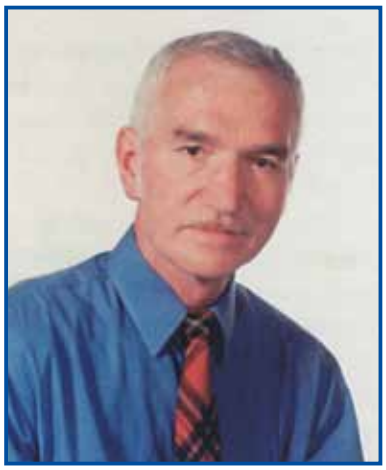
THE PRESS

Consultancy on Hydro-Dyn Press Systems

No.1/2002

Editor's Introduction



Dr.-Ing. Ulrich Haupt

Dear Hydro-Dyn Press user,
Dear user of Hydro-Dyn consultancy,
Dear friend of the Hydro-Dyn Press technology,

What you are holding in your hands is the very first issue of the Hydro-Dyn Press Newsletter. From now on, the editor providing consultancy on this press technology will inform you on a regular basis about advances, experiences and services related to Hydro-Dyn.

This newsletter will be transmitted to companies operating Hydro-Dyn presses as well as to enterprises or persons involved or interested in this technology.

What all companies operating Hydro-Dyn presses integrated into production lines worldwide have in common is the daily fight for high productivity of their machinery. Quality, capacity, line availability and operational costs are the key issues for press operation.

Information given in this newsletter will provide support especially in this field, technical experience as well as indications as to machine setting, material behaviour and maintenance.

All persons involved in this machine technology are invited to contribute to this newsletter in the form of comments, questions and responses in order to develop this media to a vital forum of technology transfer for the mutual benefit of all members of the Hydro-Dyn press user family. In addition to this, the newsletter aims at developing relations between the individual members of this family.

Cooling with Hydro-Dyn

The first concept of the Hydro-Dyn press was developed with the objective to use this system for particle board production. But very soon after its appearance on the market, Hydro-Dyn's wide range of application for a variety of different products was discovered.

The universal use of this press is mainly due to two key characteristics. First of all, the press is capable to be operated at both – isobaric and isochoric press characteristics. A higher amount of oil fed into a press zone leads to a thicker oil film and to isobaric press conditions, characterised by uniform pressure in the press area. A very thin oil film is obtained when feeding a low oil volume into a particular press zone, which consequently leads to a uniform cross-sectional profile of the product. In Hydro-Dyn presses for particle boards, both mentioned press characteristics are combined in a single machine.

However, a second important property of the Hydro-Dyn press system was responsible for its entrance into markets other than particle board application. This feature refers to the ability of the press system to work with heating and cooling under pressure in a simple and efficient way, without sealings and even without a pressure release being

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required between both zones. In the Hydro-Dyn press, cooling under pressure is achieved by simply feeding in oil at a lower temperature, which removes heat from the steel belts and from the product. This feature is ensured by installing an additional cooling circuit outside the press, the circuit comprising an extra collecting pipe for the cooling oil leaving the press, a tank, a main circulation pump, a filter, a heat exchanger acting as a cooler and the respective piping.

It is generally possible to modify a Hydro-Dyn press system such as to obtain the ability of cooling in an easy way, by adding a respective circuit either in the pump room or in the vicinity of the press.

Right from the very beginning, a number of Hydro-Dyn presses designed for decorative laminates and for technical laminates (3 presses for printed circuit board production) were mounted with an integrated cooling zone to reduce the product temperature down to a level of 100 - 120 °C. At a later date, isobaric presses for the production of plastic flooring were designed to cool down under pressure even to a level of 30 - 40 °C, in order to ensure the separation of the product from the steel belt and for technological reasons.

The advantage obtained by cooling the outlet area of continuous presses for wooden boards has been known for a long time already, but it is being rediscovered nowadays. While cooling for products such as plastic flooring is a must, the advantages of cooling during production of fibre or particle board become obvious when you look at the press technology more closely.

Benefits obtained by the use of cooling in Hydro-Dyn presses for wooden board production can be summarised as follows:

- **Increase in production capacity**
  Cooling the outlet area of the press reduces the vapour pressure in the board and thus the internal force that would split the board leaving the press. So the use of cooling allows the speed and the production capacity to be increased. Tests with a cooling temperature of 140 °C showed a 20 % increase in speed for 16 mm particle board, while even higher gains can be expected at lower cooling temperatures.

  Optimum advantages in terms of capacity are obtained with thin board, as this product achieves the required temperature levels in the heating zone early enough to obtain sufficient stress properties. Thick board (s >19 mm) shows a slower temperature development during the press process, with the required stress properties being reached close to the press outlet. This type of board benefits less from the application of cooling. But slightly higher mat moisture helps to improve the heat transfer in the product and to take advantage from cooling.

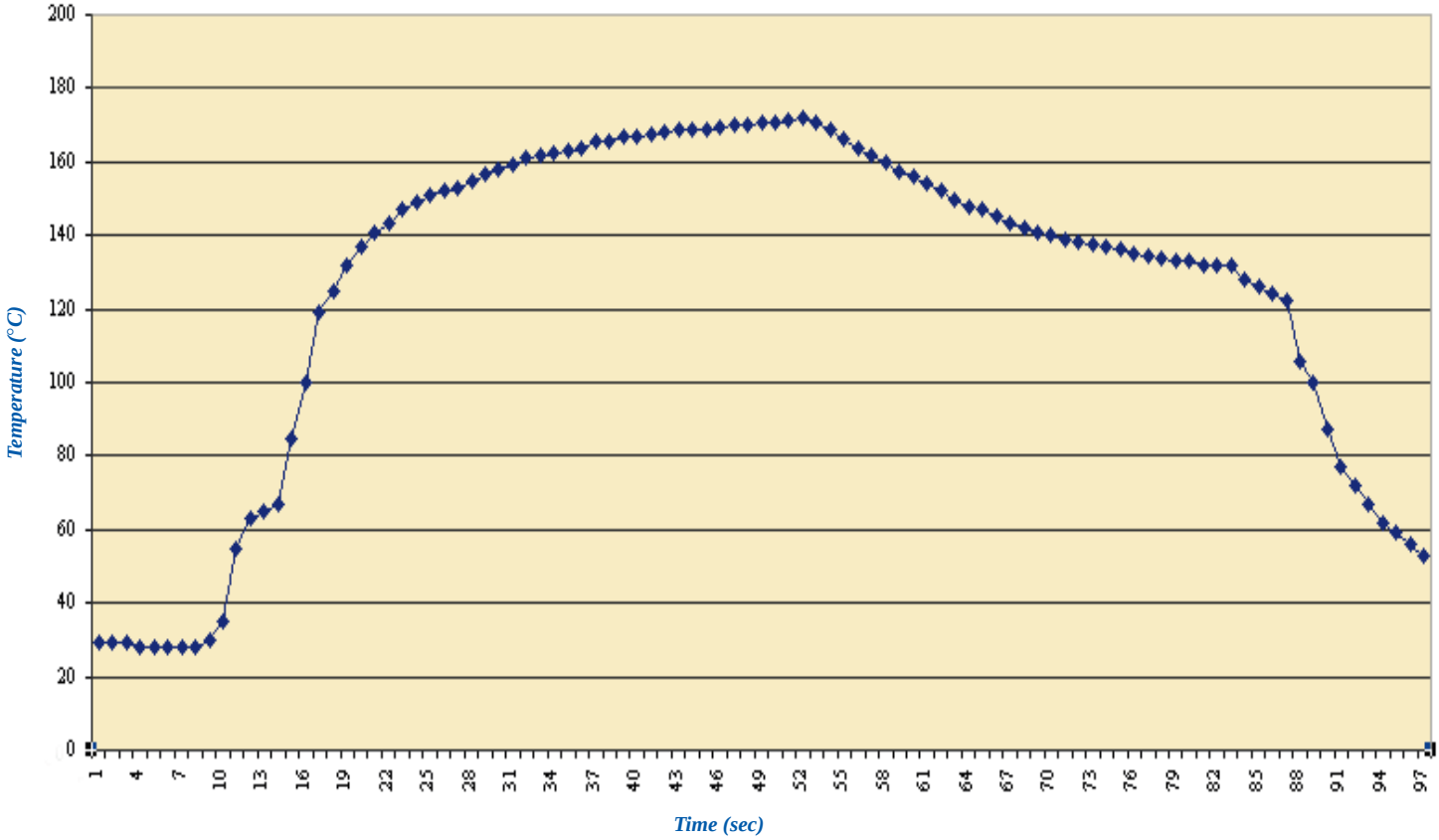
  In general, cooling allows higher mat moistures during operation even with thin board, which results in an improved heat transfer during the press process. From this point of view, it represents another reason for the potential capacity increase in a Hydro-Dyn press with cooling.

- **Increase of final board moisture content**
  Especially thin board is usually overdried during production in the press, leading to warping effects due to moisture absorption (assimilation) in the ambience. Board moisture levels can be obtained closer to ambient conditions leading to flat panels, when continuous heating and evaporating of moisture in the last part of the press is stopped and replaced by cooling. For this reason, climatisation or a similar board treatment may no longer be required.

- **Improved board surface quality and board stress properties**
  During operation at lower cooling temperatures, thin fibre board production on a Hydro-Dyn press with cooling resulted in more resistant board surfaces with a higher gloss level. At the same time, the board stress data were considerably improved.

- **Longer life time of the lube oil**
  The lower temperature level in the cooling zone corresponds to lower heat load exerted on the lube oil and is thus favourable for the oil life time, which implies reduced operational costs.

Hydro-Dyn Press with Cooling producing 7,2 mm Fibreboard
Temperature Measurement between Board and steel-belt
v = 19 m/min, heating 160 °C, Cooling 113 °C



As mentioned before, the board thickness and the mat moisture represent the parameters causing extremely different temperature development in the board while it passes through the press. Optimum conditions are obtained when the length of the cooling zone can be precisely matched to the board technology.

With the Hydro-Dyn press design, this requirement can be fulfilled to a large extent.

It is generally possible to design the system with variable cooling zone length, which means to design zones in the intermediate area between heating and cooling zones with the function to act as heating or cooling zone. The exchange is done by a simple and quick change of valve settings, which allows the press to be adjusted in a flexibly way to the board technology involved.

Spare parts for the press

Comparing a Hydro-Dyn press system of the early days with the current version, a high number of significant differences in the components will be noticed. In nearly all areas modifications were carried out as a consequence of R&D-activities and of experience gathered on many presses. The improvement of the system aimed at achieving better product quality and higher system availability is still an ongoing process.

Press users should benefit from these advances and use current versions or proven new types of spare parts instead of old-fashioned equipment.

This is to encourage all Hydro-Dyn press users to contact Dr. Uli Haupt, whenever spare-parts for the press are to be purchased. This contact will allow advice to be obtained about technical advances and the right choice of the material.

Hydro-Dyn Worldwide

Since 1973, a total of 29 Hydro-Dyn presses were manufactured, including two R&D presses.

Today, 24 presses are operated world-wide in industrial applications for various products, i.e. 10 for wooden board and 14 for different types of laminates.

Please find below a list showing the Hydro-Dyn presses in operation and the products manufactured on them:

Company	*Country*	*Product*
Ind. Emman de Ocotlan	Mexico	Particle board
Flakeboard (3 presses)	Canada	Particle board Fibre board Melamine faced chipboard
Melaplast	Germany	HP laminate
Pergo Declam AB (3 presses)	Sweden	HP laminate
Dielektra (2 presses)	Germany	HP laminate
Matsushita	Japan	HP laminate
DOK III	Russia	Particle board
Temple Mt. Jewett (2 presses)	USA	Particle board
Uniboard	Canada	Particle board
Perstorp Warerite	England	HP laminate
UTISA/Turolense de Tableros	Spain	Particle board
Eucatex	Brazil	Particle board
Pingyuan	China	Fibre board
Tarkett Sommer AB	Sweden	Plastic flooring
Gerflor Provence SNC	France	Plastic flooring
Kronospan	Germany	HP laminate
Trelleborg Rubore AB (in the installation phase)	Sweden	Steel-rubber laminate

Installation of a Hydro-Dyn Press in Trelleborg Rubore's new production line

Ulf Johansson

Trelleborg Rubore is situated in Kalmar, Sweden.

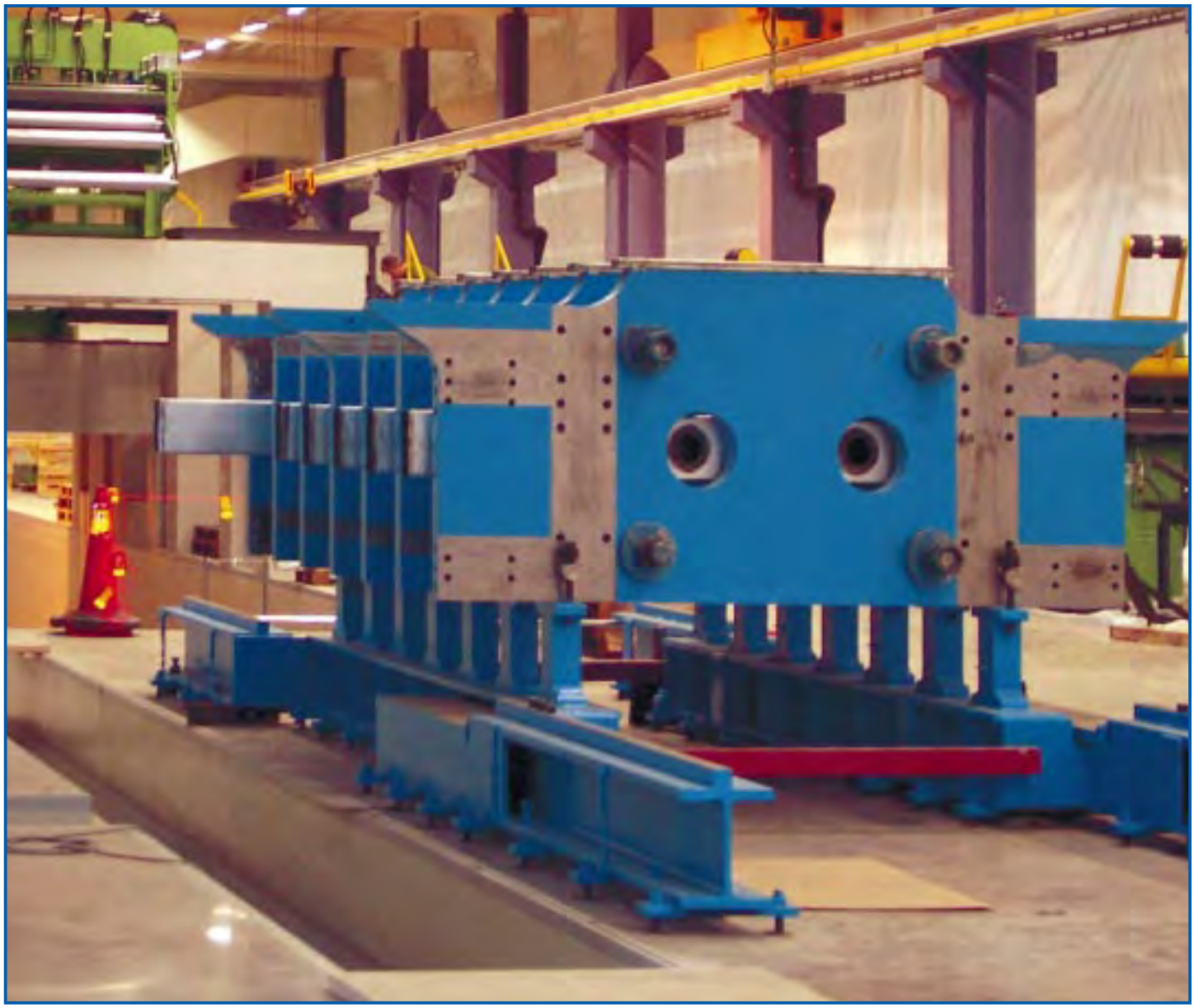
Rubore is producing thin laminates for the automotive industry mainly to reduce noise and vibrations.

Rubore is now expanding their production facilities with another 5000 m^2 and will install a Hydro-Dyn press to be able to produce thicker material, up to 3mm with steel and rubber.

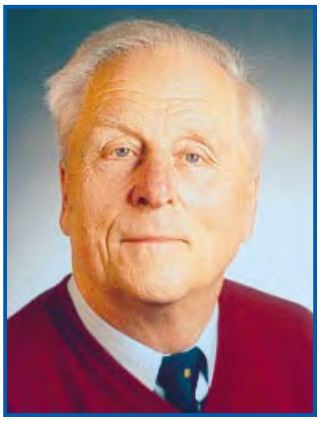
Rubore have done test runs with both Hymmen and Siempelkamp, but got the best results through the Hydro-Dyn press.

The investment in total for building and equipment around the press is over 8 million Euro.

Ulf Johansson
Plant Manager



Hydro-Dyn – a system not much utilized, yet fully developed



by Hansgert Soiné, Evessen

Hydro-Dyn – a technology offering numerous options

Many years ago, Hydro-Dyn was presented on the trade fair Industriemesse Hannover together with the mechanical press system of Siempelkamp and convinced by its apparent simplicity. However, this simplicity was deceptive as the development history was characterized by numerous setbacks and problems that were difficult so solve.

When the system had finally overcome its teething problems after two decades, the financial situation of the inventor and supplier – the Springe-based company Bison – did not allow intensive marketing efforts to be made. In the meantime, Bison was closed down and the successor company still holds all existing patents. However, the value of these patents is difficult to evaluate in terms of protection against imitation.

The actual value lies with the expert personnel that have worked on the machines up to the end. This personnel together with the former manager of the development department – Dr. Ulrich Haupt in Wennigsen – are indispensable for the lines operating all over the world. Dr. Haupt is the only one who can revive Hyro-Dyn by utilizing all smaller and larger steps made in the development in a professional manner.

At the same time, he is the only one who is in permanent contact with the users and ensures an extremely efficient exchange of experience. It would be a pity if new users could not benefit from the vast experience gathered over many years.

Hydro-Dyn – a technology offering numerous options

The few Hydro-Dyn presses operating worldwide have exceeded by far the originally guaranteed performance parameters. Most probably, further advances will be made, as certain potentials are not yet fully utilized. Prior to an investment, the financial backer asks for the advantages of the solution over alternative systems. With Hydro-Dyn, there are convincing arguments the clearness of which all sales people should take pleasure in.

- Cooling without any interruption of the press pressure is only possible with Hydro-Dyn, by simply activating a completely separate cooling circuit for the oil.

- Hydro-Dyn is the only system featuring continuous direct lamination and the production of board and lamination in a single process.

- Only Hydro-Dyn is suitable for the production of boards with a thickness of below approx. 2.0 mm.

Hydro-Dyn is a hermaphrodite operating with both isobaric and isochoric characteristics in one machine. Its basic principle is thus suitable for the production of boards and laminates. In addition, this system has been used for coating for many years already.

Three arguments should be examined in detail:

Cooling under pressure is an important topic nowadays as it reduces the required curing time of the resin at press pressure and increases the capacity accordingly. Highest efficiency can be expected by cooling to a value below 100 °C, as no steam will escape from the board at the press outlet due to the fact that the vapour pressures in the core of the board can be reduced to almost zero. This important aspect is treated in a separate article in this brochure.

Continuous direct lamination is already realized in South America. With melamine resin films, this process can be carried out without the addition of glue. The problem generally encountered is the surface structure. Without an appropriate surface structure, the sales potential is extremely limited. Trials with release papers have been carried out, but not yet been implemented at production level. High-quality structure papers could probably be used six times with the handling being certainly affected at the same time. The use of finish film, i.e. slightly resinated structured decor film with final varnish layer produced in a single process, is easier. However, in this case, the application of additional glue to the bottom side of the lower film and the top side of the particle/fibre mat in a perfectly clean manner and without the formation of fog is required. Owing to efficient cooling under pressure, no steam will escape from the board at the outlet with both types.

Boards with a thickness of below 2 mm are likely to play an important role in many branches of industry. Possible applications include inner layers for veneered board, replacement of veneers, designs with strong convexity, elimination of heavy cardboard in certain fields, etc. Boards with a thickness of only 0.5 mm have already been successfully produced. But thin products are not only important for the wood industry. Another field of application are floor coverings made of reclaimed material or PVC.

Hydro-Dyn – problems that have already been successfully solved

Hydro-Dyn – problems that have already been successfully solved

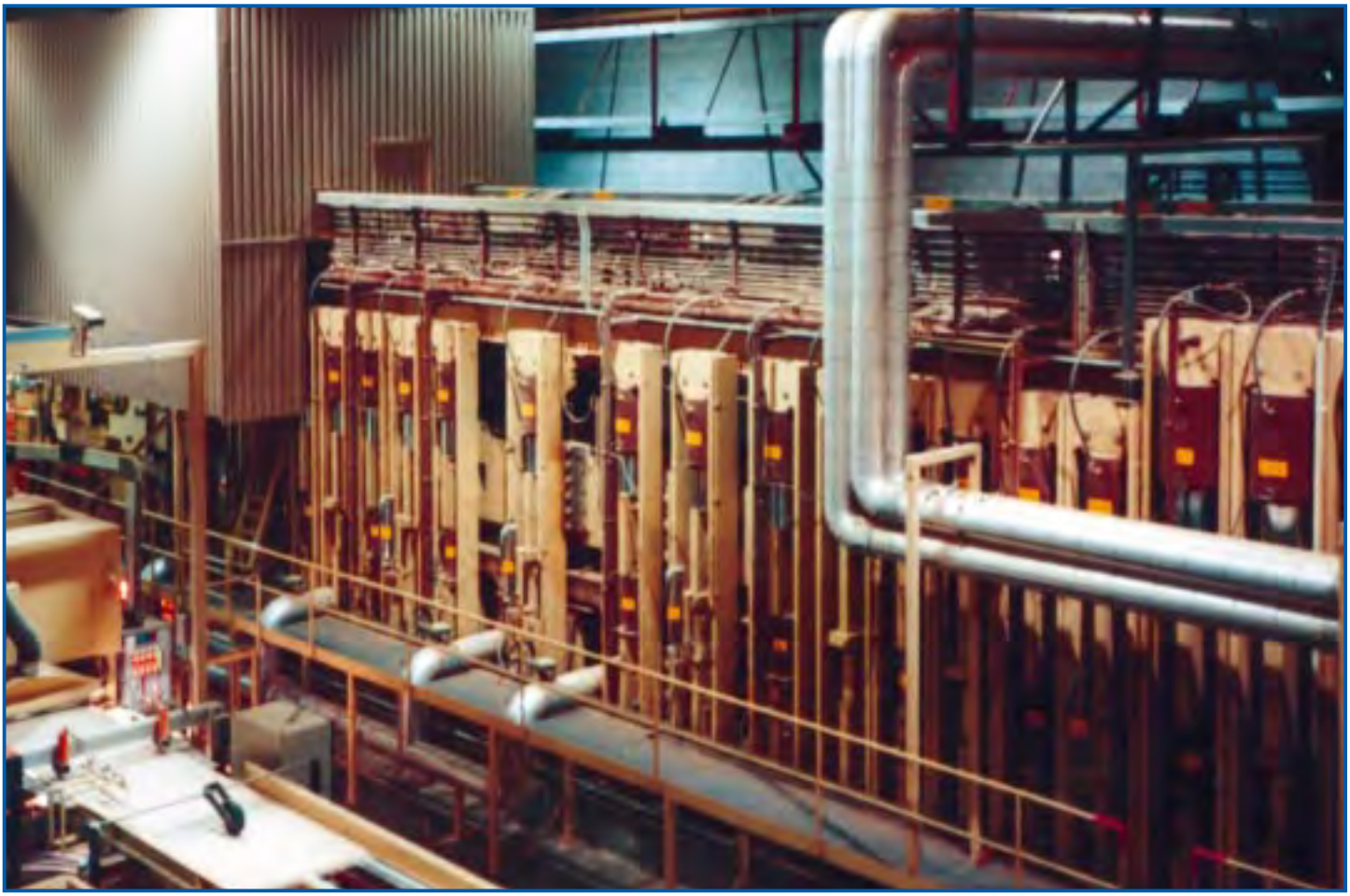
Hydro-Dyn is extremely more expensive than mechanical press systems – Owing to the outstanding cooling efficiency, considerable performance increases can be achieved. At a comparable specific performance, Hydro-Dyn presses can be realized with a more compact design than mechanical press systems, so that the price is almost identical.

Hyro-Dyn causes considerably higher operating costs due to the high oil consumption – This argument is no longer valid as the oil flow was optimized in terms of flow dynamics and lubrication fluids were improved in terms of quality and price. Oil changes are only rarely required.

Hydro-Dyn causes high start-up scrap – By using a new start-up procedure, the losses can be reduced to values comparable to those encountered with mechanical press systems. Three presses have already been equipped with this technology.

Conclusion

Hydro-Dyn is a completely developed system featuring options that cannot be offered by mechanical units. This applies in particular with regard to the option of efficient cooling under pressure and the production of very thin products with a thickness from about 0.5 mm onwards. High development costs and serious setbacks over many years put the system to the sidelines exactly at the moment when the development was finally completed and tested in continuous operation.



Hydro-Dyn involves higher operating costs due to wear of the press pads – The press pads have continuously been improved so that in combination with adequate oil types extremely high life time is ensured.

Hydro-Dyn does not comply with thickness tolerances in particular in the area of the edges: Adjustments of the oil guidance in the side areas have eliminated this complaint that was well founded in the past.

Dr. Y. N. Chen, Pioneer of Hydro-Dyn

Dr. Y. N. Chen

In 1990, the Hydro-Dyn Press team of BISON was completed by a new member providing profound theoretical knowledge on flow, vibration and acoustics. The person in question was Dr. Chen, former head of Sulzer Brother's vibration and acoustics laboratory in Winterthur/Switzerland, who is well known in international science owing to the publication of his vortex theory and other scientific contributions.

Dr. Chen and the editor co-operated years before on common research projects about flow and blade vibration on centrifugal compressors. Research was carried out in the institute for Turbomachinery at the University of Hannover/Germany and resulted in more than 20 international publications.

Dr. Chen joined the R&D team as an external consultant when the development of the Hydro-Dyn press required additional scientific work on fundamental physics on flow and vibration. Improvements in silicone oil flow and product uniformity were obtained in the following years with the assistance of Dr. Chen. He is well known to some of the Hydro-Dyn customers, where his activities were accomplished on site and who deeply appreciated his assistance. On this occasion, the editor would like to thank Dr. Chen for his outstanding contribution to Hydro-Dyn press development and for his faithful friendship.

At the age of 87 years, Dr. Chen is still active in providing advice promoting advances in Hydro-Dyn technology. The editor thanks Dr. Chen for his willingness to remain among those in the future, who are committed to solving problems that may occur on any of the Hydro-Dyn presses operated worldwide and to further developing this system.

The Barons Institute/USA has selected Dr. Chen as one of the globally leading persons in science, research, politics, sport and art in the new century. The editor would like to congratulate his friend on this outstanding award.

New chances for improved product edges

The demand most products leaving the Hydro-Dyn press have to comply with is a perfectly uniform thickness distribution. This is easy to achieve in the centre of the product, but more difficult at the product edges. In this zone, full press pressure and ambient pressure conditions are very close together. Controlling the oil flow under these conditions represents a technical challenge to be taken up by the engineer of the press.

Significant progress in this matter was achieved in the past years, also as a consequence of the increasing accuracy requirements to be met by thin products. Today's engineering level allows presses to be designed such as to come very close to satisfactory product edge conditions.

Latest investigations and findings are promising a huge step forward in terms of improved board edges and more uniform thickness distribution of the product produced on a Hydro-Dyn press. The patent application for the respective invention of Dr. Uli Haupt has already been filed. The use of this invention is offered to companies operating Hydro-Dyn presses for testing purposes and to demonstrate its benefit in terms of economic efficiency.

Press users are invited to contact the editor for a discussion about new chances involved and their realisation.

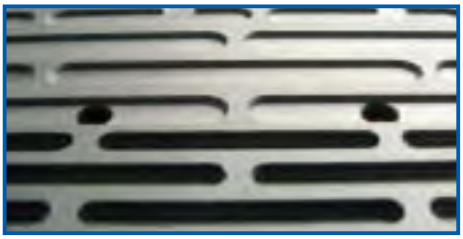
The birthplace of Hydro-Dyn press pads

When users of Hydro-Dyn presses stop their production line, open the press and relieve the steel belts, you get a clear view on the press and sliding surface that is composed of numerous individual Teflon pads.

The birthplace, i.e. the manufacturing plant of many of these

- Teflon pads,
- aluminium plates,
- edge bars,
- peek ledges,
- Al nozzles,
- silicone scrapers

and various other products is situated in Springe near Hannover in Germany.



Since 1999, the young company **FMH Produktions GmbH** has manufactured these essential components for Hydro-Dyn presses. For more than 15 years, however, the FMH team has already gathered experience in the production of Teflon pads and other elements of the press system.

FMH engineers use a direct connection between the programming system and the machining equipment to ensure a rapid data exchange. This allows designs with a highly complex geometry to be produced and design changes to be rapidly implemented.

Apart from on-time delivery of precision spare parts for users of Hydro-Dyn presses, FHM offers ideal prerequisites for the production of modern pad designs that have already proven their favourable effect on the further development.

The state-of-the-art production equipment of FMH allows the most exacting turning and milling operations to be carried out for customers from various fields of industry.

The plant manager and co-owner Guido Metzig (see photo) describes the corporate objectives of the company as follows:

- Reliable production of press pads and other components for Hydro-Dyn presses
- Rapid order handling on the basis of many years of experience and a state-of-the-art production machinery
- Flexible reaction to individual customer requirements
- Low-cost production of a small company for special products

FMH looks forward to continuing the trustful co-operation with companies operating Hydro-Dyn presses and emphasizes the favourable quality/cost ratio that characterizes FMH spare parts.

Please contact directly or via the editor.

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What's New on Hydro-Dyn

"The Press" regularly reports about advances in R&D and in technical experience in this part of the newsletter.

Continuous Start-Up of the Hydro-Dyn Press

The start-up process of Hydro-Dyn presses for decorative and technical laminates as well as for plastic flooring is very simple. When starting production of laminates, different paper layers are fed one after the other into the press under full pressure until the nominal thickness and respective composition of layers is obtained. Start-up of production of plastic flooring is similar. Spreading of granules is started with a thin layer on the moving extended bottom steel belt and at full press pressure. The spreading is slowly increased towards a thicker layer of granules being transported into the press until the nominal thickness is reached.

The start-up procedure of Hydro-Dyn presses for particle board or fibre board production is completely different. It is characterized by the following steps:
Stop of the heating-up process by shutting off the HP pumps, opening of the press, transport of mat into the press, stop of mat forming and stop of forming and steel belt, closing the press, start-up of HP pumps, heating up of mat in the press, start-up of the whole line to operation.

This procedure is very time consuming. In addition to this, it is characterized by stops of the mat forming, i.e. interruption of the continuous spreading process causing non-uniformity in the board leaving the press. Consequently, the start-up process on Hydro-Dyn presses for fibre and particle board is very expensive and unfavourable in terms of economic efficiency of the production. Attempts to realize a continuous start-up were successfully completed in order to eliminate these disadvantages and to increase the time of full board production considerably, even when occasional changes of board thickness or width are involved.

This new start-up procedure is ensured by a new press control system that was developed during the last years. This system makes it possible to begin the start-up process by opening the press with a gap corresponding to board thickness, while the two steel belts and the forming belt are moving forward at the desired line speed. At the same time, the mat is continuously formed, transported close to the press, where it is dumped. Closing the dumping pit enables the mat to enter into the press. When the first part of the mat has advanced to a position in the press, where it covers the first oil inlet zone, the respective HP pump for this zone is started. The following HP pumps are started successively as soon as the mat travelling through the press towards the outlet covers the following zones. When the first part of the mat leaves the press, the press pressure is corrected to nominal value and full pressure is applied to the mat, so that desired operational conditions are ensured. This procedure involves minimum board scrap caused by start-up, i.e. only 1.5 times the press length.

In the meantime, this new press control system has been installed in Hydro-Dyn presses of three press users and successfully been applied. The benefit of the new system as well as its practical use could be demonstrated on these production lines.

Retrofitting the new control system designed for a continuous start-up procedure with the above-mentioned economic advantages is highly recommended to other press users producing fibre or particle board.

New O-Rings

The O-ring in the aluminium plates turned out to be the key elements of the Hydro-Dyn press system. The dimensions of the O-rings used in the past amounted to 38 x 5, with 38 mm being the inner diameter of the ring and 5 mm the ring thickness.

Press users sometime observe shrinkage of the rubber material of these components

under heat. Consequently, especially the O-rings of the bottom plates may fall out during removal of the Al-plates and are not easy to reinstall.

In order to ensure proper function of these elements and to eliminate the mentioned problem, tests with O-rings of slightly bigger diameter were successfully accomplished. As a consequence, the use of O-rings with the dimensions 40 x 5 is highly recommended in the future.

Training for Hydro-Dyn Press Personnel

Past experience has shown that – when it comes to a Hydro-Dyn press that his satisfactorily operated in a company - there are always people or individuals in the background who do more than their normal daily work. You will see persons, who are committed to the technical system, continuously trying to understand and to improve it.

Apart from this human attitude, the training of the personal is certainly a key factor for the economic efficiency of a production line. This is especially valid for the Hydro-Dyn press system, the proper operation of which does not only require profound understanding of mechanical parts and their interaction, but is also favoured by a certain knowledge of flow processes, heat transfer and the special behaviour of system components.

In order to keep your Hydro-Dyn press team on a good technical training standard, Dr. Uli Haupt offers training to your personal in terms of technical aspects of the press and provides in addition technical experience gathered during many years of practice.

A number of companies using the Hydro-Dyn press already benefit from a regular training period for their personnel through a safe handling of the equipment, minimum downtime due to operation faults and also by motivating the operating personnel as the consequence of deeper knowledge of the system.

It is highly recommended to take advantage of this offer as well.

How to organise press assistance

It is a common experience of companies operating Hydro-Dyn presses that expenses involved in the technical assistance for the press system pay off after a short time. Taking care of the system on a regular basis saves operating costs owing to reduced wear of components, an economically efficient use of the silicone oil and a satisfactory product quality after correct setting of the operating parameters.

Dr. Uli Haupt offers this technical service for Hydro-Dyn press systems to customers worldwide within the frame of different forms of partnership being applied at present.

Some customers have concluded a contractual agreement with the consultant, which covers a regular inspection of the press system and a continuous contact to him for advice and support in all questions around the press. In this case, the customer is provided with the full scale of experience and advances made in this technical field.

These performances are compensated by a monthly fee and reduced costs for services on site. Such a close partnership enables the consultant to accompany the life of a press and to know the equipment and its operating conditions in detail. As a consequence, it ensures a fast and safe reaction to any event on the press and quick adjustments to be made whenever necessary. Highest priority in terms of response time is given to this group of customers.

Other customers prefer a more occasional use of the technical advice or ask for a single inspection of the press system or a technical training of the team operating the press.

The advice of the consultant allows your Hydro-Dyn system to be kept at the state of the art and ensures a satisfactory product quality. It is focused on keeping operational costs down and on operating the production line with a maximum economic efficiency. A number of press users already clearly benefit from this partnership – all others are invited to do so as well.

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