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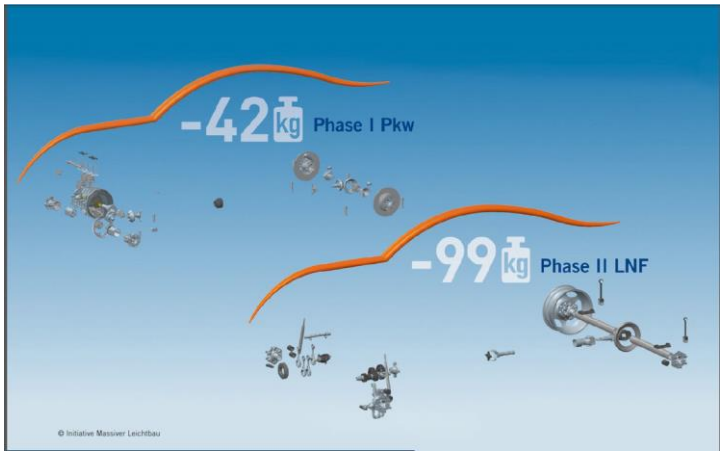
Lightweight Forging Goes International – Third Phase of The Lightweight Forging Initiative Launched



How can forging technology support the megatrend of automotive lightweighting and thus reduce climate-damaging CO_2 emissions through a combination of creative approaches in design and production processes using innovative steels? The German forging and steel industries have been pursuing this issue in The Lightweight Forging Initiative for almost five years now.

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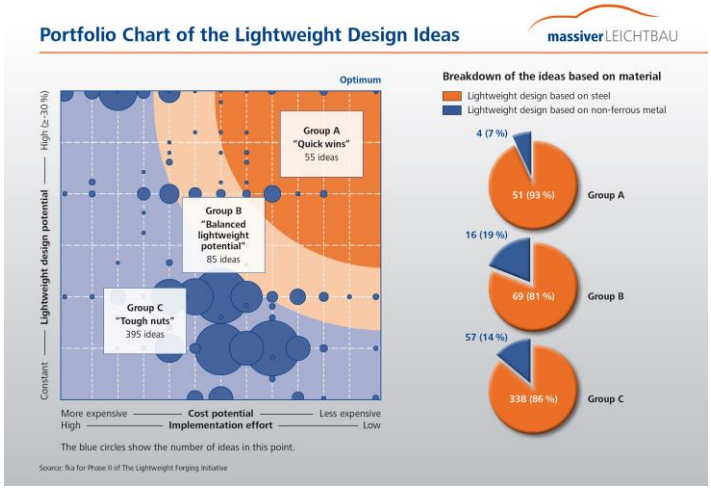
Weight savings in vehicles lead to a number of positive effects, such as a reduction in CO_2 emissions, an increase in driving dynamics and greater resource protection. In addition, they have a positive influence in terms of driving safety. Lightweighting also compensates for the additional weight due to the increased use of comfort and driver assistance systems. The topic of lightweight design has thus defined the discussion on optimizing future mobility for many years now and is one of the automotive megatrends that is frequently the focus of attention at conferences and trade fairs. The Lightweight Forging Initiative was founded in 2013 by 15 forging companies and steel manufacturers under the auspices of the German Forging Association (Industrieverband Massivumformung e. V. – IMU) and the VDEh Steel Institute (Stahlinstitut VDEh). During the first phase, a medium-sized passenger car was analysed, and a lightweight design potential of 42 kg for forged powertrain and chassis parts was identified. In view of the success which this undertaking enjoyed among customers and the public, the cooperation was continued in 2015 with a second phase. This time, the focus was on the lightweight design potential of a light commercial vehicle. As a reference, the 17 forging companies, ten steel manufacturers and one engineering service provider used a light commercial vehicle with a total weight of 3.5 t (including payload). Forged parts accounted for 845 kg of the total vehicle weight of 2,394 kg. These forged parts in turn offered a savings potential in the powertrain and chassis of 99 kg (12 percent).

Transmission development studies were carried out to analyse the ratio between the potentially greater costs of high-performance steels and the possible weight savings resulting from the use of these. Calculation models were thus generated for the transmissions of the passenger car and light commercial vehicle under analysis. These predict savings in system weight and size when the size of the gears and shafts is reduced due to the use of higher strength steels.

An additional program step calculates the secondary weight effects resulting from a smaller transmission housing. In this way, both primary savings effects and secondary weight savings can be estimated. Furthermore, the analyses also reveal competitive advantages over other production processes and materials.

The results of both phases were presented at two customer conferences, one of which took place in 2014 and the other in 2016. Following on from these, TechDays were introduced, which are now being carried out successfully at customer companies. Here, project partners of The Lightweight Forging Initiative present their lightweighting ideas by means of keynote speeches and trade fair booths on site at the customer company. The aim is to address employees from the Development, Design and Purchasing departments at the company by outlining the lightweight design potential when designing forged parts.

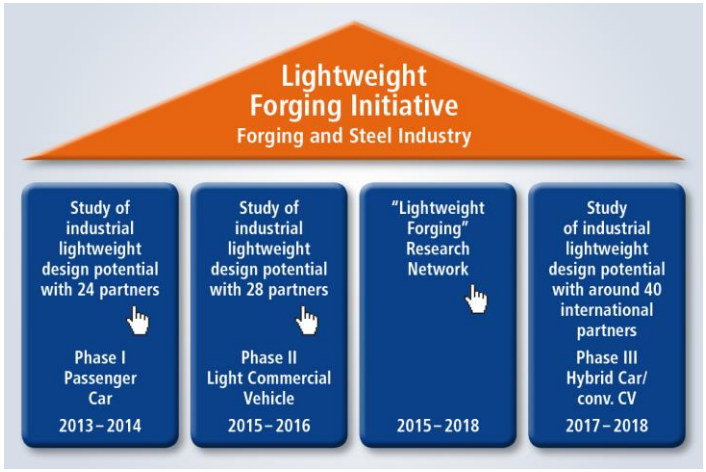


Portfolio diagram: Overview of the three groups of ideas A, B and C in Phase II for lightweight design potential and the assessment thereof in terms of weight savings

Image: fka for The Lightweight Forging Initiative

Alongside the two Initiatives outlined above, a three-year research project, which commenced in 2015, has been analysing the lightweight design potential of forged parts in the passenger car powertrain. Ten research institutes and around 50 industrial companies across the entire process chain are working together to develop more efficient steels, optimized heat treatments as well as new forging processes.

On July 1, 2017, the fourth pillar of lightweight forging was achieved and the Initiative has thus now commenced the third phase:



Steel forgings for a lightweight automotive future

Image: The Lightweight Forging Initiative

38 companies from Germany, Western Europe, Japan and the US will work together under the auspices of the German Forging Association and the VDEh Steel Institute to develop lightweighting approaches through the use of innovative steels and forged components.

In line with the general trend towards electrification, a hybrid vehicle is being analysed in order to uncover existing lightweight design potential using load-adapted, weight-minimized part design and load-optimized materials. The analysis also provides insights into new, innovative drive technology. Furthermore, the aim is to reveal relevant potential for forging companies as well as application possibilities with respect to modern, innovative steels, and to focus on steel production for new parts.

In this multilateral study, all areas of expertise – from prematerial production to the forging and machining of parts – are being brought together thanks to the intensive international collaboration among ten steel manufacturers, seven mechanical engineering companies, a tool manufacturer and 20 forging companies.

Moreover, following the lightweighting analyses of a passenger car and a light commercial vehicle, the focus will now be on a heavy-duty vehicle, namely on a truck transmission and on a truck powertrain with drive shaft and differential. As in the two previous phases, all lightweighting approaches in this phase will be assessed according to their lightweight design potential, costs and implementation effort.

Likewise, accompanying studies on the transmission will determine the primary and secondary effects of lightweighting for the transmission of a hybrid vehicle and a truck.

Phases I and II have shown that load-adapted, high-strength steels are already on the market today for designing transmissions in a lighter and more efficient way. The Initiative now wishes to clarify in another study which measures are necessary for introducing newly developed higher-strength transmission steels at the customer.

With this comprehensive package of measures, the forging and steel industries are helping to make solutions available for significantly reducing the weight, energy consumption and CO_2 emissions for the entire range of vehicles, from passenger cars to heavy-duty trucks.

Companies interested in joining The Lightweight Forging Initiative Phase III and dealing intensively with the megatrends of "powertrain electrification" and "lightweighting" have the possibility to do so until the end of 2017.

Further information may be found at: http://www.lightweightforging.com