


**STROTHMANN**

Machines &amp; Handling

# INNOVATION IN MOTION

News, tips and trends for customers and partners

## The New New MINI in Full Swing. New automation solution for BMW press line.

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Second generation New MINIs are due to leave the factory in a few months. At BMW Group's Plant Swindon, which will manufacture their body parts, STROTHMANN has again equipped a press line with a wide range of new automation technology - as in 2001, before the initial production start of the first New MINI.

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## Innovation in Motion



Dipl.-Kfm. Michael Spiegel, Managing Director

Apart from technical expertise, innovative potential and quality, automation experts like STROTHMANN succeed only with focused determination when taking on a task: a swift implementation of an efficient solution is almost always called for when the initial coordination and consultations with our customers and partners have been concluded.

Thus, full concentration on the task at hand is our motto. The current issue of "Innovation in Motion" reflects that approach by focusing on a single project – the modernization of BMW's GP-503 press line in Swindon, England.

Then again, like everything in life, our work has many aspects. Which is why this issue will not only tell you about press automation, but give you a glimpse of the broader picture, too. After all, as Germany's ex-chancellor Helmut Kohl used to say, it is the end result that counts. In this case, that end result for our customer BMW is the finished product of their production chain: the New MINI. It will receive due attention on some of the following pages.

Last but not least, we also make a point out of thinking outside of our box, which sometimes marks the difference between having an overview and developing a vision. Today's high tech and tomorrow's technologies are always based on what is and what has been. For our

Swindon location, the last feature article therefore sheds light on the close connection between industrial and social history.

Considering the extraordinary industrial history of Swindon and its press shop, it is even more impressive to see that the new name "BMW Group, Plant Swindon" is carried with such pride, and that the Swindon plant staff see themselves as a part of the car group. During our visit to Swindon, this impression arose immediately and unmistakably. Apparently, our customer BMW has succeeded in developing Swindon's strengths while integrating their own philosophy. We are very pleased that STROTHMANN technology continues to be a part of this plant's success story – in already the second Swindon press line.



Michael Spiegel  
Managing Director

### GP-503 press line – BMW Plant Swindon

#### • scope of supply

- blank loading area
  - 2 blank carts with a scissors lift
  - 2 magnetic spreaders
  - magnetic conveyor belt
  - double sheet detection and deposit
  - 2 destacking feeders
  - AMTEC lubrication
  - option for a blank washing machine
  - mechanical centering station including bypass conveyor
  - loading feeder (press 1)
- Press to press
  - 5 DualFeeders
  - 5 4-axial c
  - 1 turning s
  - 1 unloading
- complete con
  - loaders and p

BMW's New MINI may be a familiar sight on the streets by now, but the little one still stands out from otherwise uniform traffic light queues.

With the introduction of the second MINI generation next year, however, the Bavarian automotive manufacturer will re-equip its British hit model. Changes to its looks will make the second generation recognizable at first sight. Production will also be reorganized before the first "new New MINI" leaves the Oxford plant. This concerns, amongst others, the body sheets which will continue to be delivered by BMW's Swindon plant. With STROTHMANN systems now installed throughout the GP-503 press line, the modernized facility is well prepared for this next phase in MINI history.

#### It takes a feeder

Within the press line, which contains a total of six press tools, the handling of sheet metal components is fully automated except for the handling of finished parts at the end of the line. STROTHMANN's SRLM 2/120 feeders are the centerpiece of the automation solution. At the front end of the line, they act as blank loaders, destacking blanks and placing them on a conveyor belt which transports them towards the press line. Double blanks are detected and sent to a reject station at the opposite end of the conveyor belt. After lubrication and centering, a feeder inserts the other blanks into the first press tool. The formed components are picked up by an unloading feeder on the opposite side which places them on an orientation station between the press tools where they can be newly aligned. Afterwards, they are picked up by another loading feeder and inserted into the next press tool. A total of five DualFeeders traverse in this press line with its chain of

#### Destacking Station



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s transfer  
 ders and  
 orientation stations  
 station (1 gap optional)  
 g feeder

ontrol solution for blank  
 press line

• **system requirements**

- > max. output 12 SPM
- > blank size
  - single blank
    - max. 3,200 x 1,800 mm
    - min. 800 x 400 mm
  - double blank
    - max. 1,500 x 800 mm
    - min. 450 x 400 mm
- > max. blank weight = 45 kg



Pallet lift cart and fanner station

successive tools. At our in-house exhibition in September 2004, visitors were already able to view the complete solution: the whole press line assembly, which had recently been approved by the customer, was on display in our production facility, performing a test run. Soon after, all systems were transported to Swindon and installed in the plant. The press line was put into operation in January 2005. After a ramp-up time of several weeks, the line reached its planned output and has since proven itself in day-to-day operation.

**V for victory**

The beginning of the GP-503 line is marked by a V-shaped dual infeed station for blanks which enables a continuous loading of the blank destacking area. Outside of the safety area, the stacks are placed on a cart which then drives through a safety gate into the destacking area. The carts run on

RoundTracks®, a floor rail system which is set into the floor and which allows for quick and comfortable handling. The dual system's main advantage is uninterrupted operation: while one cart is being loaded, the other ensures the feeding of the press line. The V-shaped arrangement of the blank loaders, however, was primarily due to space restraints. A high infeed frequency is usually achieved by means of a T-shaped system, which was impossible to realize in this line. The V-shaped alignment of the destacking feeders is unconventional, but serves to optimize the output speed as required.

**Linear dynamics**

STROTHMANN's LinearRobot technology ensures highly efficient, smooth feeding moves. BMW's Swindon plant employs SRLM 2/120 feeders which come equipped with an on-board motor for vertical moves. They provide high

speed and acceleration rates: blanks weighing up to 45 kg are transported at a maximum speed of 5.5 m/s horizontally, while acceleration may reach a maximum of 11 m/s<sup>2</sup>. As bending movements, which are specific to articulated robots, do not occur, the parts are not stressed by centrifugal forces while being transported between press tools. Not least due to their rigid support construction, the feeders also operate with minimal vibration. As a result, precision is enhanced, especially when transporting large parts, and wear is minimized. These very cost-efficient LinearRobots need impressively little maintenance during continuous operation.

**Up and away**

A suction frame is mounted at the telescoping axis of each feeder. Tedious vertical "deep diving" to retrieve all blanks from the table is unnecessary: the lifting tables can

be moved hydraulically to meet the LinearRobots halfway. By spreading the stacks magnetically, they let every blank float readily available beneath the suction frame, thereby saving time and optimizing infeed cycles. The isolated blanks are placed on a magnetic conveyor belt which runs towards the press line. At the first station, they are coated with drawing oil. An optional blank washing station can be installed in this place as well. Just like the blank carts, the magnetic conveyor belt and the lubrication station stand on STROTHMANN's RoundTracks®. If lubrication is not required, the station can be moved away. The magnetic conveyor belt then moves up and closes the gap, staying within reach of the destacking feeder.

**In a good position**

Before entering the first press, a centering station aligns the blanks, positioning them to be picked up and placed in the press by the first





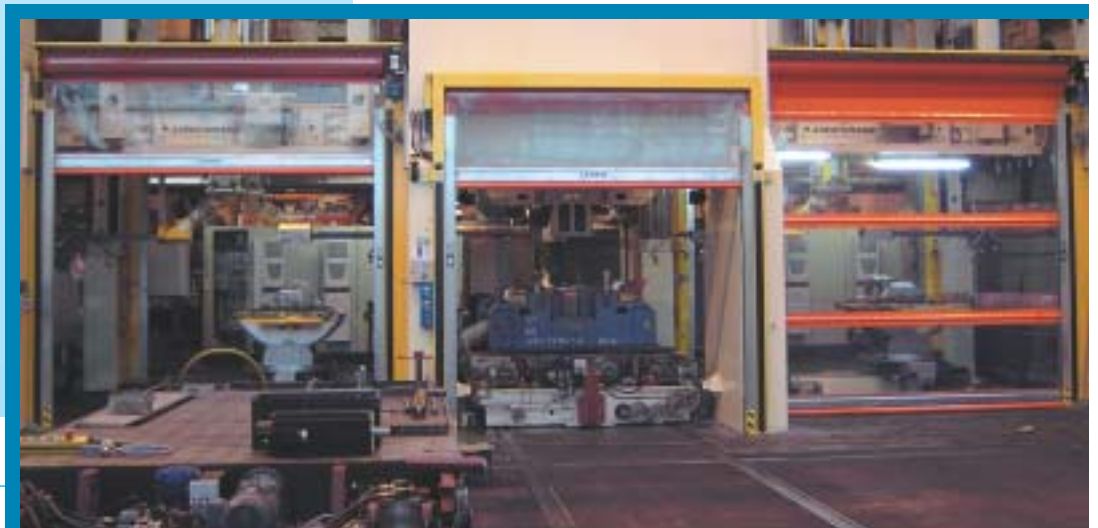
Loading feeder with centering station

## The New MINI and the new New MINI

The New MINI's most striking difference to its predecessor is first and foremost its huge success outside of its home market. It fast became a darling of the public in Germany as much as in Great Britain, and soon attained the same status in the USA: it is the first European automobile ever to be awarded the "Car of the Year" title, a distinction received at the Detroit Motor Show in 2003. The total number of New MINIs produced surpassed 500,000 in August, 2004, only three years after the first car left the factory. While they are still manufactured only in Great Britain, more than two thirds of the cars produced have been and continue to be exported. From Venezuela to South Korea, they are distributed to over 70 countries. With global demand still on the rise, BMW is making massive investments in higher capacities in Swindon and elsewhere: at the Oxford MINI plant alone, about 150 million Euros will be spent on its modernisation and extension until 2007. While the yearly production is then set to exceed 200,000 cars, the quality standards will remain on par with BMW's original factories in Germany. In 2006/07, the second generation New MINI will feature highly efficient new motors and other improvements, turning the page to a new chapter in the history of a legendary brand – which first appeared on the market half a century ago.



Press cell with dual feeder and orientation station



feeder. The mechanical centering station is suited for a wide variety of blank sizes, ranging from 800 x 400 mm to 3,200 x 1,800 mm for single blanks and from 450 x 400 mm to 800 x 400 mm for double blanks. The station consists of six lines with driven roller conveyors that are arranged parallel to the conveying direction. These conveying lines are mobile, allowing the centering station to be folded and unfolded like a concertina, thereby optimally accommodating every blank and double blank size. Every blank passes via traversable pushers and reaches the frontal stops. There, it is brought into position by lateral pushers which can be individually adjusted. They are pressed to the blank by two eccentric levers. Afterwards, the pushers that had given way to the incoming blank are raised again after it passes through. They push that blank firmly against the frontal stop, thereby

fixing it in place. The pushers are arranged to match the shape of the blank's rear edge. The blank's front edge is held by movable stops on the individual conveying lines which are also positioned according to the edge's shape. Simultaneously, STROTHMANN's double blank control ensures that only one blank at a time proceeds into the press. The centering process precisely aligns blanks within split seconds.

### On top form

Step by step and press tool by press tool, the blanks are then formed into auto body parts. Via intermediate stations, they are transported from one press tool to the next by other feeders. The press rams do not run synchronously. Therefore, the line depends on smooth coordination of press and feeder control for a high



End of line conveyor

cycle speed. The press line with its chain of successive tools is automated according to the DualFeeder principle: each press within the line has one dedicated feeder for loading and one for unloading parts. At each press, the unloading feeder moves into the opening press after each press stroke and picks up the formed component. As it retracts from the press, the loading feeder on the opposite side moves up with a new blank from the preceding tool. After inserting the blank, it retracts and makes way for the next stroke. Meanwhile, the unloading feeder has already deposited the first blank in an orientation station, where it is newly aligned and taken over by the next press's loading feeder.

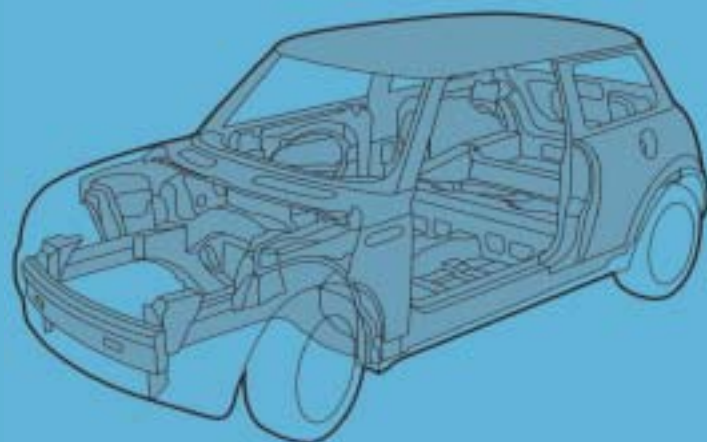
### Bridging the gap

Between presses, four-axial orientation stations serve as a sort of shuttle: they operate faster, more easily and more flexibly than feeders, aligning workpieces for the next processing step. Moreover, the aligning on the orientation station does not affect cycle times, as it can take place independent of loading and unloading of the press tools. The stations tilt and turn blanks along independently mobile axes. The blanks can be turned between +90 and -180°, while tilting is possible up to ±45°. Additionally, the systems can be traversed as a whole, moving between presses

towards the press tools or towards the loading and unloading stackers. Like the blank carts in the destacking area, the five orientation stations are mobile – having their own rollers, however, they are completely independent. If required, they can be quickly and easily removed from the space between two presses and moved to any other gap in this line. One option is replacing the orientation station by a turning station, which is occasionally needed in the first gap of the GP-503 line. These changeovers are not obstructed by the feeders which only operate above the stations.

### All's well that ends well

Manual work is merely required at the end of the modernized line. Behind the last press, an unloading feeder places the finished auto body parts on a conveyor belt, where they are picked up by hand and quality checked. They are then deposited in transport racks, awaiting their journey to the Oxford MINI plant.



## How it all began for the MINI

The original MINI was conceived in 1956: When the Suez Crisis broke, Great Britain faced the threat of an oil shortage – the nation's automotive industry was in dire need of a small car with drastically reduced consumption. Enter the MINI, designed by Sir Alec Issigonis with only a handful of collaborators. Beginning in 1959, several British automakers integrated the MINI – in a variety of slightly different build types – into their vehicle model ranges. While a decade passed before the MINI first became an independent brand, it began building its name even in the early years. The MINI Cooper and MINI Cooper S models, which boasted tuned motors, scored surprise wins in major racing competitions. Even for the Cooper sports cars, however, hardly any frills were added to modify the modest MINI look. Indeed, it was that characteristic appearance which came to represent the brand more than anything else. No surprise, then, that an attempt to brush up the original design failed in the early 1970s: it was unfavourably received. The familiar look stuck and remained more or less untouched for decades to follow. When the last classic MINI left the factory in 2000, it still bore a striking resemblance to its predecessor of forty years back.

### A car like no other – or all others?

Like so many English car models, the MINI, too, faced the end of production on several occasions over the course of four decades. Other brands merged and disappeared until the better part of the industry was gone. The MINI, on the other hand, survived all waves of consolidation. However, the brand's legacy amounts to much more than this longevity, or the sheer number of cars manufactured in forty years. In fact, only about 5.5 million classic MINIs were ever built – some other popular small or compact size cars have toppled that production figure within a single decade. What really makes the tale of the MINI an exemplary success story in the history of automobile construction is the distinctive influence it has exerted on the segment of small cars as a whole. The basic proportions of the passenger and engine compartment, and the new front-drive, transverse-engine layout in particular, became all but a blueprint for most small and compact size cars designed until the present day.

# On the fast track to productivity - thanks to a solution from a single source



A conversation with David Morrison, Press Engineering and Maintenance Manager, BMW Plant Swindon

*Mr Morrison, why did you have to modernise the press line?*

Morrison: One thing is, we simply needed to extend our capacity – the MINI is, of course, a phenomenal success, and the demand keeps growing. First and foremost, however, we are gearing up for September 2006, when the second generation New MINI goes into production. Parts for these new models will then be pressed in the modernised line.

*The old line wouldn't do?*

Morrison: Well, we're in a business with a rapid pace of innovation. And with new developments always just around the corner, it was anybody's guess when the old line would fall behind. That in itself is far from unusual. We have long become used to it: GP-503, which is thirty years old, has now been retrofitted with a new automation solution for the fifth time.

*So what was changed this time?*

Morrison: All automation technology in the press line was completely modernised, from the hydraulic components to the control systems. New STROTHMANN systems were installed to replace the existing devi-

ces, which dated back to our Rover years. This time STROTHMANN was our one key partner who delivered the whole automation package from a single source, and only consulted with Müller Weingarten Service, the press modernisation specialist, and Miebach, the press control system experts. Everything went totally smoothly, and that is a notable improvement over an earlier project in 2001, when the first

press line was modernised for the start of the production of the original New MINI. Back then, several contractors other than STROTHMANN were involved in the automation solution, and we ended up with some interface problems in the beginning. This time, with STROTHMANN taking the lead from A to Z, the hardware and all the intelligence behind the systems were supplied as an integrated package, and were fully functional and ready to go right from the start.

*It's hard to imagine there was no delay at all. There are bound to be some setbacks in any such project, aren't there?*

Morrison: Sure, some minor issues did occur and had to be taken care of. But all of them were resolved immediately. And I mean immediately: Whenever we told STROTHMANN about a glitch on a Sunday morning, they gave us a solution the same evening.

*How long exactly did the retrofit take until full-scale production?*

Morrison: For a major project as complex as this one, everything

went through exceptionally quickly. We specified and ordered the new systems in March, 2004. STROTHMANN began to install them in September. Startup took place in January, 2005. After a rampup period of about two months, our operators were thoroughly acquainted with the new automation package, and from then on, the modernised line has been in full swing, and has accomplished our current production goals. The line usually puts out about 250 large parts per hour thanks to the new linear systems. For uniform lots, it even yields up to 360 parts per hour.

*Why exactly did you prefer linear technology over conventional robots?*

Morrison: Simple enough – that's a question of benchmarks. Conventional articulated robots may be able to compete if you're handling smaller parts, but not the large steel sheets we usually process here. STROTHMANN feeders definitely move them faster, more accurately, and, for outer body shell parts, also more carefully.

Mr Morrison, thank you for this conversation.



# Swindon:

## A success story

Favorably situated at an important early railway line from London to Bristol, Swindon became the location of a Great Western Railway service and changing station in the 1840s. During the following decades, Swindon Works, which consisted of the repair facilities and a locomotive factory, developed into one of England's most important industrial centers. The little town, which had only 2,500 inhabitants in 1841, grew to a population of more than 45,000 at the beginning of the 20th century. The "Mechanics Institution", founded in the early boom years, was one of the world's first technical colleges, training the young generation of local engineers. The town's economic boom, caused by industrialization, was not stopped until the decline of the railway in the first half of the 20th century. This brought about an ongoing structural change – at its core, however, Swindon remains an industrial base.

### From locomotive manufacturing to automotive press shop

After WW II, automotive manufacturing replaced the shrinking railway sector. BMW Group's Swindon Plant soon became the most important employer. Put into operation in 1955, the plant was heavily expanded several times within a few years. During the 1960s, it provided jobs for more than 6,500 employees. The plant, then called Pressed Steel Fisher, had an output of about 1,000 auto bodies and other components per day. These parts were used in many car models produced in England – both by traditional brands like MG, Triumph or Jaguar and by the big manufacturers Ford and Vauxhall. The crisis of the British automotive industry, however, brought about hard times for the Swindon plant. Things are looking better since BMW's takeover: the Bavarian automotive manufacturer acquired the plant in the mid-1990s as a part of Rover, keeping it even after that brand was

sold and integrating it into its corporate group. With 1,100 jobs, it is still one of the biggest local employers. Additionally, many jobs are being created in Swindon in newly established industries and in the service sector. Approximately 200,000 people live in the Greater Swindon area today. An unemployment rate of 0.5 percent signals the region's unbroken growing strength and economic power: with about 100,000 jobs, the town and its surrounding region are one of the strongest pillars of England's economy.

### Public welfare in early capitalism

Swindon made history not only because of its ongoing, successful industrial development. In the mid-19th century, Swindon Works already set standards by establishing their own social security system. The first industrial employer worldwide to do so, the railway works introduced a compulsory health insurance



for all employees in 1847. The "Medical Fund Society" maintained its own hospital already in 1871. Soon after, the insurance covered the costs of providing injured workers with prostheses and subsequently also covered dental care. Even the services of a company undertaker were available to the workers. Additionally, a swimming pool complex was built for the employees. When Great Britain established a national health insurance system after WW II, it expressly referred to the standard set by Swindon Works.

## First steps in China

STROTHMANN has won a contract from commercial vehicle manufacturer JMC (Jiangling Motor Company) to provide all automation technology for the destacking area of a press line in Nanchang, China. A major package consisting of a range of different systems, this will be STROTHMANN's first project on the Chinese market. Two SRLM 2/120 type LinearRobots will form the cornerstones of the automation solution. SRLM feeders feature highly dynamic performance, but very low wear and a minimum of downtime. One of the feeders is used for destacking blanks in sizes from 300 mm x 600 mm to 2200 mm x 4000 mm, the other one for loading the washed, oiled, and centered blanks into the head press. Besides the feeders, several other

systems will be supplied: two pallet carts with fanner magnets, a magnetic belt conveyor, a Wandres Ingromat blank washer, an AMTEC blank lubrication unit, and a mechanical STROTHMANN centering station. STROTHMANN will also install RoundTracks® in the floor to allow for quickly extracting the washer and oiler units from the line whenever necessary. The destacking feeder is capable of placing up to eleven blanks per minute onto the conveyor. The automation package will be implemented by STROTHMANN and its sister company ATR Industrie-Elektronik, as the main contractor, which also supplies all control technology. JMC will receive a fully-fledged setup prepared for an immediate start of production.



# NEWS

## New US representation for even better customer service

STROTHMANN Machines & Handling follows its customers across the Atlantic: Earlier this year, we have established a new US representation in Fenton, Michigan. Derek Clark, STROTHMANN head of sales and marketing (center), Andrew Basgall, President, and William Budry, Vice President, officially opened AJB/STROTHMANN Automated Systems in May, 2005. Demand for STROTHMANN products, for linear feeders in particular, has always been strong in

North America and has continued to grow in recent years. Our RoundTrack® systems are also fast becoming more popular. Customers have already seen quicker responses thanks to the new representation, which is jointly operated by STROTHMANN and AJB Automated Systems. Regional users will continue to benefit from better application support, an extensive stock of spare parts, and other services. Of course, US-based specialists also have superior routine in adapting



systems to regional standards and regulations.

## RoundTracks® optimize Demag Plastics production

Demag Plastics Group, based in Schwaig near Nuremberg, manufactures injection molding machines – 8 to 22 t heavyweights which are between 4.6 and 10 m in length. They used to be assembled in separate boxes on the factory floor, which at least provided some flexibility: whenever a missing component caused a delay in one box, assembly workers could move on to another machine and temporarily continue work on that one. Of course, this wasn't exactly an efficient solution. However, the sheer size of the machines, long production cycles and cost considerations all but prohibited a change to line production with a conventional belt conveyor. Demag went looking for alternatives instead, and paid a series of visits to other machine manufacturers who had already optimized their production with innovative kinds of floor transport systems. In the end, Trumpf Austria's and Deckel Maho's facilities proved to be particularly impressive: Demag eventually chose the RoundTrack®-based production con-



cepts implemented there as models for its own Schwaig factory.

### Fully customized solution

Now with flow manufacturing thanks to the RoundTrack® system, Demag Plastics' machine production runs almost like a belt conveyor line: whenever an assembly cycle is concluded after about 3 hours, all

machines on their platforms advance to the next station. STROTHMANN has made a number of customizations and modifications for Demag Plastics, e.g. an optimization of the layout of the tracks. The special setup in Schwaig also includes a timing belt driven pulsing lever system for pulling the heavy loads. It is installed between the tracks (see picture). The transport platforms are fixed to two engaging pieces that

are attached to an under floor bar, and are then pulsed from station to station. While this major change to the production process also required a new logistical concept, the effort was very worthwhile: assembly time has been cut by 15%, and work has become more comfortable. A time frame of only three days is now the goal for assembling a machine.

## Trade Fairs 2006

**AUTOMATICA**

Automatica  
in Munich

Hall B3 · Stand 524  
16.05. - 19.05.2006



Euroblech  
in Hanover

Hall 27 · Stand H09  
24.10. - 28.10.2006



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