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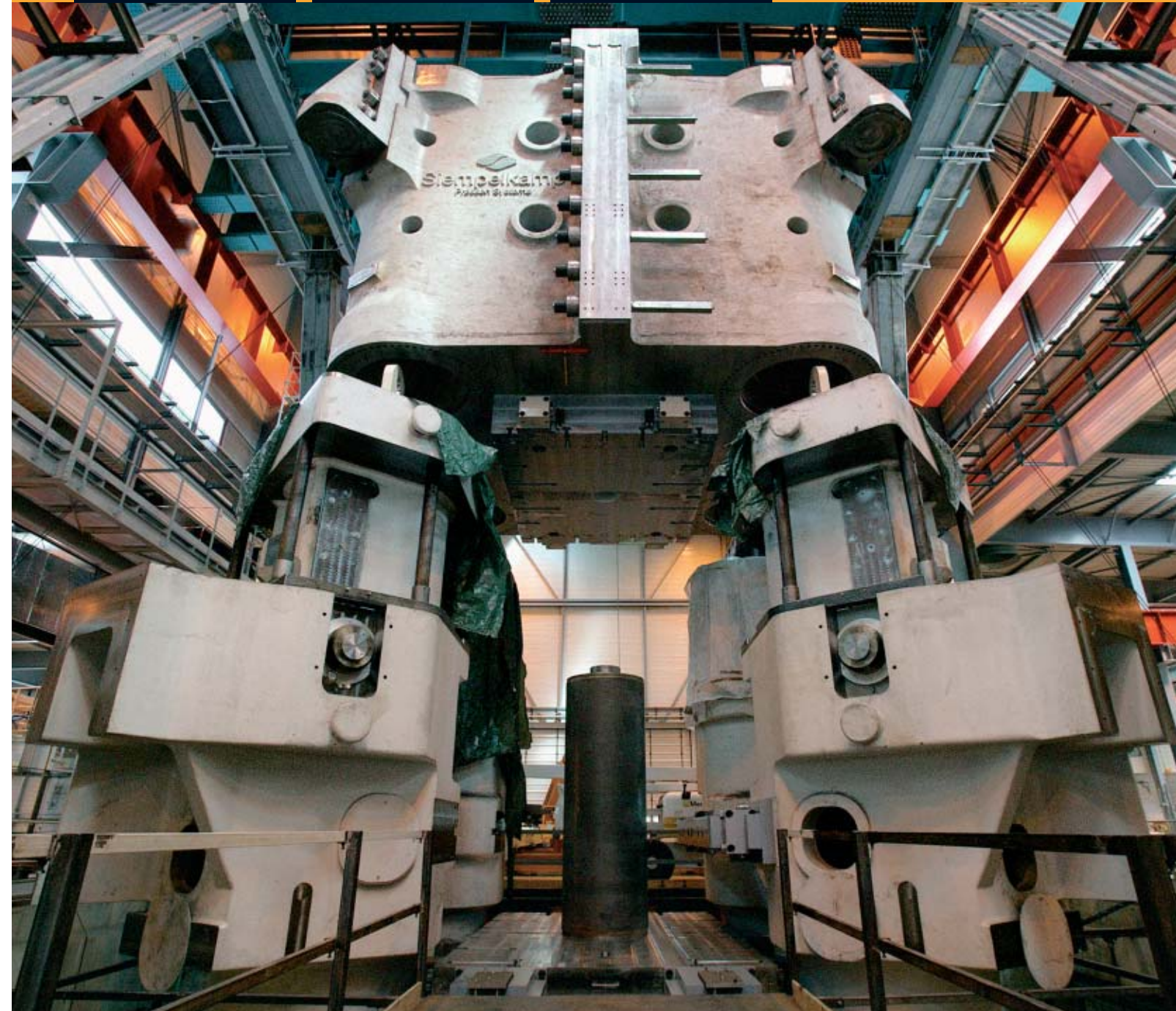
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**Growing with the task:** The new concept for the construction of a closed-die forging press  
**CASTOR®:** A high-tech product made of ductile cast iron **MDF-Preheating:** Larger capacity for  
ContiRoll® presses **Bigger than 8XL:** The world's largest OSB multi-daylight press **Wuxi conquers**  
**Asia:** Siempelkamp opens up first production facility in China **and much more**

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The Siempelkamp Magazine

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Dr. Hans W. Fechner

Managing Director

G. Siempelkamp GmbH & Co. KG



Thank goodness there is competition!

When will the industry usually invest in new equipment? Whenever business is good and new and advanced machines and equipment can bring a competitive edge. Siempelkamp has taken this fact to heart. While we cannot change the general business situation, we can definitely ensure a competitive edge. For decades we have aimed to develop machinery and equipment which will keep our customers competitive. This Bulletin will present you with several noteworthy examples. Our first example is the world’s largest press for the production of OSB (Oriented Strand Board is mainly used in the housing industry in North America). After ramp-up the customer is able to produce 725,000 m³ OSB annually on this press. This amount is equivalent to 75,000 single homes. Because of a higher press capacity our customer achieves lower unit costs and a competitive edge.

One of the largest steel manufacturers in the world, Posco in South Korea, ordered a press simulator for the production of large pipes from us. Normally, the production of pipes requires three separate presses; one for the initial forming, one for the U-forming, and one for the O-forming. Three presses would have been expensive. Therefore, we developed a prototype which unites all three forming processes into one machine. Posco uses this press to test new technologies and steel grades. The advantages of this innovation are obvious.

The next example is a true achievement. Our customer Aubert et Duval in Southern France ordered from us a closed-die forging press for the production of forged parts for use in the aerospace industry (e.g., as parts for the new Airbus A380). The demands on the press were a true challenge for our design engineers. A press with approximately 44,092 US tons press capacity over an area not much bigger than a kitchen table is unique. To withstand the high press forces, the press had to be designed in such a way that would prevent deformation. This difficult task was a headache for our engineers. With its high precision during the

production of forged parts made of titanium and other alloys, this press definitely provides a competitive edge.

Our next accomplishment talks about wire-wound constructions. We use this technique to build light but very robust presses. Our article on a hydro-forming press points out the advantages of this construction type.

Siempelkamp aims at improving our customers’ competitiveness with tailor-made machinery but also by adjusting the available machinery to meet higher performance needs. To do so we have established a global service department whose expertise includes press extensions and speed increases in multi-daylight presses. Through higher press capacities our customers achieve lower unit costs and a competitive edge.

At first sight, the Siempelkamp MDF-preheater and the Prod-IQ software, two production boosters, don’t seem to have too much in common. The MDF-preheater, which can also be retrofitted to old lines, increases press capacity. Prod-IQ is an intelligent control technology which helps customers reach a maximum product quality and production capacity with a minimum amount of resources. Both articles demonstrate that we offer a wide variety of products for all our customers’ needs in order to help them successfully withstand the tough market conditions.

Siempelkamp also faces the effects of globalization and tough competition. That’s why we decided to open up a production facility in China. This decision puts us close to our customers in Asia. At the same time, we are able to produce repetitive parts in a cost efficient way. Thus, we are taking care of maintaining our own competitive edge.

Thank you for your interest in Siempelkamp. We wish you a pleasant reading!

Sincerely,

Dr. Hans W. Fechner





# Growing with the Task

With a new concept for the design and construction of a closed-die forging press Siempelkamp Maschinen- und Anlagenbau has attracted considerable interest. This concept brings together practically incompatible customer requirements in a single solution for the first time. The result is a new type of press which permits the production of high-tech closed-die forged parts more safely and reliably, even faster than before and at lower cost.

By Ralf Griesche

We are on the approach descent before landing in Toulouse in the south of France.

The Airbus A 320 is being shaken by a stiff wind. The runway approaches at high speed, then the plane lands so heavily that the cutlery in the pantry complains loudly.

The passengers are pressed back against their seats and then catapulted forward again as the counter-thrust violently brakes the A 320.

A situation experienced a hundred times every day. But there is no need for concern if one knows that the parts of the plane subject to such heavy stresses, such as the landing gear or turbine blades in the engines, are all made of forged special alloys capable of coping with such torture with ease.

I was in Toulouse to visit Siempelkamp customers Aubert et Duval in nearby Pamiers, where Siempelkamp Maschinen- und Anlagenbau is currently installing one of the biggest and most powerful closed-die forging presses in the world. Some of the parts to be forged on this press will be parts for planes, which, as I had just personally experienced, play a critical role in the safety of the plane during flight and landing.

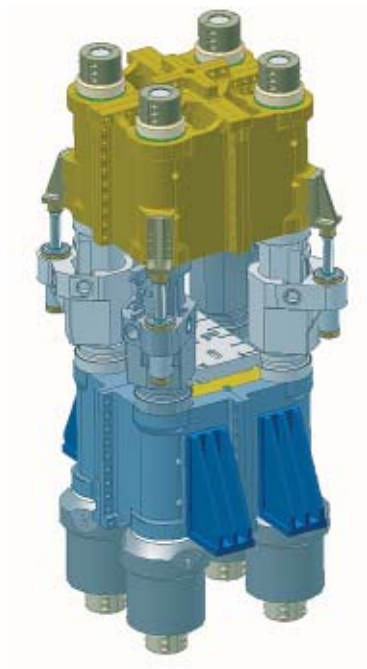
## The history

Early in 2001, the French firm of Aubert et Duval placed an order with Krefeld-based Siempelkamp Press Systems for the development of a concept for a very special closed-die forging press.

Digression: What is a closed-die forging press? A forging press is a press designed for shaping workpieces out of red hot metal by the application of pressure. Comparable to the hammer in the forge which shapes the workpiece by hitting it, a moving cross-head is pressed into the workpiece with great force.

This changes the internal structure of the part being forged and increases its strength in the process. A forming die is a die in which the heated metal part is inserted and then pressed into a predefined shape.

A closed-die forging press is therefore a press which forges parts into predefined shapes using a



The 3D simulation of the press

forming die. In this connection, one frequently refers to virtually final-contour closed-die forging presses, which literally means that the forged part almost has its final shape after forging and requires only minimal finish-machining work.

The parts to be produced on this press include gas turbines and landing gear parts for the aero-

nautical and aerospace industries, such as for the Airbus A380.

Such parts are made of titanium alloys or nickel-based alloys and are forged at what are in some cases relatively low temperatures (600°C–1150°C).

This requires an enormous pressing force over a relatively small pressing area. The peak pressure required here is 40,000 tons of pressing force distributed across the size of a kitchen table. (Imagine 55,000 VW Beetles on your kitchen table.)

In addition, it was also required that three forming dies be capable of being operated simultaneously/sequentially in the press as well, which means a major eccentric load on the press.

The high eccentric press forces were to be applied with previously unheard of working accuracy at the same time, however, to enable the forged parts to be produced with extreme contour accuracy. This saves time and money by cutting out the considerable effort involved in finish working.

These three requirements are, in principle, knock-out requirements as they are, in a narrow sense, mutually incompatible. This is because the greater the eccentric press pressure, the greater the press itself “works”, i.e. it deforms. Press deformation, however, reduces the working accuracy.

As a consequence, the specified requirements were for highly rigid press uprights, precise guidance of the moving cross-head, compensation for the one-sided frame elongation under the eccentric pressing force, and minimal cross-wise movement between the lower cross-beam and moving cross-head with asymmetrical parts being pressed. In this connection, too, the following figures were specified: Crosswise press

More than half of the press is hidden in the press pit







movement of a maximum of 3.2 mm under a horizontal force of 1500 tons and space for a die with a height of 4500 mm.

In addition, the press must be capable of enduring 10 million full load alternations without material fatigue.

Given this task the design engineers at Siempelkamp were faced with a supremely difficult nut to crack.

#### Design engineering creativity was required

Bringing together the three mutually incompatible design requirements in a single solution was a major challenge. The demand was for a large and flexible space for fitting the die, high working accuracy and low press deformation even under extreme concentrations of pressing force and high eccentric pressing and crosswise forces.

Months of work went into designing, calculating, throwing away results and starting calculations afresh. A total of 25 different alternatives were examined before a design was presented to the customer. This was a 4-column underfloor press with external main cylinders and hydraulic parallelism control for compensating for the diverse vertical expansions associated with the eccentric stresses.

Quite simply, a closed-die forging press which is capable of producing qualitatively complex forged parts at extreme pressure. The press weighs approx. 5,350 tons, which is because the press frame is extremely solid in construction in order to provide the rigidity required. The moving mass of the upper moving cross-head alone weighs 2,550 tons, plus the upper die which can weigh up to 200 tons.

From top to bottom:

The special trailer with one segment

The bridge-crossing system

The tie-rods with the main cylinders lowered in the press pit



The four tie-rods are waiting for the cross-beams

For reasons of production, transportation and installation feasibility, the upper and lower cross-beams were each designed as four segments to be joined together on site with high-tensile, pre-stressed screw connections – approx. 1100 (out of approx. 2300 individual parts) in total.

To ensure that the design would not produce any nasty surprises later, the design calculations for the entire press were made by diverse specialists at Siempelkamp using the Finite Element Method (FEM). FEM is a mathematical method which, among other things, enables the loads on parts to be calculated on the computer. The subsequent analysis then enables any possible weaknesses to be identified and remedied with geometric optimization.

The customer was happy with the concept and Siempelkamp got the go-ahead to build the press.

#### Production of the components

Once the technical concept development phase was completed, the really serious work began. Drawings were produced and translated into parts lists. Requests for quotes were then sent out to suppliers of the heavy parts, of which there are only a handful around the world capable of casting and forging heavy parts of this nature.

The high requirements of the materials in terms of technical quality and the precision of the mechanical machining of the heavy parts restricted the potential range of suppliers even further.

Finally the job of supplying the casted and forged parts were awarded to Japan Steel Works Company in Muroran, Japan. The ductile cast iron parts such as the guide columns and moving





sleeves were produced by Siempelkamp at its own foundry (a total of more than 1,000 tons) in Krefeld.

Detailed production and test specifications had to be prepared in order to enable the quality controls to be carried out as production proceeded, and for the acceptance inspections for each part. Considering that such large and heavy parts were to be joined together on site with joint tolerances of just 0.05 mm, the quality control system was in retrospect an excellent investment.

In addition, a control system concept had to be developed to enable the press to be run safely, reliably and efficiently. This first required the preparation of a detailed hydraulic drive plan, which was then subjected to a mechanical function analysis to make sure it complied with the tech-

nical output data. Finally, the control system logic was described in a 600 step flow diagram and the logical interlocking conditions for the press implemented in pseudocode. All this data was then fed into a Siemens S7 controller.

The complex structure of the control system logic is a result of the integration of approx. 90 cylinder axes, approx. 280 sensors and the customer's requirement that the press be capable of flexible use (closed-die forging, extrusion pressing, hydroforming).

Machines of this caliber are expensive and therefore have to be in use 24 hours a day. To make this possible they must never break down, or at least any downtimes required must be properly planned.

For this reason the customer also required that the press be designed to have lasting fatigue strength.

This has been achieved firstly with the sheer mass of the press frame. Secondly, the design engineers paid particular attention to the moving parts – wear normally starts here first.

Thanks to the innovative design of the cylinder heads, the four main cylinders are highly durable. The seal contact surfaces on the main cylinders/tie-rod units were also specially hardened.

This therefore provides the guarantee for 10 million full load strokes.

In addition, importance was also attached to the active (automatic press shut-down) and passive (shock absorbers for the moving cross-head, chain of progressive deformable safety zones comprised of simple, removable replacement parts) safety devices for protecting against critical operator errors.

Safety is also provided by the fail-safe design of the entire drive mechanisms in relation to



The lower cross-beam, 1,360 t, is hanging on the strandjack



The upper cross-beam will be lowered over the tie-rods

operator error and failure of the hydraulic control system.

Easy access reduces maintenance work times and maintenance work is supported by special control programs. Moreover, an all-round device for maintenance, repair and retroactive fitting and removal of the main cylinders was also developed.

#### Transportation of the press components to the building site

An exceptional press is often associated with exceptional difficulties. This was the case when it came to transporting the press.

In spite of the fact that the upper and lower cross-beams were each divided into four segments, each segment still weighed approx. 300 tons. Slightly lighter but more bulky were the tie-rods, pistons and main cylinders.

Transportation from Japan by ship was routine and the parts were placed in storage at the port of Port La Nouvelle, being the closest port to the place of installation.



From there the four tie-rods, the pistons and the main cylinders were safely transported to Pamiers along the *Route Nationale* after several supporting measures had been taken (bridge reinforcement).

For the cross-beam segments the problem was rather more difficult, however, since they could only be brought to their destination by motorway.

Normally the private motorways in France are not allowed to be closed for heavy goods transportation and therefore cannot be used for such purposes. This was a case of "national interest", however, so the authorities issued permission for an exception.

What made things more difficult was that after structural analyses of the 100 types of motorway bridges, it was found that 6 bridges along the route were not designed for such loads.

Once again, creativity was required.

A special trailer was therefore manufactured by Wirzius with 2 x 20 axles and 320 individually controllable wheels with hydraulic controls for the individual loading of each wheel. A bridge-

crossing system was then developed with Greiner which was never seen the like before in the world.

Over a length of approx. 100 meters this system guides parts of the weight into the bridge supports and directly away to the piers. This made it possible to drive over the "weak bridges".

The system has been registered for a patent and now belongs to Wirzius.

In total this "bridge" had to be erected and dismantled 48 times before all the cross-beam segments finally arrived in Pamiers.

This was done mainly at night so that the motorway could be kept open for normal traffic during the day, and the unusual "delivery" was given extensive coverage by the French press and television channels.

#### Assembly

In March 2003, the customer officially started work at the building site by beginning the earthworks for the new factory.





Bernard Finas from Aubert et Duval (right) and Heinz Ferfers, Siempelkamp

Given its enormous weight the press requires foundations in the form of piles which had to be driven as far as 40 meters into the ground.

In June 2004, the assembly site was then opened by the Siempelkamp/ADH team. Siempelkamp had prepared a detailed plan in advance for the correct positioning and assembly of the parts as they arrived because they were simply too heavy to be repeatedly turned around or repositioned. This was also the reason for not using auto-cranes for assembling the press. Instead, a so-called strandjack (similar to a gantry-type crane with a special hydraulic lifting device) with a lifting capacity of 1600 tons and a span of 24 m was set up instead.

After this advance work had been completed, the four gigantic main cylinder housings were assembled in October 2004. At the maximum lowering speed of the press, no less than 25,000 liters of hydraulic oil flow through the cylinder per minute – they are that big!

#### Assembling thousands of tons – with the precision of a watchmaker

After this they were then turned so that the forged 23.6 m main tie-rods could be inserted. This sounds relatively simple but it was a unique piece of precision work: The tolerance for the tie-rods as they passed through the cylinder was just 3/10 mm, with an assembled weight of 310 tons per unit and a length of almost 24 m!

The strandjack was used to move the 4 main tie-rods and cylinder units into position and lower

them into the press pit. Their positions were optically measured in advance, of course, because the cross-beams, each weighing over 1200 tons, were to be lowered onto the tie-rods afterwards. And, once again, with a tolerance of just a fraction of a millimeter.

In March 2005, the quarters of the lower cross-beam arrived at the construction site.

Now the detailed and thorough planning of the sequence of delivery and storage of parts really paid off. They were stored on a hydraulic assembly and moving unit in the order of their use. All joint areas were sand-blasted and then connected together with screws.

This was more a job for the heavy equipment, as some of the screws had threads with diameters of 200 mm, too heavy to be positioned by two men let alone screwed in by them. Only the heaviest equipment could help out here and deliver the immense torque required of 120,000 Nm.

The four segments were screwed together with a joint tolerance for the parts of better than 1/10 mm, a unique achievement in the history of heavy assembly at Siempelkamp, which was only made possible by the precision work carried out in the planning and implementation stages by site supervisor Heinz Ferfers and his team.

In the meantime the anchor brackets were fastened to the floor of the press pit, the 1360 ton lower cross-beam lifted and slowly (it took almost two days) moved into position over the main tie-rods and lowered. The tie-rods had already been lowered into a specially prepared

pit as the ceiling of the production building was not high enough for the assembly work.

The tie-rods were then lifted again together with the main cylinders so that the main cylinders could be screwed to the lower cross-beam.

To increase the dynamic strength of the tie-rods, the next step was to complete them with so-called spacer sleeves and then fit the guide columns for the lower and upper cross-beams to them. The pre-assembled upper cross-beam could then be fitted on top and the rest of the spacer sleeves fitted.

This was the state the press had reached when I visited in September 2005. It was open up to the top dead center and the enormous press room was empty, ready for the next step, the installation of the tool changing systems.

The 4 main tie-rods had just been pre-tensioned to stabilize the unit; this is done using a 40 ton pre-tensioning unit which stretches the tie-rods by an incredible 26 mm.

Site supervisor Ferfers and his team will be kept busy with the assembly work until early next year. Then the press can reveal what it can do.

At this point, a big thank you for a tremendous effort! And thanks also go to our customer with whom it has been a pleasure to work.



Saturn V rocket? No, the mighty press seen out of the press pit



# Wire-Wound Design

Meeting customer demands with high-tech castings and an innovative technology

By Wolfgang Voß and Prof. Ernst P. Warnke



Wire-wound press frame. Press force 200,000 kN

## Introduction

The wire-wound design is a special and fairly new technology in the field of mechanical engineering and it is still entering new application areas.

With the help of a winding device, steel wire is wound around the curved surface of a component. These components are made of ductile cast iron or forged steel and are either monobloc constructions or assembled from several parts. The wire-wound constructions are precalculated with the Finite Element Method. The strength and fatigue evaluations are carried out according to state-of-the-art calculation codes.

Wire-wound constructions are operating primarily under compression. Under compression the fatigue strength of cast iron is much higher than under tension, up to twice as much. The combination of casting design and wire-winding creates a harmonic stress field, avoiding stress concentrations.

## Background

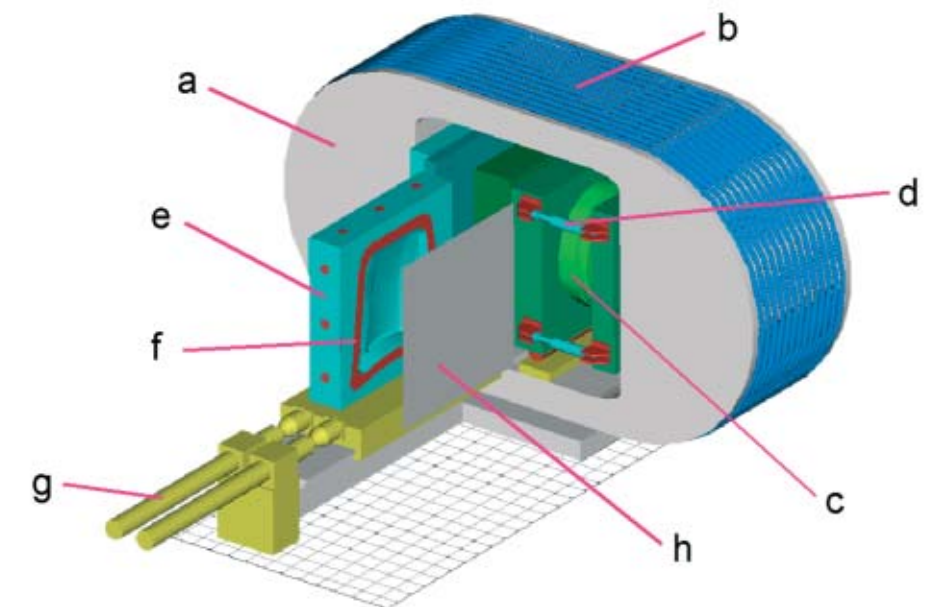
The wire-winding of round vessels made of prefab concrete segments has been state-of-the-art technology in civil engineering for a long time.

## Areas of application

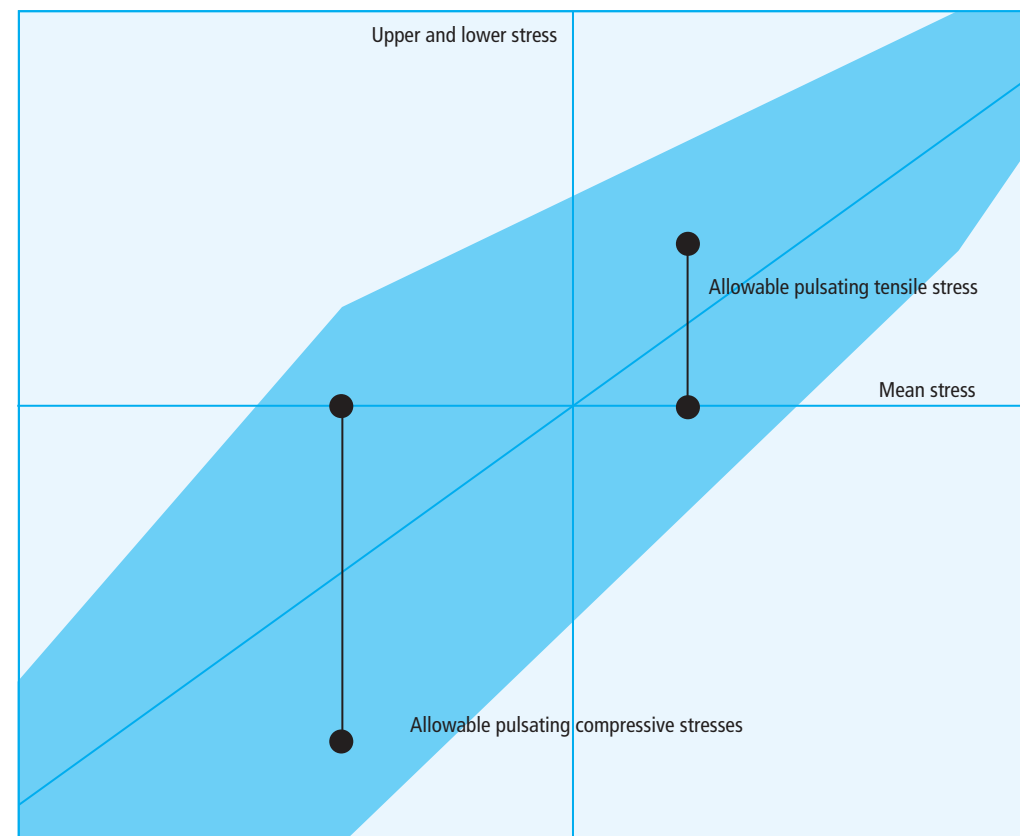
The wire-winding technology is mainly used on metal components in press construction and in pressure vessel manufacturing. These areas of mechanical engineering require the control of very high internal pressures with resulting high press forces. In addition, the goal is to achieve an optimized design by minimizing the dimensions and the weight of the body. A solution to this problem is the use of the wire-winding technology as shown in the example of a hydro-forming press.

### Wire-wound hydro-forming press, computer simulation

- a Weight of casting: 86 t
- b Weight of wire: 8 t
- c Closing cylinder
- d Retraction cylinder
- e Tool
- f Multiple blank holder positions
- g Cassette drive
- h Blank



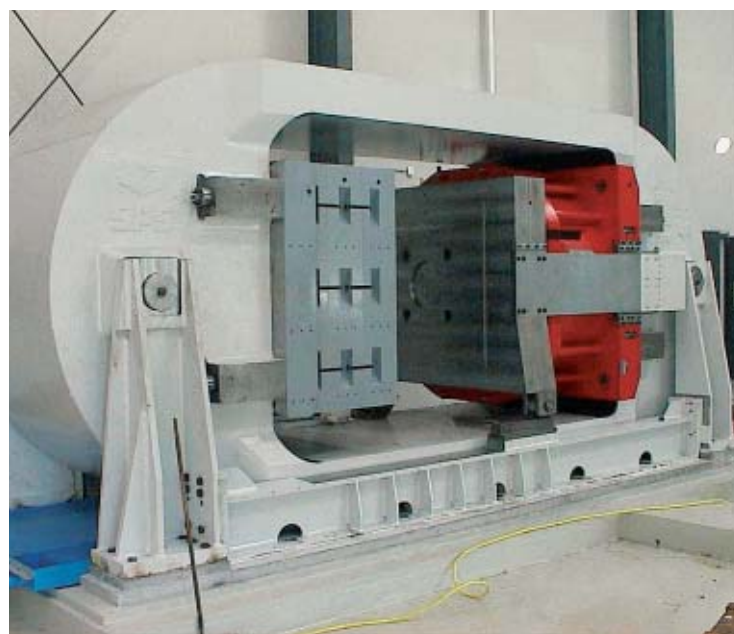




Smith diagram for ductile cast iron GJS-400



Wire-winding equipment



Press frame for a hydro-forming press. Press force 100,000 kN

### Wire-winding principle

The wire-winding equipment applies a high tensile force to the wire while it is being wound onto the structure. Depending on the application, the geometrical conditions, and the strength demands the wire package consists of a large number of helical windings and many wire layers on top of each other. The wire is anchored to the body at the start of the bottom layer and at the end of the top layer.

The cast or forged bodies for wire-winding usually have round or elliptical contours. The spring steel wire is a high-strength flat steel with typical dimensions of 6 mm x 1.5 mm or 8 mm

x 2 mm. The different wire qualities have tensile strengths as high as 1900 MPa.

The wire package subjects the casting to compressive stresses. These are residual stresses and are treated accordingly in the stress evaluation. The compressive stress level in the body is chosen to be higher than the tensile stresses arising from service loads. In superposition, the stresses remain in the compressive range during the complete press cycle. In comparison with castings and forgings without pre-stress the mean stress of the wire-wound designs shifts from tension to compression. In the compressive range the fatigue strength is much higher than in the tensile region.

### Manufacturing

The winding of castings and forgings with spring steel wire is carried out with special wire-winding equipment. The unit is mobile, permitting to wire-wind oversized components in situ. The main parts of the equipment are a turntable, a device which applies the tensile force to the wire, a lifting table for height adjustment of the wire, and last but not least, the spring steel wire in the form of wire coils placed in a reel unit.



# An "Ace" for Posco

Siempelkamp developed for Korea a "hole-in-one"-press for the production of slot pipes

By Sigfrid Buecher



Installed in only two months after ten months of developmental work: the prototype of a UOE forming press (U-forming, O-forming, Expanding)

If this headline makes you think of golf, you are not too far-off the truth. Siempelkamp Maschinen- und Anlagenbau GmbH & Co. KG, Krefeld, Germany played an excellent shot. The press manufacturer developed a forming press for the production of slot pipes (20–56 inch diameters) which unites three forming steps in one machine. With two strokes under Par 3, a "hole in one" with only one putt, this Siempelkamp press is a true ace!

For the time being, we will put golf aside. In reality we are talking about a large business opportunity, not so much for the present time, but for the future. Businesses are focusing on outstanding new developments which will provide them with a competitive edge.

Any business' main concern is to stay competitive. One of the largest manufacturers of steel in the world, Posco, based in South Korea, has made a strategic decision. Everyone knows steel can have many consistencies. Specific material compositions and different production technologies lead to steel grades with different properties, which in turn can be used for different applications.

## Research for tomorrow

A supplier who wants to shape tomorrow's markets has to be able to predict future demands

on products and has to be able to simulate processes and developments up-front. Posco's research and development center dedicates their work to exactly this type of research. The center develops steel grades for future applications.

The development of new steel grades and of new technologies for the production of large-bore pipes plays an important role in research. The efficiency of a pipeline increases with increasing pipe diameters and increasing operating pressures. A larger output amount can thus quicker reach its destination while the costs for installation, operation and maintenance of the pipeline, pump stations, etc. stay about the same. Another aspect that must be considered in the on-going research is the destination of future oil- and gas-production sites. Because new mining fields might be further away than present ones, future pipelines might have to overcome longer distances.

The mining of energy sources is a promising market in regard to volume as well as value. A current efficiency factor of about 40% is extremely unsatisfying for all parties involved in the value-added chain for oil and gas. Frequently the available equipment is in need of overhauling; partly, the lines are dangerously old. The result of these conditions: pipeline construction and renovations will have a great business potential for the next 20 to 30 years.

## More and faster – for crude oil and gas transportation as well

With this market potential in mind, it is easy to understand why pipe manufacturers worldwide are looking for the best materials designed by innovative steel manufacturers such as Posco. Currently, proven and tested special steel grades are used for the production of pipelines such as the X70 steel which permits wall thicknesses between 10 and 35 mm with pipe diameters of up to 56 inches. Pipe lengths usually run between 12 m (39.3 ft) and 18 m (59 ft).

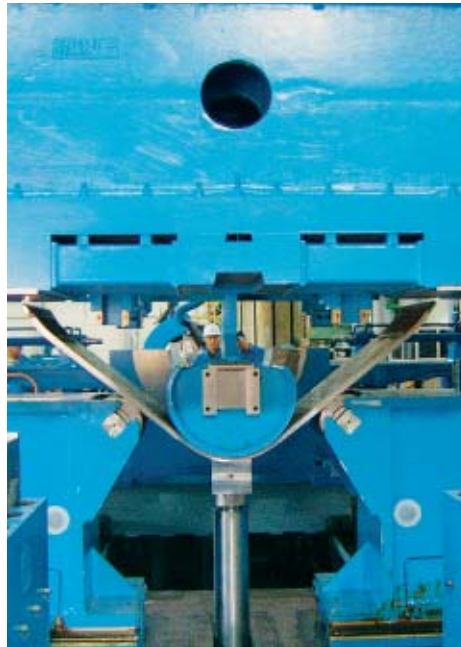
Posco aims to offer steel grades and pipes that go beyond those dimensions as soon as possible. At the moment Posco is concentrating on smaller wall thicknesses and higher operating pressures. Higher operating pressures and larger diameters require stronger and more flexible steel grades. Material scientists are already talking about grades X80 to X100. Even a commercial availability of steel grade X120 is no longer utopian.

Significantly increased mechanical properties have one drawback. Such steel grades show a higher resistance in the forming process for pipe segments. This means if a steel manufacturer offers steel with significantly improved mechanical properties, at the same time the manufacturer should develop the necessary manufacturing technology.





Three working steps united in one machine: first the initial forming ...



... followed by U-forming of the steel plate to form a so-called U-canning or U-shape ...



... finally the O-forming for the closing of the pipe

750 t (826.7 US tons), and has a press stroke of 2,100 mm. Additionally, the time frame for the execution of this order is impressive. The order was received on February 10, 2004, the shipping started on December 10, 2005 and the installation began was on January 10, 2005. Once the installation was completed, the startup only took half of the anticipated time. The opening ceremony took place on March 20, 2005.

Posco engineers are able to use the press to form and test pipe diameters ranging from 20' to 56' with a wall thickness between 10 and 40 mm using steel grades ranging from X70 to X120. In addition to the press, Siempelkamp delivered sets of tools that can be adjusted to the various material grades and pipe parameters.

The actual press force of 4,000 t (4409 US tons) is surprisingly low. Posco developers confirmed

Siempelkamp's statement that material properties, such as forming technologies for 12 m (39.4 ft) long pipes, can only be properly simulated on 1 m long test samples. This reduction in length results, next to a reduction in material costs, in a reduction of the pressing force.

#### One step ahead in development

The specific feature of the Posco press is that the three forming steps formerly needed in pipe manufacturing were united in one. To combine the number of mechanical processes, which are acting in different directions, into one machine was possible by implementing a precisely working control technology. The press is operating fully automatically. An average pipe segment is finished after a maximum of 20 minutes. The simulator can be stopped at any given time for an analysis.

Posco is very satisfied with the new equipment. The research line works without any problems and delivers first-class quality. For Posco, the new equipment is the cost efficient key element for the future. It is easy to recognize that the production of pipes on three single presses is a lot more costly.

What did the Posco order mean for Siempelkamp? A realized order value of €5 million is surely a great success. However, what's even more important is that Siempelkamp developers and engineers were able to gain completely new insights for future projects. With this unique expertise, Siempelkamp will certainly score in the future when it comes to the awarding of contracts for big industrial pipe forming presses. Because of the Posco project, Siempelkamp has achieved a handicap of one in even this market sector.

#### New steel grades require new forming presses

Posco's research and development center in Pohang develops and tests new materials and processes for the production of large pipes. Manufacturers that keep the future in mind demand state-of-the-art testing and simulation equipment. Suppliers for such are scarce. It takes specialists with extensive expertise, the willingness to take risks, enthusiastic lateral thinkers to supply this state-of-the-art equipment. Such a supplier is Siempelkamp, located in Krefeld, Germany. With its innovative press systems, Siempelkamp is a ground breaker. In 2004 Siempelkamp received from Posco an order for a forming press with the ability to simulate in one process with novel steel grades the pipe production of the future. Siempelkamp was able to realize this tremendous cost advantage for the customer by combining the initial forming, the U-forming, and the O-forming in one press.

Let's take a look at the usual production of large pipes. The edges of a 3.2 m (10.5 ft) wide and 12 m (39.4 ft) long metal plate are first bent in a press in longitudinal direction to provide the initial shaping of the material. As a consequence, the longitudinal edges of the plate will fit neatly together during the final O-forming process.

After the initial forming, also called crimping, a plunger is placed in the center of the plate in the U-press. Under the pressure of the plunger, the complete plate takes on a V-shape. With the help of two side rollers the plate is then bent into a 12 m (39.4 ft) long channel. This so called "U-canning" is formed to a pipe in a third press, the O-press. The longitudinal seam is welded together by a robot on both coplanar material surfaces which were created when the sheet was initially formed.

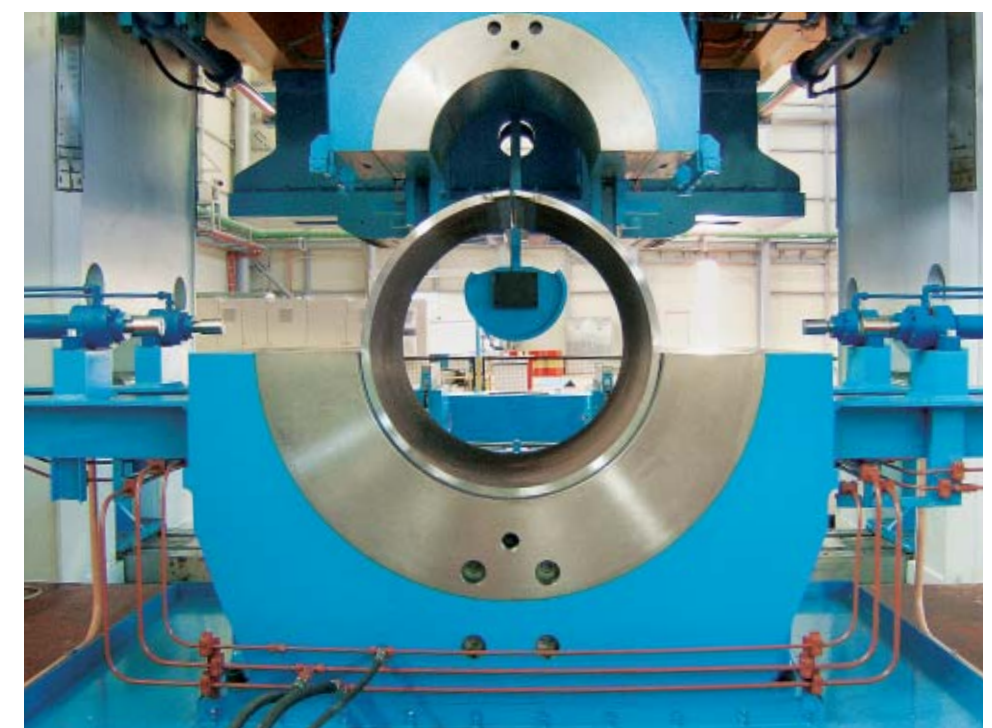
The forming process in cold condition results in residual stress in the material. With the help of an expander, the inside wall of the pipe is put under equally distributed pressure. The expander

not only homogenizes the unbalanced load distribution, which develops as a result of the forming, but it ensures the precise forming and sizing of the finished and welded pipes.

#### Three processes become one: the UOE-press simulator

Let's get back to the Posco research lab and the Posco order. The Siempelkamp engineers accepted the order to build a simulator for U-forming, O-forming, and expanding with 40 MN forming pressure for testing new technologies and steel grades. The delivery time for this unique press was negotiated to be only 10 months from the receipt of the order, and the startup would have to be completed within one quarter.

Thus, the order became a true challenge. The solution could be described as an "ace" by a golf player, and as an innovation in the field of press construction. This prototype has impressive numbers. It is 12 m (39.4 ft) high, weighs approx.



Successfully operating: the press simulator at the Posco Research and Development Center has been testing new steel grades and technologies since March 2005



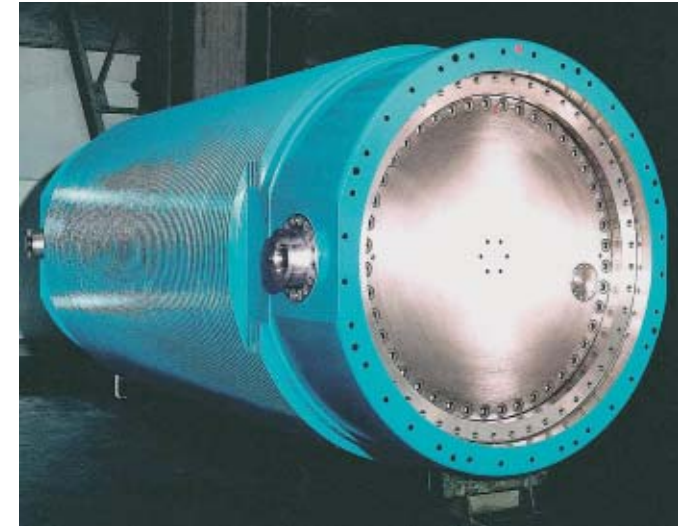
# CASTOR®: A High-Tech Product Made of Ductile Cast Iron

By Dr. Wolfgang Steinwarz



Casting of a CASTOR®

CASTOR® – Type V/19 cask



The focus of any public discussion about the CASTOR® these days in Germany centers on the social and political debate concerning nuclear energy. Pictures of demonstrations against large-scale transportation movements by train and heated discussions about the disposal of nuclear waste can hardly go unnoticed.

What is often forgotten is that the CASTOR® is the most widely used transport and storage cask for spent fuel rods in the world and provides a necessary and at the same time safe means of disposal. Not only is the production process for making the cask extremely complex, it also involves an extensive network of quality assurance measures.

## 1. The CASTOR® family

In connection with the disposal of waste from German nuclear power stations a total of some 900 CASTOR® (Cask for Storage and Transport of Radioactive material) transport and storage casks have been developed, tested, certified and manufactured since the early 1980s<sup>1)</sup>. Nearly all of the casks in this series have a cask body made of ductile cast iron. A double lid system seals the inside and the contents are sealed long-term by metal seals.

In accordance with the latest requirements and wishes of the German utilities operating nuclear power stations, the following versions of this model of cask are currently used for interim

storage at the power stations or in the transport cask storage facilities:

The CASTOR® V cask was developed to hold spent pressurized water reactor or boiling-water reactor fuel rods from German power stations with a decay time after loading of the cask of approx. five years (Roman: V). The design is based on the international regulations of the IAEA (International Atomic Energy Agency) in accordance with predefined requirements such that the casks conform with all international standards and regulations for public transportation by road, rail or sea.

The CASTOR® V/19 cask is designed to hold 19 spent fuel rods from pressurized water reactors, and the CASTOR® V/52 cask for holding 52 fuel rods from boiling-water reactors. Both casks are almost 6 m in length, have external diameters of approx. 2.5 m and wall thicknesses of approx. 50 cm. The proper weight of each cask is approx. 105 Mg; when loaded the total weight is approx. 125 Mg.

For returning HAW glass canisters (HAW = High Active Waste) with vitrified, highly radioactive waste from the reprocessing of spent fuel rods in France and Great Britain, the CASTOR® HAW 20/28 CG cask, which holds either 20 or 28 canisters, was developed and given approval.

In addition to these standard versions a range of special models were also developed to meet the specific requirements of the diverse reactor types in the East European market.

What is the structural design of the CASTOR®? The main elements – taking the HAW 20/28 CG

as an example – are a thick-walled cylindrical cask body made of ductile cast iron and a double lid system, which together form a sealed enclosure and provide the shield against radiation. To provide a shield against the neutrons which are also generated in nuclear fission, holes distributed evenly along the wall of the cask are fitted with so-called moderator rods made of polyethylene, and panels of the same material are also fitted to the floor and underside of the secondary lid. In addition, the shell of the cask has a pair of trunnions fitted on both the floor and lid side to enable handling equipment to be attached.

The so-called assembly basket for holding the fuel rods is a welded structure. The cylinder surface is augmented with cooling fins which provide for the efficient dissipation of heat to the surroundings.

The protection plate is only used during storage and provides protection against external mechanical stress and loads and the influence of the weather.

During transportation the cask is fitted with shock absorbers at both ends to reduce the load of any possible impacts. These are made of wood covered with sheet metal.

The lids are made of stainless steel. All the lids are screw-fitted and sealed with long-term resistant metal seals, and a complex cask monitoring system ensures that the condition of the seals is permanently monitored during storage.

<sup>1)</sup> Our customer GNS, Gesellschaft für Nuklear-Service mbH in Essen has all rights to and overall charge of the CASTOR® project. We wish to thank the company for the support given in the preparation of this report.

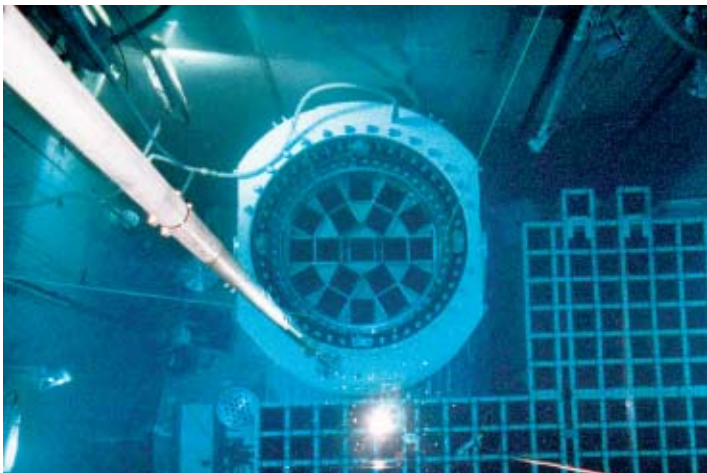




Mechanical machining on the large lathe

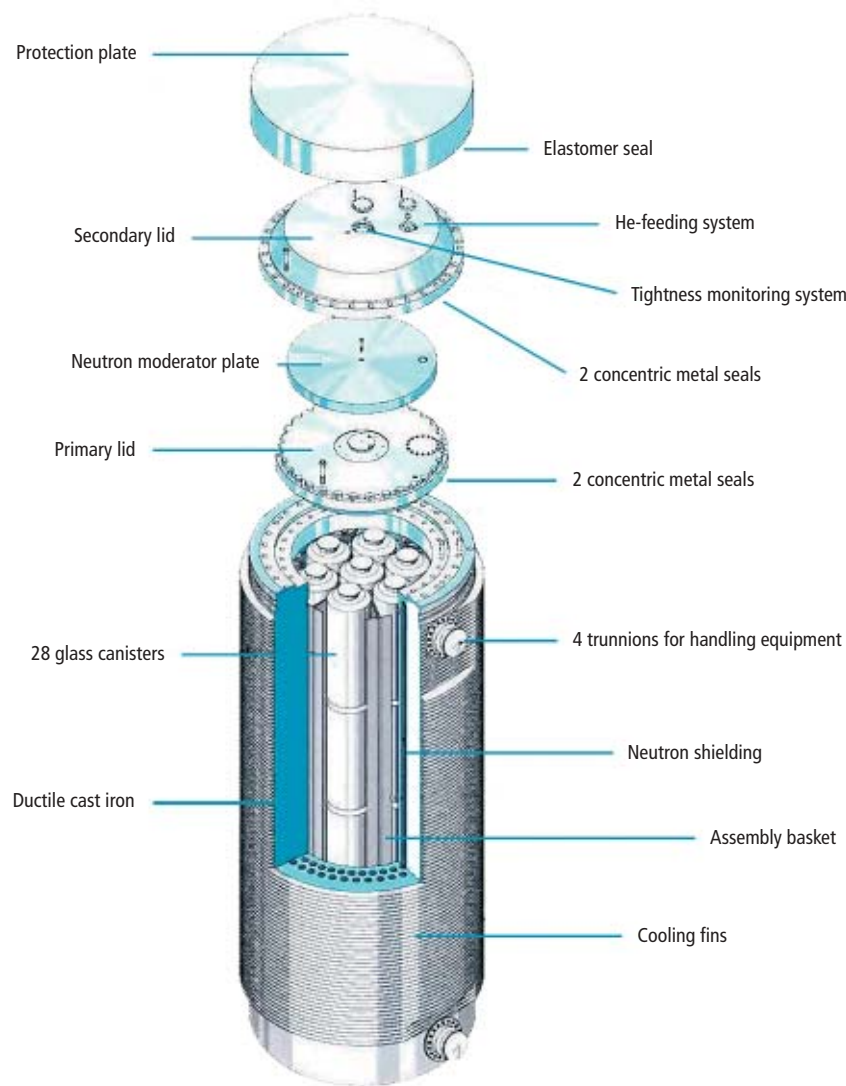


Assembly work for the CASTOR®



Loading a CASTOR® with spent fuel rods in the nuclear power station

Structural design of the CASTOR® using the HAW 20/28 CG as an example



2. The material

The CASTOR® is a cask which has to meet requirements in respect of both transportation and storage. The material used must therefore conform with special qualification characteristics, all of which can be met by nodular cast iron.

A key advantage for the CASTOR® as a system as a whole is the monolithic structure of the cask body, which under the principle of “all from a single cast” meets the requirements for completely safe and reliable enclosure and the shielding function without any additional seams. The suitability of the material must be proved in a series of highly involved tests and the specifications for the design include the transportation accident conditions set out by the IAEA (e.g. a drop from 9 m onto an inflexible ground surface, a 1 m drop onto a spike and a subsequent heating test).

3. The production process

Extensive experience has been gathered in planning, production and operational use. Nevertheless, the CASTOR® is not actually a serial product in the normal sense of the word. Each cask is a high-tech system which is manufactured in small piece numbers for each order with all the rigour required to achieve assured quality. With its about 160 Mg of molten iron in the pouring process required as a consequence of the necessarily thick shield wall, the cask body

is also one of the largest cast parts to be produced in the world, only capable of being made to high quality standards by hand mold casting by just a few manufacturers such as Siempelkamp.

The production process begins with the raw cast of the cask body at a casting temperature of approx. 1320°C at the Siempelkamp foundry in Krefeld.

Some 2 days after casting the molds are stripped as the outer cast structure, and after a further week in the pit for further cooling the cast part is then brought to the blasting shop.

In mechanical machining on the large lathe, which takes place in the Siempelkamp Nuclear Technology production center in Mülheim, approx. 50 mm of the wall of the cask bodies is then turned off to ensure that any unavoidable surface defects caused during the casting process are removed. The cooling fins are then machined in a later phase of work.

In deep hole machining, up to 100 lengthwise holes are made in the cask wall to a depth of approx. 5500 mm for fitting the neutron moderator rods.

A large boring machine is used mainly for the holes for the screw fittings for the lids and the trunnions.

The main purpose of the galvanized nickel plating<sup>2)</sup> on the inside of the cavity and the lid holders is to provide protection against corrosion during later loading underwater in the nuclear power station.

A comprehensive and stringently regulated handling and verification system involving predefined test instructions specified by the authorities ensures that the CASTOR® conforms with all applicable conditions. These include extensive tests on the material and structure plus integrity verifications by ultra-sound, for example.

In the assembly process in the GNS building in Mülheim the cask body assembly basket, moderator rods, trunnions, lids and a diversity of other small parts are put together to form the total product.

In the overload test the diverse screw fittings and load impact points are tested with 1.5 times the load of the maximum permissible cask weight.

In the leakage test all the cask's seal barriers are fully tested.

Adding together all the stages involved in production (including the preparation time for the mold production, molding etc.), the total time required for each project is about 1 year or even longer. This excludes the time involved for permissions, reports and safety tests, which can be particularly time-consuming where new types of casks are introduced or major design modifications are made.

When the cask is finally put into use at the nuclear power station a lengthy project path with many highly complex individual stages comes to an end. The precondition for trouble-

free production – and this should be mentioned here, too – is not only a high level of technical competence on the part of all the institutions involved but a committed and responsible team effort between them all.

<sup>2)</sup> Galvanized nickel plating is carried out by MTV in Solingen



# Wanted: A Higher Press Capacity

The capacity of plants for wood-based products is primarily measured by the capacity of their operating presses

By Otto Voss



Erection of the additional frames



Built-in of the press cylinders



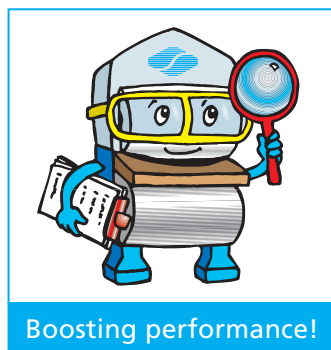
Installation of the discharge drum seat



The discharge drum seat already reintegrated Ready ...



... and looks good



Boosting performance!

## Example 1

Siempelkamp presses are amongst the most efficient machines in the market. They distinguish themselves from other presses by their quick heat transfer from the press to the mat and their unmatched high operating speeds. Often during new plant installations customers already bear in mind that after some operating time an increase in capacity will become necessary.

Several approaches aim at increasing the capacity of a plant, for example, preheating the mat before entering the press (see our article in this Bulletin), increasing the press speed, and increasing the press length.

A press extension is a proven measure in raising the press capacity because it increases the amount of boards produced in a given time. The longer a press is the more heat can be applied to the mat and with a given heating time factor the press can be operated at higher speeds. Higher speeds in turn mean that more boards can be produced.

In the following example a Siempelkamp Conti-Roll® press from 1998 for the production of particleboards was extended from 43.5 m to 48.5 m. This press belongs to our customer Prospan in Wieruszow, Poland (part of the Pfleiderer Group).

This extension had already been anticipated when the press was first installed. Provisions were made by putting in additional press foundations and enough space between the end of the press and the double diagonal saw during the initial installation of the line.

A press extension is always a time-critical task because customers request that downtime be kept to a minimum. Therefore, the modification has to be well planned and prepared ahead of time. Indispensable for a successful project are a well-trained team, the appropriate tools, the required parts that have to be delivered to the site on time, and a little portion of luck. As with every project, the disassembly of a press may hold unexpected

surprises. In such a case it is good to know that Siempelkamp has well-trained and skilled personnel with extensive experience in Conti-Roll® press extensions. A total of 19 presses have been extended by Siempelkamp worldwide.

In the case of Prospan, the press extension was from the beginning on anticipated for the rear end of the press. The first step of the press extension was the disassembly of the heat tunnels. Chains, roller rods, and steel belts had to be removed. Finally, the discharge drum seat and the succeeding roller conveyor were disassembled and the connection between the last two hotplatens unfastened. The progression of such tasks has the potential to influence the time schedule of a modification. For example, if the connection screws can easily be removed little time is spent on this particular task. If special tools are needed to remove the screws, the job may take longer. If not even special tools will remove the screws, other measures will have to

be taken. These measures can easily have a negative impact on time.

In the described Prospan case the screws could be loosened with a special tool. Afterwards, the extension hotplaten was put in place.

The installation of the 6 press frames and the placement of the press cylinders followed right after that.

Then, the final hotplaten was put in and the discharge drum seat fastened. New (or in some cases extended) steel belts and chains, as well as a larger number of roller rods, were put in position and installed.

Further works, such as adjusting the electrical equipment, changing the software and the visualization tools, were performed by the appropriate Siempelkamp specialists.

The modification to the Prospan press was carried out by 2 teams working in day and night shifts in approx. 3 weeks. The line was able to operate in 3-shift operation after only 24 hours following the startup.

## Useful benefit of a press extension

At a given heating time factor of 4 (glue reaction time of 4 seconds per mm of board thickness) and a board thickness of 16 mm a press extension of 5 m results in a press speed increase of approx. 12%. This figure is equal to an increase in capacity within the same scale.



# A Modification that Pays Back

When Huber's OSB plant in Commerce, GA went into production in 1989 it was the company's second installation. Today Huber Engineered Woods (HEW) is operating five OSB mills all equipped with Siempelkamp presses

By Joachim Meier



## Example 2



Chain conveyors at the hotplatens

The Commerce installation is equipped with a 12 opening press. It was one of the first to use the new Siempelkamp CombiLine system, combining the advantages of forming on a belt with the caul screens running through the press, only in order to make the required surface imprint.

A scheduled plant downtime in 2005 presented a good opportunity for an upgrade of the press loading system.

In its original condition the press screens carrying the strand mats were transported by trays from the loader cage into the press. The screens were then clamped in the press while the trays retracted underneath the screens. This system required the trays to fully retract out of the press before the press could start closing, thereby losing several seconds per press cycle.

The new Siempelkamp concept consists of chain conveyors mounted to the press hotplatens pulling the screens into the press without requiring a reverse movement.

The Siempelkamp service department worked out a proposal to adapt this chain conveyor

solution to Huber's press, keeping the required modifications as small as possible. The chain conveyors were to be mounted into the existing limited space without requiring changes at other press components.

The complete loader was to stay in place and only to be lowered by one inch. The loader trays were then to be used to only advance screens with mats into the reach of the press chains. Doing this the press dead time could be shortened.

Huber's engineering group immediately recognized the value of this proposal and placed the order with Siempelkamp USA to deliver this equipment to be installed during the green end upgrade.

Huber and Siempelkamp engineers jointly worked out an optimized schedule to fit the press loading modification work into the remaining plant work to be done during shut-down.

The mechanical equipment for the rebuild was manufactured in Siempelkamp's shop in Krefeld, Germany while the supply of the new drive

cabinet and the modification of press controls came from Siempelkamp Canada.

When the press equipment arrived at site in April 2005 the new press infeed drive was installed adjacent to the press with the plant still in production. The drive cabinet was installed and tested in order to minimize the work during shut-down.

All further modification work was accomplished during a plant shut-down in May 2005. Through close cooperation between Huber's engineering group, plant personnel, contractor and the local North American Siempelkamp service team the work proceeded on schedule with the pressline ready for startup at the set date.

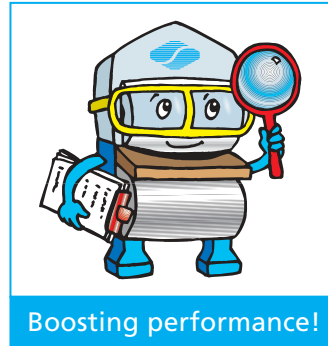
Further fine-tuning of the program cycle by Siempelkamp service engineers and Huber's control specialists during the week following startup realized the total expected time saving per press cycle. Accomplishing this goal made the project a full success for HEW and Siempelkamp. The time saving will result in increased production capacity of the pressline and allow a quick pay-back of the project cost.



# MDF-Preheating

Another example for boosting the performance of a ContiRoll® is the preheating of the mat before entering the press. The Siempelkamp system is very successful in OSB-preheating for years and is now also available for MDF.

By Klaus-Peter Schletz



Boosting performance!

## Example 3

### 1. The trend goes towards larger capacity MDF plants

The trend towards plants with a larger production capacity for MDF boards, OSB, and particleboards is rising. Larger capacity plants help to lower production costs and thus provide manufacturers with a competitive advantage in the wood-based products market.

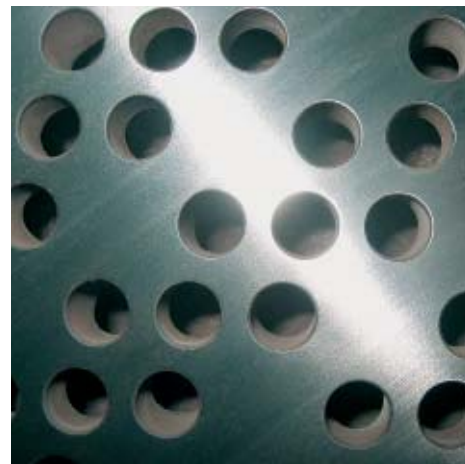
In the beginning of the seventies the daily output of a single line for the production of particleboards was approx. 1000 m³ boards. Today, lines for the production of wood-based products can manufacture up to 2000 m³ boards daily. For the production of MDF boards, ContiRoll® presses with a length of up to 55 m are no longer an exception.

### 2. Ways to increase production capacity

The hot press uses heat and pressure to press the wood-based mat into the finished board. The capacity of each hot press production line depends on the amount of energy supplied to the mat in a given time and on the specific heat demand of the mat.

The specific heat flow from the press into the mat can only be increased with great effort and state-of-the-art technology.

The fact that the specific heat demand of the mat decreases noticeably if the mat enters the hot press at higher temperatures offers an effective approach to increase the capacity. Many attempts have been made to increase the temperature of the mat before entering the press.



The steam injection plate

to decrease the curing time in order to increase capacity. Basically, all these measures can be assigned to the following three categories:

- **Speeding up the curing time of the glue in the press**

This category includes all measures that accelerate the curing time of the glue, for example by using different curing agents or more reactive glues.

- **Improving the heat flow during pressing**

The second category includes all measures that help to improve the heat flow through the mat which in turn accelerates the heating of the mat. Such measures involve the temperature of the hot platens, the heat transfer from the hot platens to the steel belts, the moisture content inside the mat, and the spraying of the surface layers with water. Adding moisture to the mat, as described in the last two measures, results in a stronger steam generation on the board surface which in turn increases the heat transport into the board (also called steamshock).

- **Increasing the mat temperature before entering the press**

This last category includes all measures that aim at increasing the temperature of the mat before entering the press. For example, an improved insulation for the transport chute between the dryer and the matformer reduces the heat loss in fibers and particles. For MDF production an attempt was made to heat up the fibers in sifters or by adding steam during the transport of the fibers to the fiber bunker. However, the best reduction of the cure factor can be achieved by preheating. During preheating the mat is heated to its highest technologically possible temperature before entering the press.

### 3. Preheating before the hot press

Preheating the mat before it enters the hot press can be done in two different ways. One process uses electromagnetic waves such as HF or microwaves, the other process preheats the mat through a gaseous mixture.



A preheating device during installation





The ContiTherm® in line with the ContiRoll®

- **Preheating by means of electromagnetic waves**

Preheating by means of electromagnetic waves has one advantage but two clear disadvantages. The advantage is that this process can be used to heat up nearly every wood-based mat (particleboard, OSB, MDF boards, LVL, etc.). A disadvantage of this process is the need for expensive electric energy to heat up the mat. Furthermore, glue and water absorb the energy of the electromagnetic field better than wood. This might cause the mat to be heated up unevenly. Local overheating can cause serious damage to the glue.

- **Preheating by means of a gaseous fluid**

Preheating by means of a gaseous fluid can only be carried out if the fluid is able to flow into or flow through the wood-based mat. For this method, hot air, hot steam or a hot steam-air mixture can be used as heat carrier medium.

Hot air releases heat while flowing through the colder mat and thus heats up the mat. If steam is used as heat carrier medium the mat is heated solely by the condensation of

the steam onto the cold wooden particle or fiber surfaces. During this process, the energy used for evaporating the water is released. The condensation energy of the steam has a heat content which is several times higher than that of hot air and can heat up the mat very quickly.

Because of their disadvantages preheating methods using electromagnetic waves are used only when a steam-air mixture cannot penetrate into the mat as it is the case with Laminated Veneer Lumber (LVL) or with the high-quality specialty product "Parallam".

Preheating of a mat by means of a gaseous fluid hasn't achieved a widespread use so far. As far as air is concerned, the main reason for it is its low effectiveness resulting from the low heat content of air. Furthermore, hot air doesn't permit an even heating. Thus, temperature and moisture gradients can develop which can cause serious technological problems.

If pure steam is used for the preheating of a wood-based mat, the mat is heated through

condensation up to a 100°C. If a large part or the complete mat shall be heated, a sufficient amount of steam has to flow through the mat. Starting from where the steam is applied to the mat, a condensation front moves in flow direction through the mat, dividing the part of the mat which is already heated from the one that is still cold. If a bigger part of the mat thickness has to be heated more steam has to be applied to the mat, thereby enlargening the part of the mat that is heated to a 100°C.

#### 4. Functional principle of the ContiTherm® method

The ContiTherm® method for preheating of wood-based mats is based on the preheating by means of steam condensation. The goal of this method is to heat up the entire mat quickly and evenly.

The advantage of this method is the ability to use a steam-air mixture which avoids a heating of the mat above the desired preheating temperature. The desired preheating temperature can be exactly set by adjusting the amount of steam in the mixture.

The preheating temperature is equal to the dew point of the steam-air mixture. When the mixture is cooled down the steam starts to condensate when the dew point temperature is reached. At this temperature the air becomes saturated and the relative humidity is 100%. If the steam-air mixture comes in contact with a surface of which the temperature is lower than the dew point of the mixture local steam condensation on the surface occurs. This local condensation ends immediately as soon as the surface has reached the same temperature as the dew point of the mixture.

When mixing steam and air, mixtures consisting of only steam to mixtures consisting of only air with dew points between 0°C and 100°C can be produced. Because the dew point depends on

the amount of steam in the steam-air mixture, the temperature that the mat shall reach can be exactly set by means of the dew point control. If the preheating temperature/dew point temperature is selected in such a manner that it won't cause any damage to the glue the mixture can be applied to the mat until the mat is completely heated up to the desired preheating temperature.

Due to the steam condensation the moisture content of the wood-based mat is increased by approx. 0.7% per 10°C temperature increase. This moisture increase occurs evenly throughout the mat during preheating and is calculable. Therefore, it doesn't represent a technological problem at any time.

- **The quick heating of the wood-based mat to the preheating temperature**

The very high specific amount of energy which is needed for the vaporization of water and which is released during condensation makes steam an excellent heat and energy source.

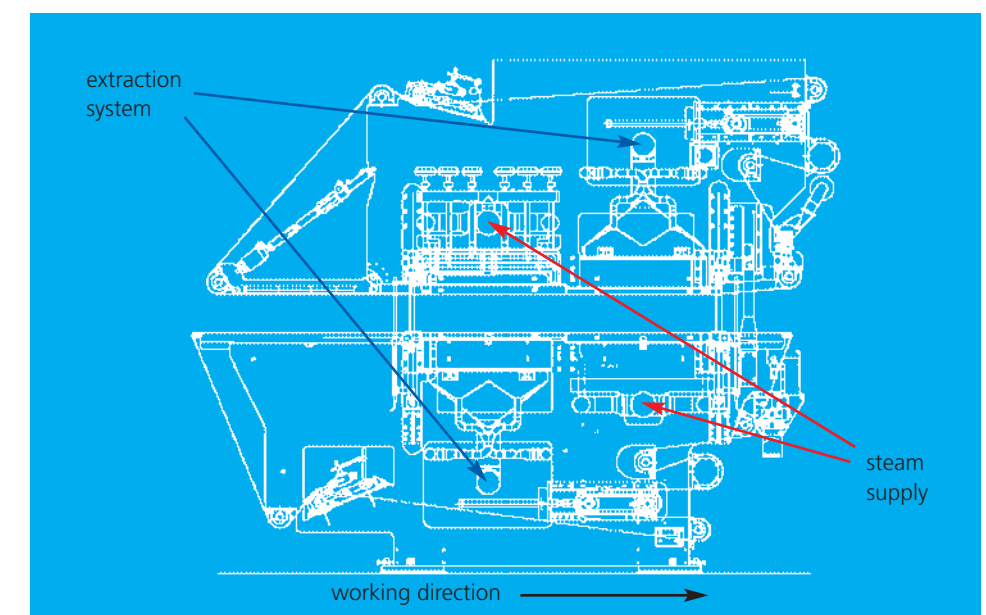
For the preheating of the wood-based mat only a small amount of steam/steam-air mixture is needed and can be applied in only a matter of seconds.

- **The systematic and even heating to reach the preheating temperature**

The condensation of the steam in a steam-air mixture starts as soon as the temperature falls below the dew point. An example we all have witnessed is the condensation that occurs on cold windows or mirrors of which the temperature is lower than the dew point of the surrounding air.

The more steam the air contains the higher is the dew point and thereby the temperature at which the steam condensates. By controlling the amount of steam in the steam-air mixture the temperature that the wood-based mat shall reach through steam condensation can be easily set.

After reaching the desired preheating temperature no further condensation of the steam takes place. An overheating of the



Graph 1: Side view of a ContiTherm® fiber-mat preheater



wood-based mat is therefore impossible. Because the temperature of the steam-air mixture is only slightly above the dew point and because the entire preheating process only takes a few seconds, the hot air that is flowing through the mat also won't cause overheating of the mat.

5. The ContiTherm® principle for MDF production

The mixing chamber is the main component of the ContiTherm® steam-air-system. The air is mixed with exactly the amount of steam needed to reach the technologically desired dew point. The preheating temperature control is very reliable and allows maintaining a stable dew point for long periods of time. The mixture is transported via insulated supply lines from the mixing chamber to the ContiTherm® preheater where it is applied to the mat via funnels and steam injection plates.

This principle is similar to the one used with the OSB ContiTherm® where it has been working successfully for years.

Graph 1 shows a schematic side-view of the MDF ContiTherm® preheater. The lower and upper steam plates of the preheater with a circulating screen belt each and the two pre-heater sections with a length of 1.5 m each can be seen.

In the OSB ContiTherm® the mixture flows from the center of the mat to the mat edges. This flow direction is not possible with the MDF ContiTherm® because of the high flow resistance in MDF mats. The only way for the mixture to completely heat up the MDF mat is for it to flow vertically through the mat.

Graph 2 shows how the steam-air mixture flows through the MDF mat vertically from top to bottom in a section of the ContiTherm® preheater. If the pressure loss, which is developing as the mixture is flowing through the mat, would be present as overpressure acting on the mat blow-outs would damage the mat edges. To avoid blowouts the loss in pressure is applied by a suction fan beside the existing mixture injection fan.

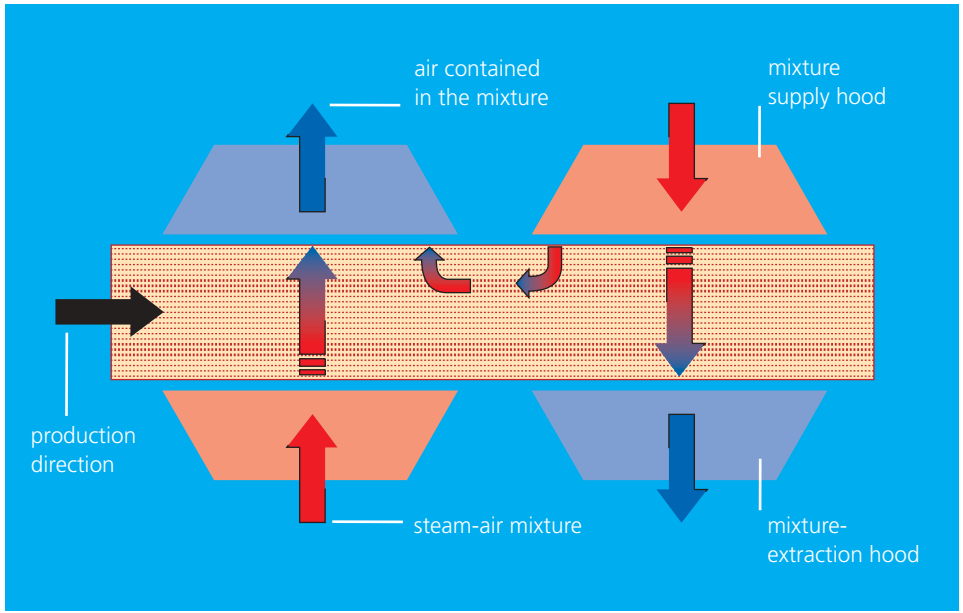
Another schematic section of the ContiTherm® shows the steam-air mixture flowing in the opposite direction through the mat, i.e. from bottom to top. Thus, temperature and moisture gradients are kept as low as possible so that MDF boards keep their symmetrical density profiles even when preheated.

Unlike in OSB preheating, a correct preheating of the mat edges cannot automatically be achieved for all product widths with the type of flow geometry used in MDF-preheating. Therefore, the MDF ContiTherm® preheater has a built-in widths adjustment that allows modifying the inflow width as well as the suction width according to the width of the particular product.

Because the MDF mat is plastified in the ContiTherm® during preheating, the upper plate of the preheater is closed slightly more in the outfeed than the infeed.

The condensation of steam during the MDF ContiTherm® preheating process can cause water stains on the boards. Therefore, the flawless operation of the heat tracing of the steam injection plates is of higher importance for the MDF ContiTherm® than it is for the OSB ContiTherm® operation.

The mixture used with the MDF ContiTherm® is relatively moist to avoid a drying of the mat surfaces during preheating.



Graph 2: How the steam-air mixture flows through the two sections of the ContiTherm® fiber-mat preheater



Installation of a ContiTherm®



Tune-up of an existing line with a ContiTherm®

6. The experiences made with the MDF ContiTherm® system

The first MDF ContiTherm® preheater was installed in Turkey in 2003 as part of a new 20.5 m long MDF ContiRoll® press. With the ContiTherm® preheater it is possible to produce boards with a thickness of up to 60 mm on this press. After optimizing the control concept of the ContiTherm®, this preheating process is used for all products and it has been running successfully for over a year. At the present time another MDF plant with a 55 m long ContiRoll® with ContiTherm® preheater is put into operation in Turkey. In 2005 two more MDF-preheaters were added to already existing MDF ContiRoll® presses in order to increase their production capacity.

For the modification of already existing forming and pressing lines, downtime was kept to a minimum of only one week. In comparison, the extension of a press to reach a comparable increase in capacity would have required a much longer downtime.

The ContiTherm® preheater and the control concept have matured to a degree that allows the expected and guaranteed capacity increase to be achieved after only a few hours of operation. The basic startup time for this implementation is only a week long. The optimization process of the press programs, which has to be carried out right after the basic startup in order to achieve the maximum production capacity, can be compared to the optimization process for a new ContiRoll® press.

MDF boards with a thickness ranging from 6 to 60 mm are produced on the ContiTherm® preheater at preheating temperatures between 50 and 75°C. At lower dew point temperatures, the amount of air in the mixture increases and the preheating process becomes less effective. Therefore, preheating temperatures below 60°C should not be used.

To compensate the moisture intake during the ContiTherm® preheating process, the moisture content of the fibers has to be lowered in the flash dryer prior to preheating. The applied glue should also be adapted to the production conditions of the ContiTherm® preheater, especially for thicker boards that are produced with lower feed speeds.

When using sufficiently high feed speeds and a glue that has been adapted to higher preheating temperatures, only a minimal increase in glue consumption is to be expected at a preheating temperature of 75°C.

The experiences we made with our 3 operating MDF ContiTherm® preheaters demonstrate that the use of the ContiTherm® system results in a considerable increase in capacity. Our results show that by preheating with temperatures between 60°C and 75°C an increase in capacity of 0.8% per 1°C temperature increase can be reached for boards with a thickness above 6 mm. In some instances, an increase in capacity of 1.2% per 1°C temperature increase was achieved. When heating a mat from 30°C to 70°C this result is equal to an increase in capacity between 30% and 50%.

With such a considerable increase in capacity, the MDF ContiTherm® preheater implements the first MDF-preheating process which utilizes the enormous potential of a mat that is completely heated before entering the press.



# Production Intelligence

Modern manufacturing plants are under high demand to increase plant availability and ensure product quality while maintaining efficient resource usage and production schedules. Siempelkamp faces these challenges by offering more profitable and efficient lines which are equipped with our enhanced and proven control technology.

By Gregor Bernardy and Trajan Sandweg



prodIQ

The production of wood-based products is a technically and technologically challenging process. Due to large plant dimensions, increasing use of recycled wood and other influencing factors (e.g. ambient conditions, interlinking production steps, factors influencing the product quality), it is becoming increasingly difficult to meet the requirements for continuous production and for developing new optimized production methods. In order to meet these production challenges, reliable process control tools are needed. In addition, it is a proven fact that wood-based production facilities can only run fail-safe with the right maintenance concept and management in place.

In order to reach these objectives, Siempelkamp has developed the control technology system Production Intelligence (Prod-IQ). Many years of experience and 50 predecessor systems helped to further enhance the range of activities of the Prod-IQ. Prod-IQ is based on the Microsoft .NET platform and ensures customers flexibility for future investments.

### What is Production Intelligence (Prod-IQ)?

Production Intelligence (Prod-IQ) is a control technology system which is based on a wide range of modules. It allows a quick integration

into existing control structures according to the customers’ needs. Prod-IQ combines various process control applications under an integrative program interface. It is divided into the separate areas of Prod-IQ.basics, Prod-IQ.business, Prod-IQ.quality, and Prod-IQ.maintenance. All modules are based on a standard production database which integrates and links all process and operating data of all plant components.

### Prod-IQ.basics

The Prod-IQ.basics version includes basic functions for data collection and monitoring, e.g. for process and production trending, acquisition of downtimes and statistics, and commission evaluation.

All the important process data concerning raw board production and, if necessary, the sanding line is collected online, time-stamped, and stored in a systemized database. An integrated system tracing the material flow enables the punctual assignment of process values to the finished product or the data of the laboratory section test. Thus, the entire board production process is precisely documented and stored. Prod-IQ.basics is a standard feature of our new ContiRoll® installations. With the help of Prod-IQ.basics the system “learns” right from the start which processing conditions lead to a certain product quality.

### Prod-IQ.business

Prod-IQ.business is a completely automated reporting tool including web modules for shift, daily and monthly evaluations. Thus, important up-to-date characteristics are regularly available to the management in order to evaluate the line’s productivity. This includes production times and quantities, rejection rates, and consumption levels. Other plant components such as sanding lines or short-cycle press lines (LAM-IQ) can also be incorporated. Furthermore, the system can be connected to higher-level ERP systems (SAP systems) without problems. Special modules used to generate a total cost transparency (e.g. by cost trending) can also be easily implemented.

### Prod-IQ.quality

Prod-IQ.quality is a comprehensive system for the online quality control of important quality parameters. This system is based on statistical process models which were originally developed as SPOC system (Statistical Process Optimization and Control). With the help of laboratory sections Prod-IQ.quality is able to “learn” which processing conditions lead to a certain product quality. Prod-IQ.quality can forecast the quality of the manufactured product online directly from the provided process settings, i.e., the system can determine the quality directly after a board

has left the press. Thus, the raw density can be determined with a 99% accuracy and the transverse tensile strength as well as the bending strength with a 95% accuracy. Without Prod-IQ.quality measurable product parameters such as the transverse tensile strength, the bending strength, or the thickness swelling could only be measured by means of destructive material testing. The quality parameters are represented in trending diagrams. In addition to the current quality, the system also indicates the minimum necessary safety margins which have to be maintained as a result of the actually occurring process fluctuations.

### Prod-IQ.maintenance

Prod-IQ.maintenance is an extremely efficient software system which is used to carry out preventive maintenance and servicing jobs on production machines and plants. The module contains a plant structure tree that can be used to allocate objects to be maintained in a clear and understandable manner. This allows for a hierarchical structure, e.g. in accordance with factory, plants, groups, units, construction elements and components, whereby all objects are registered and easy to find again. Comprehensive information can be stored for every maintenance object. In addition to the maintenance criterion/maintenance interval, details of information such as identification numbers, installation date, place of installation, CAD drawings, images, service instructions, and scheduled times for servicing can also be entered. Traditional maintenance approaches result in additional costs through plant inspections to detect modules and components reaching a critical state. In order to avoid this, Prod-IQ.maintenance evaluates relevant process data, such as operating hours, loading patterns, temperature and patterns of loading, via an online connection. The system then generates personnel-specific service orders according to the actual condition of the machinery.

### How can Prod-IQ increase the profitability of a plant?

To increase the profitability and availability of a plant, the production of rejects has to be

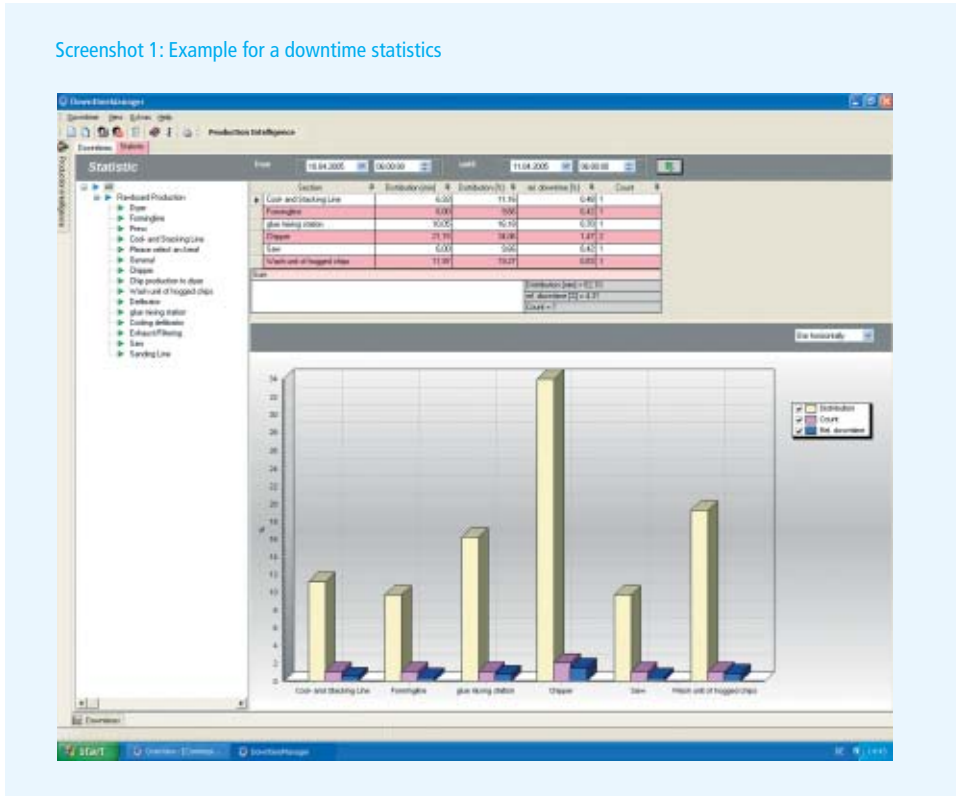
avoided, quality ensured, resources preserved, and repair and maintenance costs reduced. The foundation for all plant-related improvements and decisions is relevant process information. Prod-IQ stores all process and operating data in a linked database and then evaluates it according to the needs of the user (management, production manager, technologist, quality assurance personnel, operator). The Prod-IQ system represents the information center of the entire production. The rapid availability of characteristics (KPI – Key Performance Indicators) results in more transparency and contributes to the desired increase in profitability.

### Increased profitability by analyzing weak points and taking the appropriate measures

Prod-IQ.basics features modules for data acquisition and evaluation. For example, the downtime statistics module, which provides extensive information related to downtime duration and causes, and the commission report are included. The durations and reasons for the downtimes that are held in the downtime acquisition are

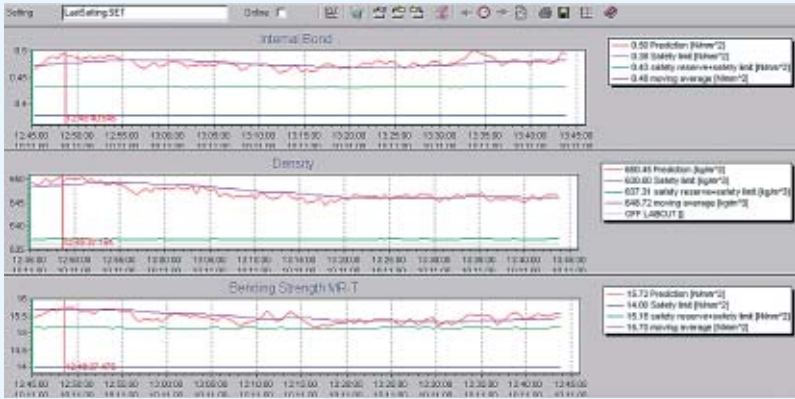
grouped, ordered and evaluated in the downtime statistics and the total durations and frequencies of certain downtimes are presented in a bar graph (screenshot 1). Weak points can easily be recognized so that the appropriate measures for the elimination of the main downtime causes can be taken. The flexible comparison of before and after conditions shows whether the applied measures were successful.

Users of the system are also able to receive early warnings based on the collected downtime data. If, for example, an increasing number of notifications are given in regard to metal contained in the mat it is advisable to look for the damaged equipment parts from which the metal pieces broke off before these parts are totally damaged. Such precautions can prevent time-consuming repair works. Also, the included trends reduce the duration of downtimes because they allow the retroactive reconstruction of changes to process parameters from one machine to the next. As a result, the cause for a downtime can be found much quicker.

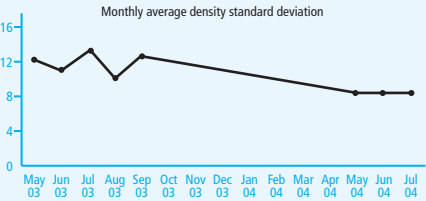




Screenshot 2: Example of a quality trend



Graph 1: Example showing the reduction of process fluctuations (standard deviation raw density of HDF boards)



**Avoid rejects:** Evaluate quality online beforehand  
When Prod-IQ.*quality* has gathered enough data, the expected quality can be determined from the current process settings with the help of a mathematical model (online quality control). The model can be equated with knowing precisely which process parameters influence quality in which way. The user simply selects the process parameters used in the model and everything else, especially the weighting of the influences, is performed completely automatically. In order to assist the user with his selection of process parameters, Prod-IQ.*quality* has been further developed and improved and it is now possible to generate a model almost automatically.

The process model is used to calculate and predict the quality according to the actual production conditions. This calculation is performed with high accuracy as our experiences with MDF, particleboard, and OSB lines verify. The quality trend informs the user instantly whether the quality is safely kept.  
Screenshot 2 represents a quality trend. In order to avoid rejects, the red curve (calculated online quality) has to stay above the green curve (necessary safety margin). If the curve progression changes it is possible for the operator to react immediately without having to wait for a result from the laboratory.

- Predicted accuracies (average values):
- Raw density 99%
  - Transverse tensile strength 95%
  - Bending strength 95%
  - Thickness swelling 94%
  - Lift-off strength 94%

**Preserve resources** by keeping the product quality only as good as needed and by better controlling the process  
In addition to the current quality, the system also indicates the minimum necessary safety margins which have to be maintained as a result of the actually occurring process fluctuations. Thus, the operator is always aware which quality the line is producing, even if the quality is higher than necessary.

The example in screenshot 2 shows a density reduction of approx. 5 kg/m³ within 30 minutes. The material used is reduced until the specified bending modules of rupture is precisely achieved (necessary safety margin – green curve). A further reduction would lead to quality problems. The operator is able to precisely set the necessary safety margins for the desired production or quality level of his line. The impact of changes to the process settings on the quality

Screenshot 3: Example of a cost trending (simulation)



are immediately displayed in the trend. As a result, the production process can be controlled better and process fluctuations can be reduced (see graph 1).

**A transparent production process:** Cost trending clearly illustrates the effects of changes to the process settings

A meaningful addition to the quality trend is the newly developed cost trending module (screenshot 3). While the quality trending displays the effects that changes to the production settings have on the quality, the cost trending shows the effects that changes to the production settings have on the production costs. This value is displayed as a percentage value to keep the cost secret.

In this module the “tachograph” displays the actual calculated cost value, while the adjacent area compares cost characteristics by shift in a bar chart. Beneath it the cost trend is shown. Any deviations in target values from specified target values (e.g. glue factors, weight per unit area/raw density, and production speed) are evaluated using adjustable coefficients of costs. This provides the production manager with a high degree of control and the plant manager with a high degree of cost consciousness. The costs of production are perfectly transparent at all times and the impact of any changes to plant parameters can be seen immediately.

With this module it is, for example, possible to determine whether it is more cost efficient to use more glue if the use of more glue helps increase production speeds.

**How cost efficient is Production Intelligence (Prod-IQ)?**

For many years the predecessor systems of Prod-IQ (PROMACS and SPOC) have been successfully operating at numerous plants. Prod-IQ is now running in 7 plants and is used in all new installations since the end of 2004. With the help of

Table 1: Example for cost reduction with Prod-IQ

Example of a plant

Amount of production	1,000	m³/day	costs of wood	50	€/to
Average density	650	kg/m³	costs of glue	250	€/to
Average of earned profit	40	€/m³	personell cost	50	€/h

Modules/functions

Prod-IQ. <i>basics+business</i>	x	(PROMACS)
Prod-IQ. <i>quality</i>	x	(SPOC)

Benefits	value	experience from	up to	remarks
Reduction of downtimes in %	1.5	1.5	2.5	downtime analysis detects failures more easily
Increase first quality in %	1.0	1.0	2.0	online quality control
Material savings in %	2.5	2.5	3.0	increased process capability → lighter boards – same quality
Increase press speed in %	0.5	0.5	6.0	closer to guaranteed quality
Time savings for reports in h/day	1.0	1.0	2.0	automatically generated reports and KPIs
Cost optimization (“Tacho”) in %	0.5	0.5	1.5	increased awareness of costs
Benefits in €/day	2,405	Sum		
Cost reduction in €/day	2,295	(– running costs)		
Cost reduction in €/year	837,675			

Prod-IQ these plants were able to provide an extensive amount of data regarding cost savings. Downtimes could be reduced by 1.5 % – 2.5 %, rejects by 1.0 % – 2.0 % and material consumption was lowered by 2.5 % – 3.5 % (see table 1).

The presented example shows how high the savings are when Prod-IQ is used. For a

1000 m³/day-plant, the savings amount to more than €800 thousand per annum.

This proves how effective the use of automated control technology can be for a plant nowadays. The advantages exceed the investment costs of a Prod-IQ by far. Therefore, it is difficult to understand why some plant owners are still not using this kind of information system.



# Wuxi Conquers Asia

Siempelkamp starts production for the Far-East in China

By Ralf Griesche



Best wishes: with the cutting of the ribbon by Dr. Hans W. Fechner (4<sup>th</sup> from right) and Heinz Classen (5<sup>th</sup> from right), Managing Directors at Siempelkamp Maschinen- und Anlagenbau, the Chinese subsidiary starts operations in the Asian market

On July 5 of this year the time had finally arrived: Dr. Hans W. Fechner and Heinz Classen, Managing Directors of Siempelkamp Maschinen- und Anlagenbau GmbH & Co. KG, Krefeld, Germany ceremoniously opened the new plant for the company's first subsidiary in China. This represents the high-point so far of two decades of activity in the Far-East. The new company, Siempelkamp (Wuxi) Machinery Manufacturing Co. Ltd., is based in the city of Wuxi in the province of Jiangsu.

China is, as everyone knows, by no means a small country. Beijing, Shanghai, Canton, Hong Kong – well-known names. But Wuxi? Just a small town perhaps? Nothing could be more wrong, for in Wuxi the press specialist with registered headquarters in Germany has selected a prosperous city in the vicinity of the metropolis of Shanghai. With a population of 1.7 million, Wuxi is roughly the size of Hamburg in terms of figures and is one of the ten fastest growing economic regions in China.

## Close to the customer

There are a range of reasons in favour of a plant in Wuxi. In geographical terms it is close to the sea and to Shanghai, which is approximately 150 km to the south-west. In commercial terms the key advantages revolve around wage costs, development conditions and the good infrastructure, which includes a city airport. In addition, Wuxi has been well established as a center for mechanical engineering for decades, so the workforce is well qualified in this particular field.

The primary considerations, however, were strategic. China, like Asia, is the fastest growing economic region in the world. A lot of jobs are dependent on the order situation in the Far-East – especially in Germany. And being close to the customer is a critical business factor without which it is difficult to offer the efficient and trustworthy consulting and support required. Customer loyalty is not just an empty phrase in Asia – the need to meet the wishes of the customer is taken extremely seriously.

## Growing in and with Asia

Siempelkamp has been active in the Asian-Pacific region for years and has delivered countless plants for the wood-based materials industry and other branches of industry there. China, too, has always been a significant sales market and the Krefeld-based company established its first small office there in the mid-1980s. After first renting in Hotel Beijing in the capital city, the company's representatives then moved into larger premises in the Silver Tower in Beijing.

The late 1990s then saw the establishment of Siempelkamp (Tianjin) International Trade Ltd as representatives. Even here it was customer proximity that was the main focus of the decision, with quick and direct supplies of spare and wearing parts to customers being another key consideration.

When an attempt to set up a plant a little later in the form of a joint venture was not as successful as had been hoped, the parent company decided that its medium-term objective would be to

develop its own component production for Asia and the Pacific/North American market, but without any institutional partners from China.

## Production with a high element of manual work

With a capital investment of approx. €1 million, development of the plant in Wuxi, which has 3,000 m<sup>2</sup> of production floorspace and 600 m<sup>2</sup> of offices, was started last year. The small production company manufactures parts with a high element of manual work – from mesh guards for ContiRoll® lines, insulation

cassettes or catwalks, as well as simple conveying systems.

In addition to the manufacture of steel parts and containers the plant is also responsible for in-situ quality control and direct purchasing of semi-finished and finished products in China. It is already apparent that after-sales services and optimized project development are making an increasing contribution to the profits of the subsidiary. These are all the result of hard work on the part of the company and its workforce – which promise to give Wuxi lasting and successful prospects.

Ceremonial opening of the plant on July 5, 2005 in the presence of honored guests, employees and friends



The new Siempelkamp Wuxi site with production building and offices





# Bigger than 8XL

Siempelkamp sets new standards in Fort St. John, Canada: 820 MMSF OSB produced on a multi-daylight press

By Ralf Griesche

Because of its boundless spaces, gigantic building structures, rags-to-riches careers, North America is often entitled the "Land without borders"... Many more stereotypes could be listed here. Due to their multitude, it is always impressive when one of them actually comes true. This was the case in Fort St. John, a small Canadian town in the province of British Columbia. In a joint venture, the two companies Louisiana-Pacific and Canfor decided to build a one-of-a-kind OSB plant. The heart of the plant is a 12-daylight press enabling a raw board size of 12' x 34'. With these dimensions the press is the largest multi-daylight press for the production of OSB worldwide.

## Peaceful economical development due to the wood-based products industry

In the beginning of the nineties, the provincial government of British Columbia started discussing ways to make better use of the region's natural resources. Their focus was especially set on an increased use of the province's forests. As a result of many negotiations, a structural



The wood yard of Canfor-LP with a yearly turnover of 1.1 million m³ Aspen and Cottonwood

Not only the First Nations people, as the native Canadians are called, were attracted to the region on the border of British Columbia and Alberta, which they named Peace Valley, but also traders, explorers, and homesteaders who founded a trade post there and made the area their home in 1794. At first, living conditions were provincial. This quickly changed in 1942 when the town was incorporated in the path of the Alaska Highway.

From then on Fort St. John was conveniently located between the Grande Prairie region, Alberta and the Delta Junction in Alaska. The growing town started to make the most out of the available natural resources in the form of natural gas, oil and wood. Fort St. John is *The Energetic City*, which reflects not only its large resource base, but also the vitality of its residents.

development program was prepared until 1998. The program's goal was to ensure the independent existence of the First Nations people, create jobs for the people in the area, as well as to use the available resources efficiently while preserving the environment. To make a long story short, the government was looking for a large investor from the wood-based products industry.

Louisiana-Pacific, as well as the former Slocan, own large forests in the Peace River region. These forests mainly consist of Aspen and Cottonwood, which are species that are robust, grow quickly, and ensure steady returns.

## The recipe for success: a partnership

Both companies showed great interest in the government proposal. With the goal of opening up the forests of the Fort St. John Timber Supply Area and, at the same time, implementing the social and municipal demands set by the government, they founded a joint venture with the name Slocan-LP OSB Corp. in 2000. This joint venture in the installation and operation of a future OSB plant united two giants of the wood-based products industry. Louisiana-Pacific alone employs just in Canada 2,200 people and runs 30 plants in the USA, Canada, and Chile. Its partner Canfor, Canadian Forest Products Ltd., has developed into the largest Canadian softwood supplier and employs more than 10,000 people. Included in this figure are the employees of the entire forest and wood division of Slocan, which Canfor acquired in 2004.

After government authorities had examined all investment documents, the Ministry of Sustainable Resource Management of BC gave the green light in 2002. The project could begin; a forthcoming giant was born! The following figures demonstrate what the expression "gigantic" means: the planned annual production capacity of the plant  $> 700,000 \text{ m}^3 = 5,460$  train wagons = OSB for 75,000 single homes. On the part of the resources this means: 1.1 million m³ of round timber will be used annually for only one plant! No need to worry about the sustainability though: British Columbia only permits a logging of 75 million m³ of wood yearly.

After the declaration of intent was signed and the acceptance provided, the planning works for the \$200 million project started immediately. On January 22, 2004 the decision to build the OSB plant was final. As a result 130 people will find a job at the plant; an additional 300 jobs will become available with sub-suppliers and customers. Finally, on June 1, 2004, the foundation stone for the new plant was laid.

Still under construction: the 20 m high (65.6 ft) 12-daylight press by Siempelkamp hides part of its enormous construction in a press pit





Chris Baby, General Manager of Canfor-LP OSB, recalls: "The project was an enormous undertaking. Normally, two plants would have been built, one for Canfor and one for LP. However, in our situation this wouldn't have made sense. Two smaller operations would not have been profitable and we would have had to work against each for timber supply, qualified labor and product markets. Instead, we decided to break new grounds. Both companies own large forests, so we decided to form a joint venture. We have gone beyond the scope in many ways. Canfor-LP OSB will be a plant that many people will speak of!"

#### The courage to take risks

The Canfor-LP Management started looking for suppliers that were willing to break new grounds together with the company in Fort St. John. Amongst many other companies and 300 workers responsible for the installation and assembly of

the plant, the expertise of Siempelkamp Maschinen- und Anlagenbau, Krefeld, Germany was in great demand. According to Canfor-LP, Siempelkamp was able to provide the technical and technological expert knowledge needed for the design and manufacturing of equipment in the desired dimensions for the production of OSB.

Siempelkamp supplied many crucial components for the plant. The heart of the entire operation, a 12-daylight press as high as an 8-story building, is Siempelkamp-made. This press impresses with its unique design, gigantic dimensions, and an enormous production volume.

The press compresses and bonds the raw strands to OSB in 12 daylight. With its nominal hot-press dimensions of 12' x 34', this press is capable of producing boards with a thickness ranging from  $\frac{3}{8}$ " to  $1\frac{1}{4}$ ". Thus, the daily production capacity is 2,070 m<sup>3</sup> OSB or 725,000 m<sup>3</sup> annually. In order to produce this kind of volume, eight hydraulic press cylinders, each with a piston

diameter of more than one meter (3.3 feet), have to press the hot-press, each weighing 77 US tons, with a force of 210 MN together.

#### New developments and solutions for a unique press

A unique press requires innovative development work. In order to manufacture, transport, assemble and maintain this giant press, the press design utilizes a modular construction for the press frames. The vertical frame components are held together by upper and lower cross beams to form the press frames. High fatigue strength of the press frames is ensured by using a unique connection method between the upper and lower cross beams and the vertical tensile members of the frame. The extensive Siempelkamp expertise is reflected in the design of these frame beams. Because of their dimensions (13 ft x 36 ft x 5.9 ft and a weight of 237 US tons) the beams were cast from ductile iron in Siempelkamp's own foundry in Krefeld, Germany,



The complete plant under one roof

which is one of the few foundries able to produce castings of up to 330 US tons, and then machined in the adjacent machine shop. This process created a rigid monoblock design that will withstand the press forces for decades.

Another notable characteristic is the construction type for this giant press. The immense forces and component dimensions made it necessary for Siempelkamp to base the design work on the Finite Element Method. This method is used when technical and physical coherences reach such a complexity that they are no longer manageable without a numerical simulation. The FE method breaks the problem down into small units which can be computer-simulated and their interactions evaluated. Once a model has been computed and elaborated, it is possible to infer all loads and stresses, deformations, reaction forces and pressure distributions, flow analyses or thermal conductivity, in a word, all interactions with the interfacing equipment. The result is a press for which the effects of the press forces and the geometry of each daylight and component part were precisely determined.

#### Constant wood supply guaranteed in three ways

On the one hand, the large capacity of such a press has many economical advantages. The multi-daylight technology permits a problem-free mass production. Robustness and weight distribute to a high reliability. Few moving parts and the modular design reduce press

maintenance. On the other hand, the gigantic Canfor-LP press uses enormous amounts of wood. To ensure the high availability of the plant, the Canadians made a complex, but absolutely reliable decision. The wood is supplied to the press via three supply lines which work completely independent from one another up to the mat forming process. If one line fails, e.g., because it has to be maintained, it is thus still possible to maintain the production of the end product around the clock by simply altering the product thickness.

To ensure a steady production, especially during the long and bitter cold Canadian winters, a

defrost basin is a necessity. After their arrival at the wood yard, the trimmed logs are transported via two gantry cranes to a basin filled with warm water. There, the logs are defrosted, separated and then transported off for further processing. Due to the cold winters, the complete production line is also placed inside a housing.

Three separate bark removers bark the logs. The subsequent strand processing is also performed on three separate machines. The produced strands are stored in three wet strand bunkers of 15,000 ft<sup>3</sup> each and afterwards fed to three

The press with the press loader



The press pit with the belt conveyor for the screens



The Siempelkamp team in front of the press loader







Three drum dryers side by side: even if one aggregate fails or needs to be maintained the plant can continue running at full capacity

rotary dryers made by the Siempelkamp subsidiary Büttner. The necessary energy to operate the dryers is partly generated by burning bark waste in three GTS generators with a built-in high efficient exhaust gas cleaning system. At a temperature of about 450°C (842°F), the strands are dried to their final moisture content. After the strands are discharged from the dryers, they are separated in cyclones and the water evaporated during drying is cleaned in wet electrostatic precipitators.

Three-layered board with Quadradyn®

The strands are transported via a pneumatic conveyer system to three Quadradyn® screens made by PAL. The latest development of the Siempelkamp affiliated company screens the strands on a roller system. The separation of the strands according to their size into fines, core, intermediate and face is precise and the composition of the future board is thus more homogenous and better structured. The fines are then

super-screened with an oscillating screen and once again fractioned into fines for fuel and fines for recovery.

Glue is applied separately to each of the three strand fractions in coil drums. Afterwards the strands are transported to the mat forming bunkers.

Via belt scales and a belt conveyor, the strands are directed from the three mat forming bunkers to the mat forming line. The strands are fed onto six mat forming heads and then spread in a uniform, multi-layered, endless OSB mat over the forming belt. To obtain a symmetrical board structure, the heads orientate the strands in specific directions, i.e. either in direction of the production flow or in transverse direction to the production flow. Before the mat enters the press, it is trimmed on the edges and cut with a diagonal saw to one of two available board formats.

An accelerator belt conveyor transports the mat to screens that run underneath the press. These

screens are responsible for leaving the imprint on the finished OSB. The 12 daylighters of the press are loaded and unloaded via a loading and unloading system. During the two to ten minute long pressing process, the press is operated with 80,000 l (21,134 gallons) of hydraulic oil and the hot platens are heated with 25,800 l (6,816 gallons) of thermo-oil. These figures are just another example for the gigantic dimensions of the press.

SHS: the specialist for finishing line equipment

Siempelkamp Handling Systeme (SHS) supplied the complete finishing line including a reject system for scrap boards, a cooling and stacking line, and a cut-to-size line with a longitudinal edge trimming saw and a cross-cutting saw. The longitudinal saw trims and divides the master-board into 4' wide strips in longitudinal direction. The cross-cutting saw then trims and divides these strips to their final board length in trans-

verse direction. The boards are transported to the cross-cutting saw via a chain drive configuration utilizing an electronic shaft. The result guarantees a perfectly square and highly accurate cut of panels.

SHS also supplied two packing lines as well as an improved high-speed tongue and groove line which is able to reach cycle times of less than 2 seconds. During the packing process, the board edges are sealed, the stacks are cross-strapped, imprinted and prepared for the transport and shipping.

Conquering the US-market with the "Power of Peace"

The OSB sales will mainly be handled by the offices of Louisiana-Pacific, which are primarily serving the US-market. If the amount of houses being built continues to rise, chances are good that the expected 820 million square feet of OSB (on a 3/8" basis) produced after production start

in spring 2006 can be marketed with a high profit margin. The OSB will be used for walls, floors, ceilings, and roofs in new houses.

As far as the marketing of the products is concerned, all conditions are looking great. Instead of using an outsourced consultant, the company decided to include the local population and employees in finding a company logo and a name for their business by having a contest. From a high number of entries, the Board of Directors made the final decision. Based on the plant's location in the Peace Valley, the new facility will be named "Peace Valley OSB". The logo will present the course of the river through the green valley. The more than a thousand-year old connection of the First Nations people with the region around Fort St. John is expressed in the Canfor-LP OSB Partnership's sobriquet "The Power of the Peace". A name of such magnitude overcomes all obstacles!

From left to right:

The Quadradyn®: the latest development by PAL for the perfect screening of strands has achieved positive market responses

To form the perfect mat: two forming heads each for surface layer, intermediate layer and core layer orientate the strands in specific directions to obtain a symmetrical board structure

The American homebuilders will be grateful: the end finishing equipment by SHS converts raw boards to Oriented Strand Boards that meet the requirements of floorboards, walls and ceilings





# Interview with Chris Baby and Derek Stewart of Canfor-LP

Canfor-LP is an equal partnership, what was the reason for establishing a fifty-fifty joint venture?

Stewart: Shortly before the turn of the millennium, the Province of British Columbia had decided to make the large wood resources of the Peace River region available for lasting industrial use. Two companies expressed their interest in this intention, Louisiana Pacific Corporation and Slocan Forest Products, Ltd. The latter was taken over by Canfor – Canadian Forest Products, Ltd. in 2004. Both businesses already owned large forests in northern British Columbia and both had the expertise, as well as the means, to develop marketable end products. Additionally, the two companies had been planning on building a medium-sized OSB production line anyway. With the assistance of the provincial government, both businesses finally agreed to become equal partners in running a very large production line under the name Canfor-LP OSB Limited Partnership.

Why was the mill built in Fort St. John, BC?

Baby: The enormous wood resources, which are available almost right in front of our doorstep, made the decisive factor. Additionally, Fort St. John is the largest city in the region with a

population of over 17,000 people. We were able to recruit enough qualified personnel in the area. 130 people will find work at the plant; an additional 300 jobs will become available with logging contractors supplying the mill. Last but not least, the infrastructure in the area is well developed.

What is the idea behind the name “Peace Valley OSB”?

Baby: The installation of the plant will be completed in 2005. It was important to us to have our own name and logo for our business before the opening of the plant. We decided a contest would be a good way to include the local community in the finding of a name for us. That way the people of this region were given the first opportunity to identify with our plant. The contest was a great success. We received over a hundred entries. A panel of judges selected 10 finalists who all received a prize. Three final winners were chosen by the Canfor-LP Design Team and then introduced to the Board of Directors. We are happy the name Peace Valley OSB won. This name not only represents the area it is coming from but it also expresses the appreciation of nature's elements and a very high level of independence.

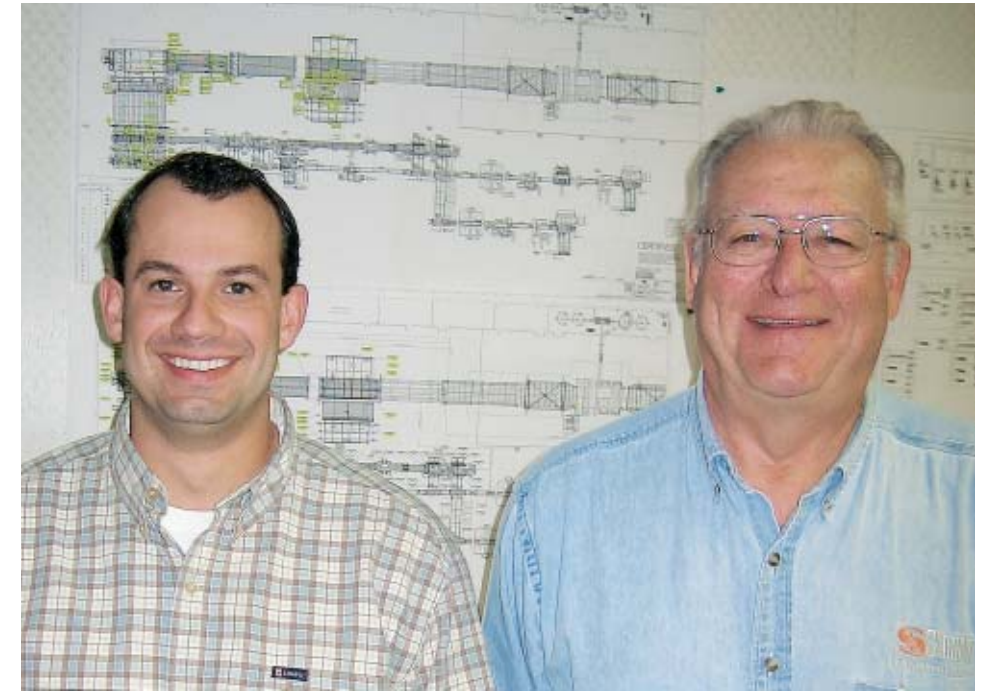
What's the situation with the raw material?

Stewart: The raw material is supplied by the region. It mainly consists of Aspen and Cottonwood (10%). We have a Memorandum of Agreement with our First Nations neighbors and part of that agreement is that they could participate in harvesting approximately 50% of our wood needs. This will provide jobs and income to the local First Nations. British Columbia permits a logging of 75 million m<sup>3</sup> of wood yearly. We will need approx. 1.1 million m<sup>3</sup> of round timber yearly for the production of approx. 820 million sq. ft. of 3/8" OSB (700 Tm<sup>3</sup>). To visualize this number, here is an example: The yearly OSB production of Fort St. John will produce enough wood for 75,000 new houses in North America – that is approximately half of all the new homes built in Canada annually!

What kind of OSB will be produced and for what applications? Where is the market for all these panels?

Baby: OSB is generally used for residential and commercial construction in North America. The large board sizes we will be producing on our press are primarily used for house walls and roofs. Our products will be sold in the West and

Chris Baby (left) and Derek Stewart



Midwest of the USA and Canada. The marketing and sales department of Louisiana Pacific Ltd. will be responsible for the distribution of our products to the customers.

How does Canfor-LP handle the transport of these panels to the customer?

Baby: We will be one of the biggest OSB manufacturers worldwide. The vast amounts of OSB will be transported predominantly via railroads. The use of a well-developed railway system is not only an advantage in terms of preserving the environment, but it will enable us to deliver our products continuously. With temperatures of minus 40°C during the winter months this is an advantage that we cannot underestimate! At this point I'd like to provide you with another impressive figure. The transport volume of our boards takes up approx. 5,460 rail cars annually.

Which measures are taken to protect the environment?

Stewart: It is important to us to closely follow the environmental regulations of the Province of BC. Especially for this purpose we have prepared an Environmental Management Plan that exactly codifies how to keep the air and water of the

region clean. The exhaust air from our three dryers, for example, is first cleaned in a cyclonic cleaning system. Then, the exhaust air is fed into modern Wet Electrostatic Precipitators, where emissions are reduced until they meet environmental standards. While the particulate matter is centrifuged and then burned, the water is re-entering the cycle. If one of the filters should fail, the entire line is shut down.

Why did Canfor-LP choose a multi-daylight press instead of a ContiRoll®?

Baby: Within our company we have had many good experiences with the multi-daylight press technology. For Fort St. John we wanted to have a straightforward, robust and user-friendly press. Furthermore, because of the intended application areas of our end products, we will probably not have the need to produce many different format varieties.

Why was Siempelkamp your preferred choice of supplier of the mill?

Baby: Siempelkamp has a long experience with machinery for the production of wood-based boards, especially OSB. Additionally, the concept of the press was very convincing. All heavy parts,

such as the press table, the upper beam and the cross beams were cast instead of welded constructions. These parts were manufactured at the Siempelkamp Foundry. Thus, practically the entire plant came from one single source. To build such a press with one-of-a-kind dimensions definitely was a challenge for all parties involved. However, we were able to successfully meet this challenge with our partner Siempelkamp!