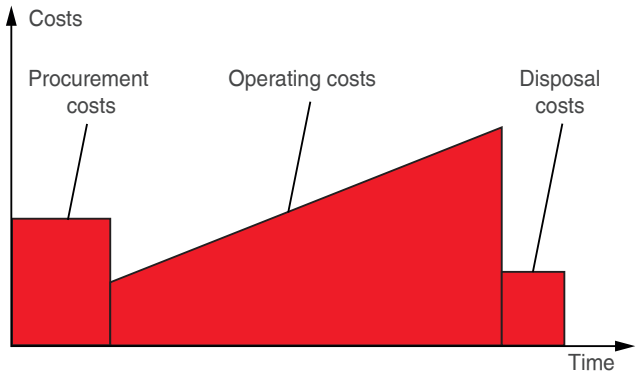
in welding or coating techniques. Furthermore, as the work is not contracted out to external service providers, companies stay in full control of the timing and quality of all steps. Besides improved cost-efficiency, a building kit system comprising aluminium profiles also offers added safeguards for the engineering process. For example, errors in planning that only emerge during production can be easily corrected thanks to the screw connections, which can be disassembled in a few simple steps. This advantage also helps when customers want to make retrospective changes.

## Transport

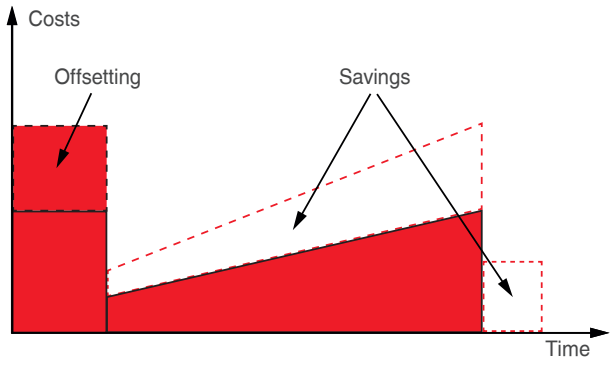
Depending on the size of the structure or plant that has been built, there are two points to consider when it comes to transporting it to the customer. Firstly, machinery and plants made of steel are very heavy, simply because that is the nature of the material. Secondly, because the structures are held together by weld seams, there is limited scope for disassembling them. As a result, companies sometimes need to use heavy goods transport options for structures in unusual sizes. Both of these are major cost factors in logistics. When planning projects that will take up a great deal of space, local conditions at the customer's site and in-house production facilities can change, resulting in capacity bottlenecks. For example, the dimensions of doors and bays that may not have been taken into account can quickly become insurmountable obstacles. In a case like that, the only option is to partially disassemble the project or the doors – which is a costly and complex process.

The outstanding flexibility of a building kit system made of aluminium is beneficial for both the transport and setup of machinery and plants. The low weight of aluminium compared to steel also means that companies have a much wider range of options when it comes to transport. What's more, because the connections on the aluminium profiles can be disassembled, optimum use can be made of the transport space. The excellent flexibility of the aluminium profiles is particularly striking when having to deal with building layouts at the customer's premises, which can vary widely. Elements that have already been assembled can be taken apart very easily and flexibly and then reassembled at the final installation site.

**Option 1** has very low procurement costs, but high subsequent costs




**Option 2** can compensate for the higher procurement costs due to low subsequent costs




Lifecycle costs must be factored into any price comparison

## Service

New market requirements and tough competition force many manufacturing companies to change their machinery and plants. However, making changes to an existing machine park comprising steel constructions is a hugely expensive and complex affair. Indeed, the original production costs associated with a steel construction can be multiplied several times over throughout the course of its full service life. What's more, rigid steel constructions can make access for maintenance and repair work difficult, thus driving up personnel and cost outlays. As a result, many manufacturing companies do not just look at procurement costs, but lifecycle costs, too. Lifecycle costs comprise the costs associated with procurement, operation and any disposal requirements. What might seem like an expensive machine at first can actually work out much better value over the course of its service life, due to low operating and disposal costs, particularly compared to a machine that is cheap to buy but involves enormous operating costs.

When using frames made from aluminium profiles, the separable connections ensure that the part of the frame that is in the way can be temporarily removed so that service work can go ahead. Larger components can also be replaced and modified to account for changed market conditions – without the need for complex and costly welding operations. Another issue that merits consideration is that welding cannot be carried out in just any production environment and can therefore lead to significant downtime.

Using aluminium profile technology can significantly boost the cost-effectiveness of machine projects

# Summary

Building kit systems based on aluminium profiles offer numerous practical benefits in industrial applications and have significant cost-efficiency benefits. While the main advantage of steel is its cheap purchase price, aluminium profiles offer maximum flexibility, which benefits overall lifecycle costs. Innovative and stable fasteners ensure constructions can be improved at any time, so that users can conveniently and cost-effectively respond to last-minute requests for modifications, correct planning errors and implement subsequent additions and extensions.

Using aluminium building kit systems helps to significantly reduce the number of processing machines that a company needs. In turn, that means the company needs fewer specialist staff, is less dependent on external service providers and can lower fixed costs. Since there is no need for the complex processing steps associated with steel, the company can make considerable savings in terms of both time and costs. By reducing disruption and uncertainty in this way, the company can achieve efficient planning and capacity utilisation, while optimised throughput times are key to making sure projects are completed on time.

Aluminium profiles also offer a high basic level of flexibility that is particularly beneficial when the end-product has not yet been completely finalised and modifications are highly likely. Since constructions are only bolted together and not welded, making retrospective changes is also very straightforward, and no specialist expertise is required for processing work. What's more, since fewer special machines and workstations are needed, companies automatically have more floor space for additional projects. There is no need for extra acquisitions or employee training, either, which means processing work is fast, efficient and cost-effective.

A building kit system comprising aluminium profiles therefore offers all the benefits of steel and much more besides. At the same time, processing and reprocessing work is less costly and time-consuming, and being able to respond to retrospective customer requests satisfies the market's need for flexibility. Throughput times can also be reduced and the company's production capacities increased. When taken together, all these factors mean that using aluminium profiles instead of steel is much more cost-efficient.

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