

“Optimize Cash Flow with M-Tech® Shims”

Flexible tolerance compensation in the assembly of components

An economic solution for the entire process chain

The decisive aspect of the **M-Tech® concept** is the unique combination of process-orientated arguments regarding its benefits with the practical solution options of M-Tech® shims for adjusting play in the assembly of industrial components. The concept can be applied in all sectors of industry.

The M-Tech® Concept

The “**M-Tech® Shim**” concept has positive effects on the entire process chain of components assembly. It has profound effects on construction, production planning, production and maintenance and it also helps to boost the motivation of the user. The result of all of this is increased cash flow. Although it is of such comprehensive significance, it has only been known to a small group of industrial users and decision-makers in Germany up to now. The increasing implementation of lean manufacturing processes, however, is forcing many businesses to take a close look at their value streams with a view towards realizing any optimization potential. In doing so, however, certain value-added aspects, such as “precision” and “quality” are often only viewed individually and are not assessed collectively throughout the entire value-added chain. Accordingly, only a few companies have developed a heightened awareness of the fact that the total tolerances (i.e. inaccuracies) which accumulate in the process of assembling components can be compensated inexpensively and pragmatically with the help of shims. Because there is also a severe lack of practical knowledge in many places concerning the intelligent application of shim solutions, sub-optimum and non-productive intermediate layer products, such as sanded or pre-assorted spacer components, are often used. Now these inferior approaches can be replaced profitably by innovative layer material solutions such as the “**M-Tech® Shim Concept**” from Georg Martin GmbH. With this concept and the material solutions it offers, the process chains of components assembly can be optimized as a whole in both OEM as well as MRO operations.

Degree of Technological Innovation

When adjusting the play in the assembly of components in mechanical and plant engineering applications and the automotive industry, the question is always “how?” In many companies, however, there is no conception of a strategic and systematic approach to the subject of tolerance compensation with a view towards technological and economical optimization. In general, it can be seen that the use of shims is handled with “varying levels of success”.

Numerous economic disadvantages arise if no shims are used at all. In addition to this, subsequent forced measures are often required in everyday practice: shims are purchased at random or have to be manufactured quickly and at great cost from whatever materials are available. If this is not possible, it can take hours or even days to complete the job and this can jeopardize the competitiveness of the entire company. When inferior shims (and work methods) are used, either components sorted by tolerance class have to be brought in to the production process – which is expensive and complicated in the OEM process and virtually impossible in the MRO process – or the components have to be measured and ground down to the required dimensions individually during assembly, which involves a great deal of rework. It is not the best solution either to produce shims exclusively from solid sheet metal or metal films simply due to a lack of awareness of the different options available, because this usually results in handling problems, time loss and waste.

In all instances, process planning becomes inconsistent and more work and costs become necessary at several points along the process chain. Using the **M-Tech® concept**, on the

other hand, the entire process chain can be shortened at the point of assembly in a user-friendly manner with much less expense and effort, thereby producing considerable savings effects.

The “**M-Tech[®] Shim**” **concept** centres around three different shim material combinations: laminated (M-Tech[®]L), solid (M-Tech[®]S) and bundled (M-Tech[®]P). The different material compositions are designed to correspond with the varying applications and requirements:

M-Tech[®]L (laminated shims): laminated shims are semi-finished layers of sheet metal which are peeled off by hand. They are made up of several layers of laminated metal film with thicknesses ranging from 0.05 mm to 0.075 mm. The space that has to be filled to compensate the joint tolerance of components is achieved by peeling off and reducing the thickness of the spacers. With the VT version, the fine adjustment of the thickness is set over the complete thickness of a single shim. More flexible than a single, solid shim, the NT version is distinguished by its insensitivity to stress under severely alternating loads (E-Module). Click on the link to our handling demonstration for more information on this: <http://www.georg-martin.de/downloads.html>

M-Tech[®]S (solid shims): this material combination is regarded as the classic in tolerance compensation. It can be ground down to size, applied as a self-adhesive solution or used as an assortment. It also forms the basis of a countless number of versions that combine different thicknesses (see M-Tech[®]P).

M-Tech[®]P (bundled shims): built up on the above-mentioned types L and S, the user can combine all of the different shim material versions. They are either glued together at the edges (“tear-off calendar”) or are packaged together in different thicknesses or materials.

What accounts for the technological creativity and quality of the concept?

The creative aspect and special quality of the **M-Tech[®] concept** lie in the unique, systematic structuring of the topic “Shims” and the defining of understandable, plausible benefits. The clear and concise presentation of an entire concept and concrete material solutions leads ultimately to an enhanced perception on the part of the users, who become more and more aware of the optimization potential that exist within their process chain by making intelligent use of modern shim solutions. Quality and sustainability do not come from the **M-Tech[®] concept** by itself, they also have a lot to do with the improved quality of the manufacturing and handling processes and verified value for money which has already been proven in the market millions of times over.

What are the unique features of the concept compared to previous solutions?

There is no other manufacturer of edge-glued shims in Germany apart from Georg Martin GmbH. This accounts for the special position of the **M-Tech[®] concept** in the German and European markets which comes from the combination of special unique features concerning the production process of laminated shims with an overall concept. To date, we have not encountered any shim concept in the US market either which is as comprehensive and clearly structured as ours.

Benefits for Industry, the Environment and Society

What special technological benefits and what restrictions does the concept have in industrial applications?

The benefits of the Georg Martin GmbH “**M-Tech[®] Shim**” concept are based on five

arguments:

1. Machine and processing costs are reduced because the tolerance of the components does not have to be as precise during the construction and manufacture of fitted parts. This reduces the expense and effort of producing the component, because the problem of total tolerance is solved at a later stage by using shims. Accordingly, several connection points can be constructed with a greater tolerance, thus simplifying machine processing or avoiding it altogether.

2. Processing times are reduced because the compensation elements can be scheduled and ordered in advance so that they are on hand when assembly begins. The parts do not have to be taken to a stationary machine for reworking and machine capacity accounts no longer have to be considered because the parts are provided on time. In addition to this, the user is not dependent on the location when setting or adjusting tolerance in both the OEM and MRO areas and no parts have to be classified in advance in regard to their fitting tolerance. Last but not least, the user achieves the manual assembly result quicker with the suitable shims than without.

3. Handling advantages ensue because the users can select the material structure of the shim to suit the task on hand. They can work with a combination of thicker and thinner shim elements, thus speeding up the coordination process and avoiding search processes. The option of sorting and bundling shims during production to suit every tolerance instance in a specified installation position helps to further reduce processing times.

4. Repair costs are reduced because the user can prepare the repair job in the ideal manner both logistically and in terms of handling by using the technical drawings to allocate a defined shim unit to each connection point in advance. The shim structures are specified in the drawing with regard to the possible requirements of the fitter and the properties of the connection point and surrounding areas. In this way, there are no more waiting times in Maintenance, Repair and Overhaul operations (MRO) due to unforeseen fitting problems.

5. All of the listed advantages improve cash flow: machine investment costs tend to sink along with the expense and effort required for logistics, purchasing and production planning and the reduced processing times help towards ensuring prompt receipt of payment.

There are certain restrictions with fully automated assembly processes and very simple constructions. Where special requirements exist due to high temperatures and pressure types (dynamic, alternating), the suitable construction solutions must be determined in advance.

How environmentally compatible and socially relevant is the concept?

If the **M-Tech® Shim concept** is realized throughout the entire components assembly process, considerable overall savings can be achieved in regard to materials, time, logistics and effort. Where this is concerned, the use of M-Tech® shims corresponds very well with the efforts being made by producing companies to optimize and slim down their processes with a view towards conserving resources. Alone the energy savings that result from dispensing with expensive reworking (see above) are of significance here. In addition to this, the use of M-Tech® shims means that unnecessary procurement trips can also be dispensed with, thus reducing transport costs. On top of all of this, the number of different parts is also reduced, thus complying with the widespread desire for simplification. Ultimately, the use of M-Tech® shims in itself ensures the optimum functionality of the assembled components from an environmental and energy point of view, because when everything fits and there are no leaks, energy can be used efficiently and there are no harmful emissions.

Economic Efficiency

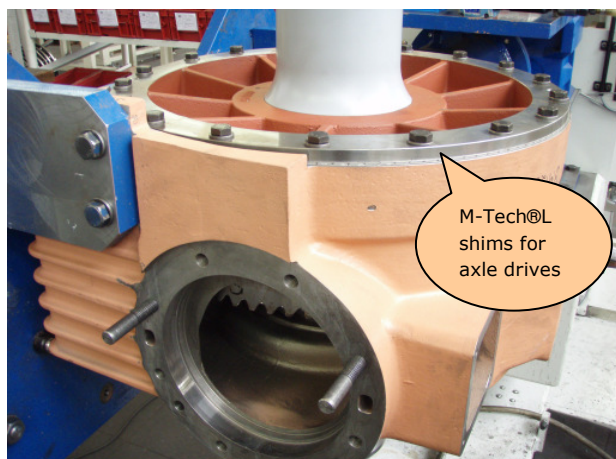
What economic benefits result from the use of the concept?

We would like to expand here on the five arguments listed above by listing some actual examples of the benefits realized in everyday industrial situations:

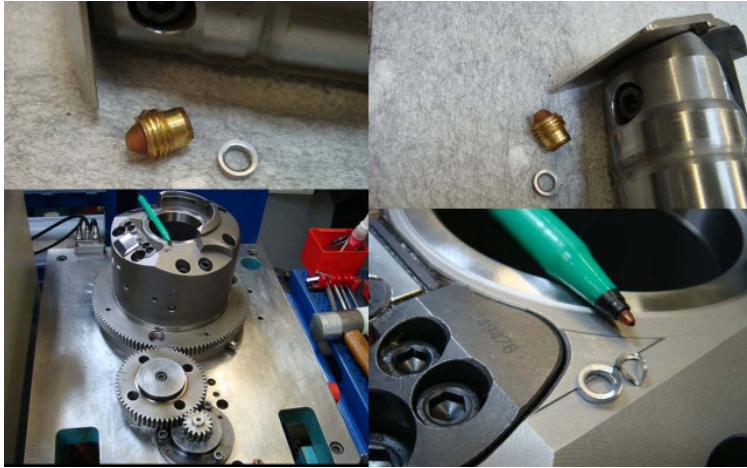
A fitter was given the task of grinding down the compensation plates required in the set-up of a piece of machinery. The first step here was to assemble the machine to such an extent that the gaps to be compensated could be measured. On the basis of the measured values, the plates were taken to another department for grinding and polishing, thus stopping the machine assembly process for a while. This resulted in a backlog at the grinding machine because Production Planning had not properly considered this eventuality when scheduling the capacity of the grinding machine. The problem was “solved” by postponing other grinding orders. After grinding, the plates were taken back to the point of assembly and only then was the fitter able to continue with the assembly of the machine. The waste of time was considerable; in this particular instance, the delay amounted to 30 minutes, but other constellations are conceivable where the assembly of a machine can be delayed by hours or even days.

If the **M-Tech® Shim concept** had been used, a shim would have been used instead of the compensation plate, Production Planning would not have had to improvise and grinding capacities would have been utilized as scheduled. Parts list ordering processes would have ensured and scheduled the procurement of the shims, which would then have been available to the fitter without any delays so that the components could be assembled within the regular workflow without any interruptions. If maintenance work is required on the assembled product at a later date, the necessary shims can be ordered in advance in line with the memorized re-procurement times and delivered on time. In this way, the buyer of the assembled product avoids extensive downtime and every business can easily calculate the economic benefits of this.

Another case study outlines the use of an M-Tech®-L adjustment ring in the rail vehicles built by the Voith company, where shims from Georg Martin GmbH are used in combination with solid sheet metal plates. The components involved here are axle drives for locomotives. The adjustment rings are used to set the axle base and distance to the drive shaft. Wheel sets are attached to the axles and the complete unit is then mounted onto the vehicle. The shims show the typical nibbling marks that occur during the manufacture of the rings.



We would like to round off the presentation of practical examples with an M-Tech® application in a TruMatic6000 combined laser-punching machine from Trumpf/ Hettingen where the sensitive adjustment of a clamp on the grip head matrix is required: a little jet uses an air stream to establish the position of the clamping piston for the nibbling device and the air may not be allowed to escape in a certain position. This requires fine tuning in the one-hundredths range and this is achieved with an M-Tech®-L ring which controls the clamping piston. "The adjustment work can be done easily and the handling of the M-Tech®-L material poses no problems whatsoever," say the Trumpf employees.



What do the demand situation and main sales markets for your product look like (expected market size, quantities market shares)?

The first indications are that demand for the new M-Tech® family products will continue to rise thanks to the new **M-Tech® Shim concept**. Sales in 2008 were around the 6 million euro mark and we are looking at achieving a turnover of 12 million within the next five years. Thanks to our strong position in the home market, handling strengths in European and non-European countries and potential in sales structure development, we are assuming a very positive development. The reason for our optimism lies in the fact that we were able to continuously develop our product and expand our customer base in recent years without any great advertising activities. And because our product range continues to improve all the time and we are able to offer our customers our comprehensive **M-Tech® Shim concept**, we expect to gain an even bigger share of the market, above all in those areas where other solutions used to make life harder for our customers and the process chain can still be optimized.