

TEC TRENDS

March 2011

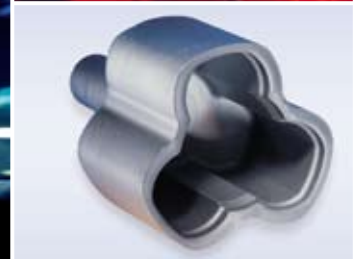
Information for forging companies



NEWSLETTER

Greater quality and competitiveness through tried-and-tested machine concepts and innovative system solutions.

Put it into Motion.
Forging with Schuler.



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Forging press line from Schuler produces one heavy truck component every minute

Schuler offers proven high performance

You must have something special up your sleeve in order to impress with speed nowadays. Schuler can do it: a fully automatic forging press line that produces heavy forgings in less than 60 seconds!

Schuler received the order to deliver a forging press line from a large Chinese automotive and commercial vehicle supplier. This fully automatic line has enabled the customer to expand its product range to include larger trucks.

Components by the minute

Components weighing up to 250 kilograms (550 lbs) are produced quickly and, it goes without saying, in the very highest quality. "The line produces a crankshaft in only 50 seconds and a front axle for a truck in 60 seconds," says Jochen Früh, the head of the Forging business unit for the Schuler Group.

Perfect shape is achieved with automated line

The forging process takes place in several steps, and is fully automated. Once the components have been heated in the

line's induction heater, a robot transports them to a reducer roller. This establishes the preform which is subsequently pressed in the forging press built by Schuler subsidiary, Müller Weingarten, with a press force of 16,000 metric tons (18,000 US tons).

The preformed axle or crankshaft is then transported by another robot to a hydraulic press from Schuler. Here, trimming and calibrating operations are conducted with a press force of 2,000 metric tons (2,250 US tons) to produce the perfect final shape of the component. The third robot in the forging line then places the finished product onto a conveyor system.

"The customer has been producing axles for pick-up trucks on a fully automated forging press line from Müller Weingarten since 1996. The good experience with

this machine prompted the company to choose us for their next order as well," explains Jochen Früh.



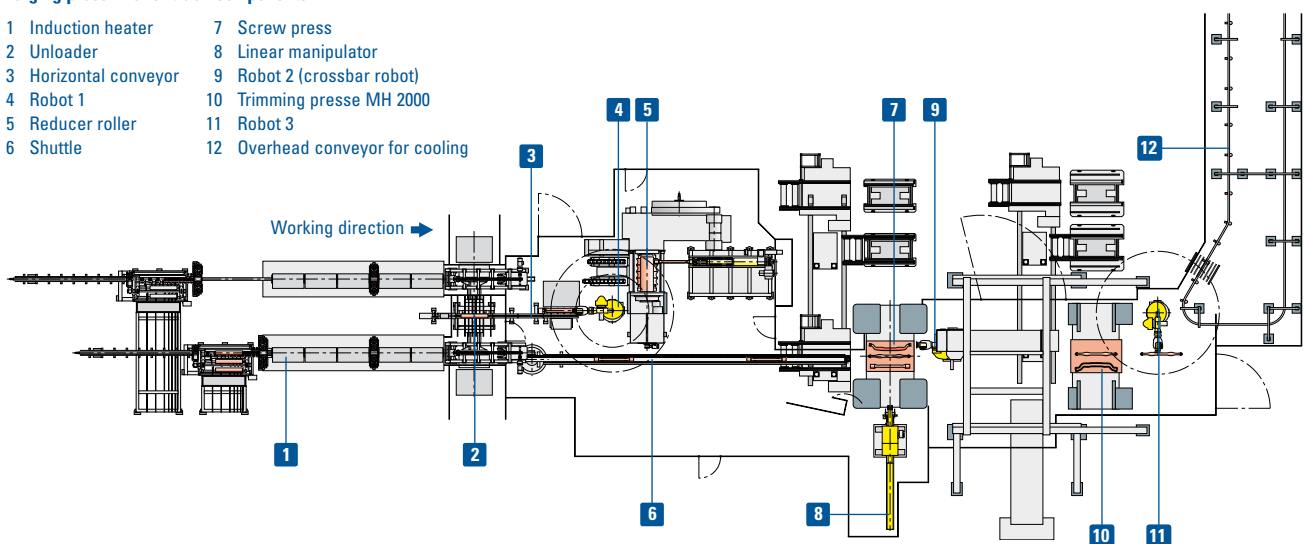
Trimming and calibrating press with a press force of 2,000 metric tons (2,250 US tons)



A crankshaft is finished in only 50 seconds

Forging press line for truck components

- | | |
|-----------------------|----------------------------------|
| 1 Induction heater | 7 Screw press |
| 2 Unloader | 8 Linear manipulator |
| 3 Horizontal conveyor | 9 Robot 2 (crossbar robot) |
| 4 Robot 1 | 10 Trimming presse MH 2000 |
| 5 Reducer roller | 11 Robot 3 |
| 6 Shuttle | 12 Overhead conveyor for cooling |



Schuler is already supplying its fifth screw press for forging aluminum

Five is a magic number!

Future generations of vehicles will be lighter and consume less fuel – and therefore be more environmentally friendly – thanks to ground-breaking forging technology from Schuler.

With a rich tradition as a technology pioneer, Schuler has been working for some time now with Umformtechnik Radebeul GmbH, a company based close to Dresden and specializing in closed die forging of aluminum components for automobile and motorcycle production. In the autumn of 2010, the fifth line from the Schuler Group entered production for the company. The new 1,200 metric tons (1,350 US tons) screw press ensures a consistently high standard of quality for forging aluminum.

Precisely controlled speed

Due to its special flow properties, aluminum calls for special production systems – especially when it comes to forging. “Forging aluminum isn’t easy, it takes special expertise. The material is very sensitive and doesn’t tolerate any mistakes,” explains Hartmut Kußmaul who works in customer support at the Schuler, Weingarten location.

A critical factor to achieve high quality is speed control, which is done using a variable-speed direct drive in the case of this 1,200 metric tons (1,320 US tons) screw press. It controls the forging speed by precisely setting the required value – and thereby guarantees the outstanding quality of the forged aluminum.

Perfect forging

However, when processing aluminum, it is also essential for all other components of the line to be adapted to the special properties of the material – from the dies through to the spraying medium. “This is the fifth time that we have been able to show to Umformtechnik Radebeul GmbH that we know precisely what these conditions are and how to master them,” continues Hartmut Kußmaul.

Modern press control

Further technological details raise productivity to a new level. For example, there is complete process monitoring and production data acquisition by the modernized Forge Control System (FCS). The operator can conveniently monitor the process using a touchscreen, and simultaneously receive an extensive range of die and parts data. This ensures the process is highly reliable.

Guaranteed repetitive accuracy

Since October, Radebeul has been operating in three-shifts, producing a very wide range of products in small and medium batch sizes. They are in demand in the automotive and motorcycle business as well as in the machine tool, electrical and construction industries. “It is all the more important for the machine

to deliver high repetitive accuracy in all forging processes with its control system and programming,” explains Hartmut Kußmaul. “This is the only way that a consistent high level of quality can be achieved, which in turn pays off in terms of customer satisfaction.”

The material of the future: aluminum

Aluminum only weighs about one third as much as steel, while it has high strength and good welding properties. Therefore, many designers in the automotive sector regard it as the material of the future. Its low weight means it can make an important contribution toward saving fuel.

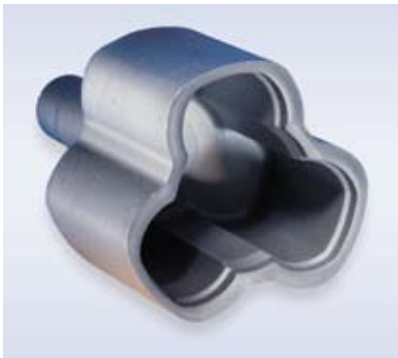


A Schuler Group employee working on the thread of a forging press screw

Schuler delivers an additional mechanical warm forging press

Perfectly optimized components

Shanghai GKN Drive Shaft Co. Ltd. (SDS) continues to bank on Schuler. In fact, we didn't have to persuade the Chinese drive shaft manufacturer of this: our machines did the talking for us.



Constant velocity joint

Field proven with success

The high production reliability and effectiveness of their existing Schuler presses has tipped the scales. Therefore, the automotive component supplier will put another five-station warm forging press from Schuler into operation at its plant in Shanghai in the summer of 2011. In total, there will be three Schuler forging presses from the same series in production there. The machines are predominantly used for constant velocity joint shafts for Chinese automobile companies.

The figures speak for themselves

Thirty-eight strokes per minute, six million components per year: a glance at the performance data of the forging press is enough to make it clear that SDS's investment will deliver enormous future potential for the company. The MME2 press series forms the technical foundation for this high production rate – it is a flexible system that can be precisely adapted to the production conditions.

Quantity is enhanced by quality

Speed is not achieved at the expense of component quality – just as you would expect from Schuler. Andreas Kress from the Forging business unit emphasizes the point: "Warm forging is a complicated process. The various components of the machine had to be perfectly integrated with one another in order to guarantee dimensional accuracy and surface quality in the components that are produced."

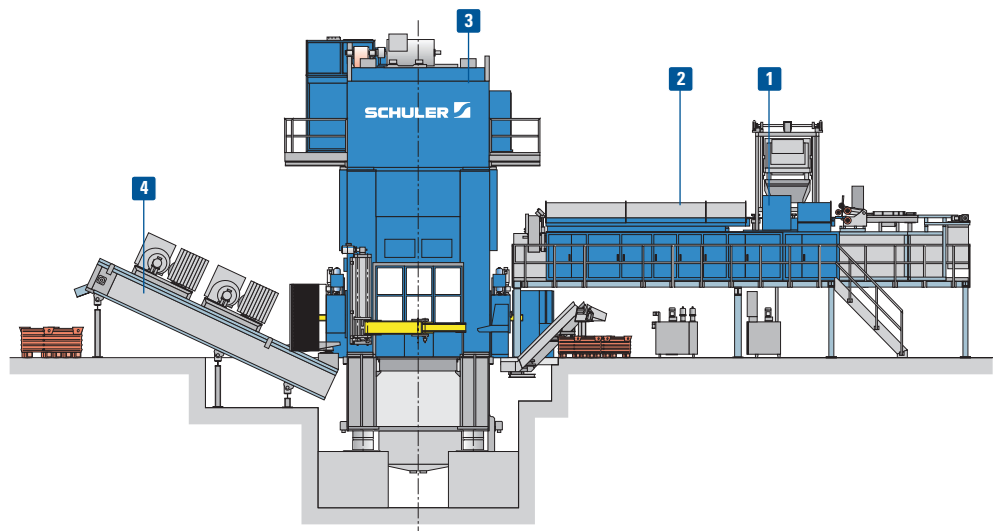
This quality was one factor amongst many that convinced SDS: "The existing machines enabled us to demonstrate our expertise in this area in the past. Therefore, SDS once again relied on its successful partnership with Schuler," says Andreas Kress.

From blank to finished component

At SDS, the blanks are induction heated under controlled conditions and are then forged with an overall press force of 2,000 metric tons (2,200 US tons). The outer part of the cardan shaft weighing about two kilograms is created in five forging stations – from forward extrusion through upsetting and reduction, then centering and finally pressing the interior shape. "Following this, the component is cooled down under controlled conditions and given its final shaping in a cold forging process on another press. This process ensures optimum surface quality," explains Andreas Kress.

Mechanical forging press

- 1 Pre-graphitizing station
- 2 Induction heating
- 3 Press with transfer system
- 4 Cooling section



Hydraulic presses from Schuler produce CNG tanks for natural gas vehicles

We put it into motion

Many vehicles are already using alternative fuels today, so we can continue our mobile lifestyles without restrictions and with a clear conscience. However, all the details must meet the most exacting technological requirements.

Four complete lines delivered

The introduction of compressed natural gas (CNG) as a fuel has led to an increase in demand for high-pressure gas tanks for natural gas vehicles with an operating pressure of 200 bar (2,900 psi). Schuler responded early to the market's requirements and has prepared an economically attractive solution for this task, and one that has already proven its effectiveness many times over. We have already supplied four complete lines for economical production of CNG tanks worldwide – including the dies and automation systems.

Proven solutions

Schuler offers a process for manufacturing from the blank, which avoids the disadvantages of conventional methods

(see box). It can be used for making all sizes of gas tanks – even large diameters such as 406 mm (16 in) no longer pose a problem. The base thickness is optimized by selecting the correct blank thickness. Another advantage: the material is available worldwide.

Easily meeting the light weight targets

With deep drawing, the length of the hollow body is limited. As a result, many forming operations are needed in order to manufacture tall, slender tanks. With Schuler's die concept, the deep drawing and ironing process are combined in one forging stroke. As a result, the required length of the tank is achieved with the minimum use of material – and therefore a lighter weight. At the same time, ironing significantly improves the quality of

the tank wall. As is typical with cold forging, the parts are annealed, phosphated and lubricated with soap.

Perfectly integrated

The commonly used tank types from 229 to 406 mm (9 -16 in) are produced on three presses with 1,900 metric tons (2,100 US tons), 1200 metric tons (1,320 US tons) and 800 metric tons (880 US tons), with slide strokes of up to 4,000 mm (157 in). Fully automated production processes as well as advanced methods for product changes reduce downtime to a minimum, thereby rounding off the entire concept.

The limits of conventional manufacturing

The processes that have traditionally been used to manufacture high-pressure tanks involve forging from block or manufacturing from seamless precision tubes by pressure rolling. This forging process results in tanks with thick bottoms and can only be used for relatively small diameters. Seamless precision tubes for the pressure rolling process are expensive and difficult to obtain due to the immense demand. Neither of these disadvantages applies with the innovative Schuler process.



Increased demand for CNG tanks for natural gas vehicles



Line with three hydraulic presses for manufacturing CNG tanks

Schuler forging presses produce caterpillar tracks that withstand even the toughest loads

Ahead of the competition

Quality or speed? Caution or productivity? Schuler combines unique efficiency with progressive technology, so we can offer all of these properties.

This convinced the management of one of China's biggest construction machinery manufacturers. Shandong Shantui Construction is using two new forging presses from Schuler. They produce the track links and related reversing rollers for the caterpillar tracks of construction machinery. The components must withstand the harshest loads.

The principle of flexibility

Both machines are equipped with the MW Forge Control System (MW-FCS). It makes it possible to run the machine flexibly in a variety of operating modes – such as setup or automatic mode. Moreover, operators can store complete stroke programs for each die, including selection of the number of strokes, the energy per stroke and the waiting time between strokes.

More than twice as fast

On a crank forging press, chain links are produced from steel blanks with a press force of 3,150 metric tons (3,500 US tons). All the components in this turnkey solution are precisely integrated with one another. "In this way, twenty chain links can be produced per minute in the forging process – instead of only eight as before," explains Herbert Pfeiffer, the head of Forging Project Management at the Schuler subsidiary, Müller Weingarten.

The advantages of forging processes can be utilized to their fullest potential, because the forging speed is adapted to the process. This guarantees not only outstanding quality, but also long die life.

Screw press for support roller production

The second machine from the Schuler Group is used for manufacturing the support rollers for guiding the tracks of construction vehicles. The direct-drive screw press has an increased press force of maximum 3,200 metric tons (3,520 US tons). The direct drive with a three-phase motor delivers up to 16 strokes per minute.

Global network of local support: Customers benefit from comprehensive Schuler service

"Our presence with facilities in many different countries all over the world means that we can be sure to provide our customers with comprehensive advice and support on-site, even after production has started," says project manager Herbert Pfeiffer reassuringly.



Caterpillar tracks and support rollers manufactured on forging presses from the Schuler Group ensure safe driving on construction sites.



Crank forging press – shown here during startup



Screw press with a max. press force of 3,200 metric tons (3,520 US tons)

Expansion of the product range – FormMaster is once again under Schuler's roof

The right answer for wire forging

Competitive pressure has increased significantly in recent years. Worldwide, production is being concentrated in fewer sites, meaning that high production flexibility and short reaction times are called for. Schuler supplies the tools to do this job.

Nowadays, bolts and other fasteners are usually manufactured by forging them from wire. As a specialist for all areas of forging, Schuler first presented the FormMaster engineering series about ten years ago. The rights to this process were sold to Wafios in the intervening period, but have now been taken back by Schuler, thus expanding our product range.

The difference is in the details

The cold header systems offer proven performance with a range of features that ensure high productivity. Bolts, hinges and fittings or other technically complex mass-production parts are manufactured with six to seven horizontally moving forging stations, a wire pulling system and a transfer system. The result: high quality components – and with very fast stroke rates.

Greater flexibility

Small batch sizes can also be produced without difficulty – for example parts with complex shapes for the automotive industry. "To ensure production that is particularly flexible and economical, Schuler placed great emphasis on achieving particularly short setup times when designing the systems," explains Joachim Roske, the head of the Forging product area at Schuler in Göppingen.

Optimized operating sequences

The forging stations are arranged one over the other. "This means the die space is particularly easily accessible for the operator," explains Joachim Roske. The base block, shearing block and punch blocks are mounted on the same punch plate, and can be exchanged rapidly using a die change aid. The dies that are going to be changed can be adjusted

in advance outside the press. This also applies to the transfer grippers that are positioned on a removable cassette unit.

User friendly

The unique NC transfer system and the menu control of the machine provide high productivity with their straightforward and user-friendly programming. Thanks to its ingenious design, the machine is available again quickly after a die change. "For example, there is no need to adjust or exchange any cam shafts for the transfer. All that has to be done is to change the servo drive program," says Joachim Roske.

The menu control of the FormMaster allows for a rapid die change.



FormMaster horizontal multi-station press



Typical parts extruded from wire



Transfer system for six stations with depositing gripper

TecTrends in conversation with Jochen Früh and Arnd Kulaczewski

From bolts to turbine blades

Mr. Früh, by integrating Müller Weingarten just under three years ago, the Schuler Group further strengthened its position in world markets. How has the Forging technology area developed since then?

J. Früh: We have Forging expertise with three proven locations within the Schuler Group, and they are now grouped together as one technology area. By subdividing our activities into cold, warm and hot forging, we now offer a comprehensive product program worldwide. Integrating Müller Weingarten into the Schuler Group was an important step for our customers as well. In doing so, we succeeded in forming a major supply base that can play a leading role in world markets – and strengthen individual technology areas at the same time. Our customers also benefit from this improved capability.

In what way can customers benefit from this development?

A. Kulaczewski: The merger has brought us even closer to our customers. Although Europe, including Germany, still represents a very important market for us, we are also supplying more products to the BRIC nations of Brazil, Russia,

India and China. These markets are an important part of Schuler's strategic stance which is already bearing fruit today. Many customers in China and India are already relying on production technology from Schuler. And we are well on the way in Russia and Brazil.

What makes Schuler an attractive supplier?

J. Früh: Above all, our market success is based on outstanding innovative strength. As a complete supplier, we are continuing to invest very heavily in research and development, in order to enable our customers to achieve new peaks in performance. We offer high-quality systems for manufacturing crankshafts, turbine blades, front axle structures, flanges, railway wheels – as turnkey solutions. We have strategically expanded our product range with the FormMaster, open-die forging presses and wheel rolling tools.

A. Kulaczewski: As well as offering first-class products, we are also winning over more and more customers with first-class service. We are present all over the world, and we can respond very quickly. Our customers appreciate that!



Jochen Früh (left), head of the Forging technology field and Arnd Kulaczewski, Managing Director of Schuler SMG

What sets Schuler apart from its competitors in the forging business?

J. Früh: We make ourselves responsible for the entire process. Thanks to our many years of experience and our expertise in process engineering, we are able to recommend the most economical solution for our customers.

A. Kulaczewski: This experience is also beneficial for us in developing countries where many customers are only just embarking on forging technology or are integrating new types of machinery. Whether a small family firm or a large OEM, whether manufacturing a spade or precision parts such as turbine blades, we are at our customers' side with help and advice!

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