pmp PROMOTIONAL MAGAZINE

33/2018

Paper | Tissue | Subcontracting | Services | Specialty Products

PMP "HONORING OUR PAST – EMPOWERING OUR FUTURE" CAMPAIGN 2018

PMP`S NEW STRATEGY "EVEREST" FY 2017-2020

(9) NEW PMP INTELLI-TISSUE® ECOEC 1600 PREMIUM TISSUE MAKING LINES WILL BOOST CHINESE TISSUE MARKET DEVELOPMENT!

SPRAY APPLICATIONS FOR PAPER AND BOARD SURFACE TREATMENT

INTELLI-JET V® HYDRAULIC HEADBOX – AN ICONIC SOLUTION FOR YOUR ULTIMATE SUCCESS

TISSUE TRENDS – OVERVIEW

Dear Readers,

Have you been wondering what is standing behind our new marketing campaign entitled “Honoring our past empowering our future”? Let me tell you a story.

Year 2018 is a very special for all papermakers. 220 years ago Louis - Nicolas Robert - a French soldier and mechanical engineer invented a prototype of a paper machine that became the blueprint of contemporary paper-making lines. Robert’s machine with a trim of 640 mm could only run 2.5 mpm only. Today’s fastest tissue machines can run over 2200 mpm and the widest one (for fine paper grades) is almost 11 000 mm. Indeed, our Pulp & Paper industry has made a huge progress not only when we consider the technology applied. What is more important, paper is freely available for people all over the globe. It is present around us in many forms helping us to live better lives.

Our company was established in 1854. Still today, our activity was filled with projects and great team spirit. Through our campaign, we wanted to say thank you to our predecessors and inspire our successors. Of course our dream was to leave our footprint as well. Over the years, from generation to generation, we have past the knowledge of how to create some of the best paper machines that have changed the world for a better place. That is why we believe that our heritage is our foundation, a spirit that drives us to action and an experience that gives us knowledge. We were inspired by many, including our long term CEO Aaron Braaten. We are grateful for all creative talks, common actions and milestones we reach. Our heritage is our pride that we draw strength from to provide the best value to our customers every day.

I believe that our predecessors would be proud of us. The last decade brought a large number of complex projects all over the world (more information in this issue of our magazine). Paper and tissue machines with a PMP nameplate can be found on 6 continents helping local communities to grow. We aim higher and higher. That is why we have created and announced a dynamic development strategy “PMP Everest Strategy” for the next three years based on a refreshed mission, vision and values. Our well-planned success will be the best legacy for those who will come after us.

Our ambition is to listen carefully and grow together with our esteemed partners. What is more, we want to create a positive image of our Pulp & Paper industry to attract specialists – people with energy and true commitment.

On behalf of the PMP team, I would like to say thank you to our partners for all the opportunities we have been given and all the challenges that you have put in front of us. Without common effort all successful startups, those unique moments of glory, could not take place. We are ready for more so let’s write a new chapter of papermaking history,

Yours sincerely

Maja Mejsner

Vice President Business Development & Marketing – PMP Group

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AFRICA

September 2017

On September 8th, we had the unique opportunity to celebrate the grand opening of a new facility in Ga-Rankuwa with our partners – UPM (South Africa). TM5 is not only the 1st new machine launched within the last 20 years, it is also the 1st PMP project in Africa. Thank you for your trust. The future looks bright!

October 2017

On Sunday, October 1st, 2017, the new Universal Paper Machine PM5 reached its first milestone of 10,000 tons of paper produced. The significant milestone was reached within 7 months after the plant was commissioned. This would not have been possible without the continued collaboration between the PMP team and UPM stakeholders.

ASIA

March 2017

During CIDPEX 2017 in Wuhan, China, the PMP team presented a new solution for tissue makers – the Intelli-Tissue® EcoEc Premium 1600!

March 2017

Another PMP Intelli-YD® yankee dryer went on the way to our Chinese customer - Hebei Jinboshi Group.

June 2017

On the 21st of June 2017, we were celebrating not only the summer solstice but also the successful start-up of a PMP Intelli-Tissue® EcoEc 1200 TM1 at Hebei Jinboshi Group mill in China! The PMP tissue line started-up smoothly and easily and as a result, the first paper at reel appeared on the afternoon of the 21st June local time.

July 2017

We have the pleasure to announce, that on the 6th of July, Jiangsu Changfeng Paper's PM2 has been successfully brought on stream. PMP was responsible for the press section rebuild which included delivery of a Intelli-Nip® Shoe Press.

September 2017

Second PMP machine (TM2) for Jinboshi Group has been successfully brought on stream on the 2nd of September. The start-up was very smooth and first paper on reel was obtained in just half an hour from the first trial.

November 2017

As a result of the beginning partnership between PMP and one of the leading chinese tissue producers, the 1st out of (9) New Intelli-Tissue® EcoEc 1600 Premium Tissue Making Lines was brought on stream, on the 7th of November 2017.

NEWS

January 2018

On the 17th of January 2018, the 2nd out of (9) New Intelli-Tissue® EcoEc 1600 Premium Tissue Making Lines for one of the leading Chinese tissue producers has successfully started-up.

February 2018

The 3rd of the (9) New Intelli-Tissue® EcoEc 1600 Premium Tissue Making Lines for one of the leading Chinese tissue producers was brought on stream on the 4th of February 2018. Currently (3) Tissue Machines are up & running with great results, brining pride to all involved!

AUSTRALIA

July 2017

In July 2017 we have announced our partnership with one of the leading paper producers from Australia - Australian Paper Corporation. Our first common project is a delivery of PMP's Intelli-Jet V® Hydraulic Headbox for PM2 located in AP's Maryvale Mill. PM2 start-up is scheduled for the 1st quarter of 2018.

EUROPE

January 2018

In January 2018, PMP has launched a new Robotic Welding Laser at its HQ in Poland. This technology includes a fiber laser powered with 4kW power, equipped with a welding scanning head and a vision system. The device enables welding up to 4 mm deep. The state-of-the-art robotic laser welding station will significantly improve the process quality and efficiency.

April 2017

During the Tissue World Milan Conference & Exhibition that took place in Milan, Italy, the PMP team presented a technical presentation entitled "Recovery Steam Generator System Gives Energy Savings at WEPA Lille (France)".

April 2017

PMP has announced that it has appointed Miroslaw Pietraszek as President effective April 28th, 2017. Zbigniew Manugiewicz, PMP's co-founder and former President, will continue to serve as a chairman of PMP's supervisory board of directors.

May 2017

In May 2017, PMP's Open House Poland 2017 conference entitled "Save Your Energy Save Your Money Empower Your Future" took place. We were proud to host guests from 18 countries from 4 continents. We believe they have collected lots of positive energy and knowledge. Thank you very much for sharing your valuable time and creating an amazing atmosphere. Together we are building a better future of the Pulp & Paper business!

October 2017

During the MIAC Conference & Exhibition in Lucca, Italy, we had 2 technical presentations entitled "A Concept For Premium Tissue Production With Ultra-low Media Consumption – PMP's Intelli-Tissue® EcoEc Premium" and "A Recovery Steam Generator System by PMP as a Key for Spectacular Energy Savings – TM1 WEPA Lille Rebuild Case Study".

NORTH AMERICA

April 2017

PMP was also present at PaperCon 2017 in Minneapolis, USA. Besides the presence at the exhibition, we have also presented "A successful project execution in P&P"!

September 2017

An Open House announcing the partnership between PMP and Rollmeister took place on the 26th of September in Neenah, Wisconsin. Rollmeister has become an official PMP roll service center in USA!

September 2017

A common project between PMP and Smurfit Kappa Mexico, Los Reyes Mill, for a PM6 rebuild was brought to stream on the 27th of September 2017, bringing pride and satisfaction to all involved!

October 2017

On October 2017, a new trade fair and conference - Tissue 2017 in Miami, USA took place. We had the pleasure to present together with the UPM Team a technical presentation entitled "An Innovation that Empowers the Future - Universal Paper Manufacturers' Green Field Tissue Mill, South Africa Case Study".

October 2017

An Intelli-Jet V® hydraulic headbox for Sappi Cloquet, Minnesota, USA has started-up in October 2017! The project goal was to improve PM12's headbox functionality and to improve product quality and production.

SOUTH AMERICA

July 2017

Our Intelli-TriNip® press at Smurfit Kappa, Barbosa Mill, Colombia has started-up on the 18th of July at 21:45 local time. This project is another step forward in the partnership development between PMP and Smurfit Kappa.

WHO WE ARE

OUR MISSION IS...

With Passion & Pride We Create Success Together In The World Of Paper

OUR VISION IS...

To Be The Best Supplier of Advanced Technologies

PMP Paper Machinery Producer
A global provider of tissue, paper & board technology

OUR STRATEGIC MARKETS

- Europe
- North America
- Asia

OUR DISTINGUISHING FEATURES

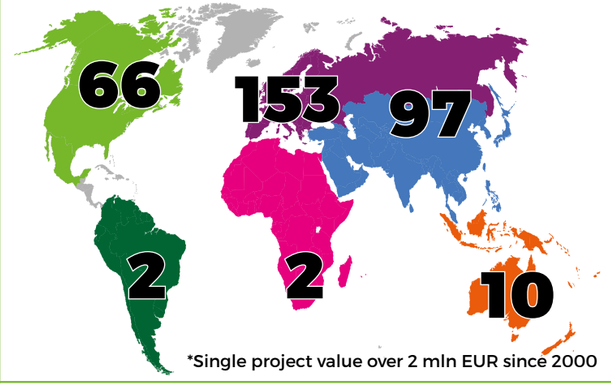
- Technology
- Excellent Quality
- On Time Delivery

OUR DIVISIONS

6 PMP Divisions

Poland, China
Italy, USA

WHERE WE OPERATE



*Single project value over 2 mln EUR since 2000

OUR VALUES

TECHNOLOGY

Pulp & Paper


Services

Paper Machinery

Tissue Machinery


Subcontracting


Specialty Products


Energy Saving Solutions

intelli® TECHNOLOGY

intelli® TISSUE

intelli® PAPER

SATISFACTION

330 References in **33** Countries
Worldwide on **6** Continents

PROFESSIONALISM

10%
EBITDA

3A1
PMPoland
D&B rating

PMP Group Turnover FY 2017
70.5 mln
Euro

PRIDE

Over **160** Years of Experience

RESPECT

Chosen by Market Leaders

ETHICS

Code of **VALUES**

Long Term **PARTNERSHIP**

LISTENING
to Customers' Needs

TEAM WORK

600
Employees

English
as a Common Language of Communication

Staff **Development**

Experienced and **Dedicated** Team

PASSION

PASSION COMES FIRST

Fueling Our Company to Achieve Success

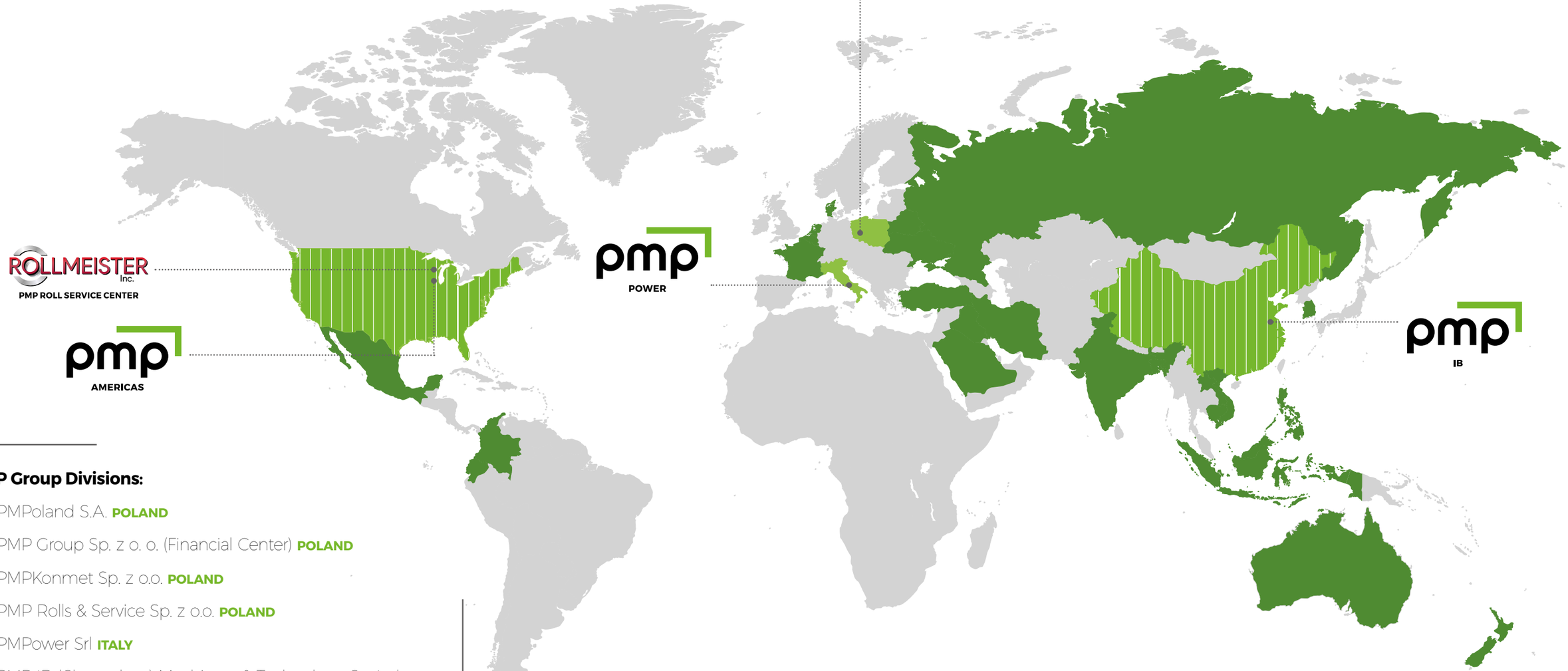
PMP DIVISIONS AND AGENTS OFFICES

pmp

pmp FINANCIAL CENTER

pmp ROLLS & SERVICE

pmp KONMET



PMP Group Divisions:

- PMPoland S.A. **POLAND**
- PMP Group Sp. z o. o. (Financial Center) **POLAND**
- PMPKonmet Sp. z o.o. **POLAND**
- PMP Rolls & Service Sp. z o.o. **POLAND**
- PMPower Srl **ITALY**
- PMP IB (Changzhou) Machinery & Technology Co. Ltd **CHINA**
- PMP Americas INC. **USA**

PMP DIVISIONS

PMP AGENTS OFFICES

PMP DIVISION & AGENTS OFFICES

PMP NEW STRATEGY "EVEREST" FY 2017-2020

EVERYONE HAS THEIR OWN EVEREST...

Who do we want to be? Where do we want to go? What do we want to achieve? These were the key questions during creation of PMP's new strategy called "Everest".

With passion and pride, PMP has been building its success in the world of paper since 1854. Our heritage and tradition in designing and manufacturing of paper machines are our identity and a source of never-ending inspiration. We are determined to strive for ambitious goals in many areas of the world. Our power is based on a wide, and continuously deepening knowledge and belief that we are able to achieve even more. We are responsible to create our own reality.

EVEREST PROJECT

"EVEREST" PROJECT GENESIS

We live in a dynamically changing reality. The condition of the paper industry is getting better – which makes us optimistic, but we should also be aware of continuously growing expectations. Numerous changes in the paper industry, as well as a strengthening of the PMP brand, influenced the beginning of organizational changes, including defining the company's strategy for 2017-2020.

PMP has started organizational changes with the announcement of the appointing of Mr. Miroslaw Pietraszek as President of the PMP Group effective April 28th, 2017. Mr. Zbigniew Manugiewicz, PMP's co-founder and former President, is continuing to serve as a Chairman of PMP's supervisory board of directors. At the same time, there have been changes in the corporate structure at the management level (see Diagram 1). All of these changes have become a great opportunity to rethink and redefine our goals and ways to reach them.

"EVEREST" KEY FINDINGS

The new strategy is based on refreshed company mission, vision and values. Those statements are the core of PMP's identity, showing its philosophy, directions and

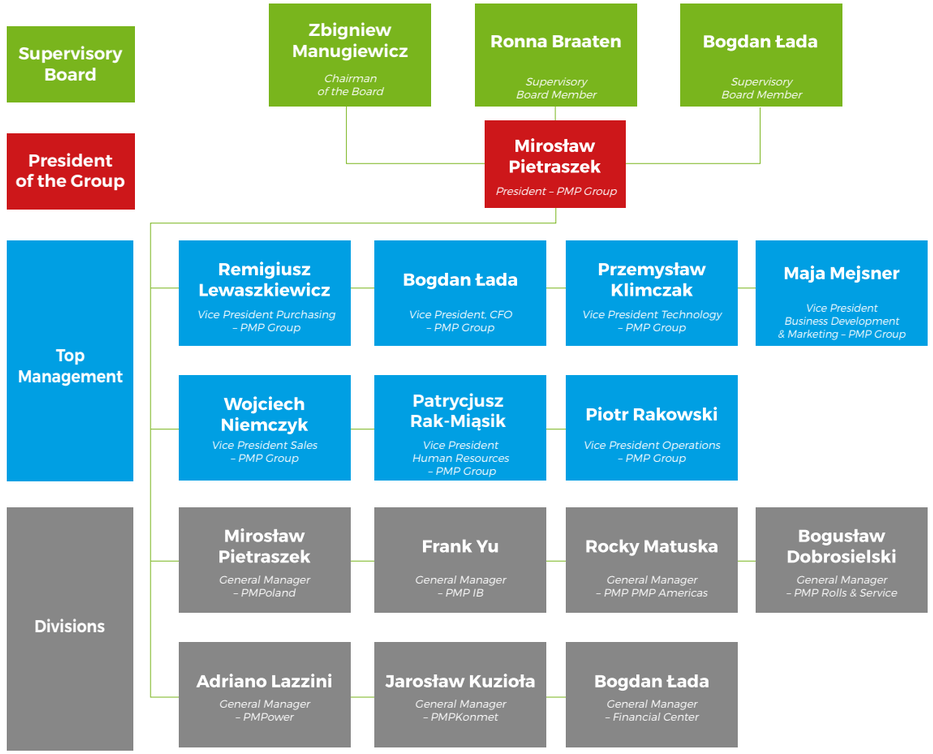


Diagram 1: PMP Corporate Structure – Management Level

corporate culture. They are the highest priority for the entire PMP Corporation and its employees.

PMP's Mission Statement

With Passion & Pride, We Create Success Together in The World of Paper

PMP's Vision Statement

To Be the Best Supplier of Advanced Technologies

PMP's Values

- Passion
- Pride
- Respect
- Professionalism
- Ethics
- Team Work
- Satisfaction

Another base of PMP's identity are its competitive advantages. They underline our uniqueness and customer-driven approach:

- **Technology**
- **Excellent Quality**
- **On-Time Delivery**

Thanks to the above statements, PMP will be able to reach its strategic goals including:

- Further **market expansion**
- **Healthy balance** – market diversity with strong focus on strategic markets
- Increase of **market share**

- **Technology** based approach
- PMP **brand strengthening** – providing a blend of technology & passion
- PMP **staff development**
- State-of-the-art **technology** focused on energy savings & user-friendliness
- Achieving a **synergy effect** between PMP Divisions
- Focus on a **standardization** and efficiency improvement

SUMMARY

We want to aim higher, reach more and conquer Everest. We want to be ambassadors of our culture and values in which we believe. We are sure that fulfilling our ambitions is worth it. We want to be an example that we can achieve our goals and that courage is a feature of strong and extraordinary people. People like us, who create the best paper machines in their segment, can achieve whatever we set our minds to. We are changing not only for ourselves, but also for you, so we can achieve long-term success together. Let's reach Everest together!

PMP "HONORING OUR PAST – EMPOWERING OUR FUTURE"

Campaign 2018

Close your eyes for a minute and think how our world would look like without paper? Sound's impossible, right? Now open your eyes, and take a look all around you. How many things made of paper can you see? Imagine they are gone. What would your life look like without them?

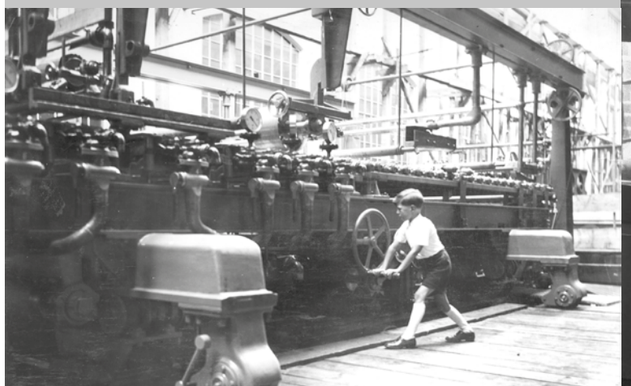
Exactly 220 years ago something changed. In 1798 a French man, Nicolas Louis Robert designed the first machine in the world, that was able to produce paper. Thanks to this invention, paper making evolved from craftsmanship into an industry. More and more paper was manufactured and in the 19th century, it has become one of the most popular products in the world.

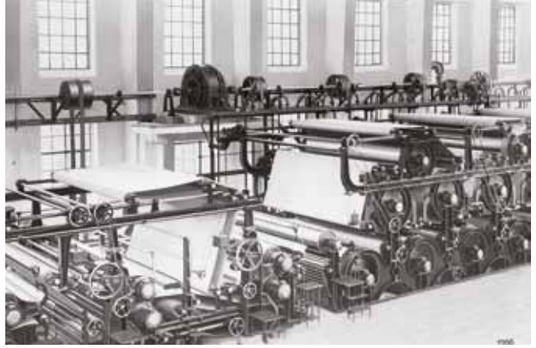
PMP'S PLACE IN THE WORLD OF PAPER

PMP is proud of its rich heritage and history, which has begun in 1854. The historical situation caused changes of our company name throughout the years: at the beginning German H. Füllner, later Polish "Fampa", then American "Beloit Poland", and finally Polish-American Corporation "PMP". Although so many changes, the company has been always following the idea of its founder H. Füllner, being active in the paper industry for over 160 years...

On the 15th of July 1854, Heinrich Füllner paid 366 talars for a small wooden building in Cieplice, where he established his workshop. He started his business with paper device rebuilds and manufacturing spare parts for local paper mills. Over the years the company grew up and became a paper machinery producer. The first complete H. Füllner's paper machine was built in 1865. By the end of the 19th century, Füllner's workshop became a well-known paper machinery producer. Customers from Europe, Asia and even South America have bought complete paper lines designed and manufactured by Füllners due to their high quality. Up to the Second World War, the company built almost 600 paper machines and provided around 500 modernizations.

In 1945, the Polish government decided to continue the tradition initiated by H. Füllner and has reconstructed the paper machinery production center in Jelenia Góra, Poland. The Company named Fampa became a supplier of the most modern machines for the paper industry. In the year 1964, Fampa signed a license agreement with Beloit Corporation, which was at the same time a beginning of Fampa's fast development. After 26 years of common work under the license agreement, in 1990 Fampa became one of Beloit's divisions – Beloit Poland.





Working as one of Beloit's divisions was a huge step for the company's development. Unfortunately, at the end of the 90's the financial situation of the Beloit Corporation became increasingly worse. In 1999 only the Polish division, Beloit Poland, had not generated any losses. The great Beloit Corp was bankrupt.

Thanks to the Polish Managers and an American Investor, the company in Jelenia Góra was saved, and in the year 2000, they created the PMP Group corporation and started a brand new chapter in our history.

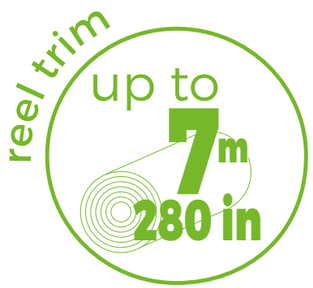
The company was always focused on supplying the best paper machines, and as a result, its development kept growing. The machines that were, and still are, designed by this company are significantly influencing the development of the world's paper industry.

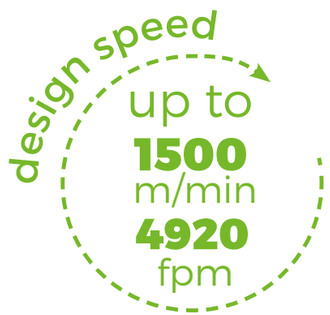
We are proud that for over 160 years we have been a part of a stormy and at the same time a wonderful history. Over the years, from generation to generation, we have passed the knowledge of how to create the best paper machines that have changed the world for a better place.

That's why we believe that our heritage is our foundation... A spirit that drives us to action and an experience that gives us knowledge. It is our pride, from which we draw the strength every day, to provide the best value to our customers. We believe that thanks to our heritage, we build a better world for us and the next generations.

At PMP we are **"Honoring our Past, and Empowering Our Future"...**

Paper Line Solutions





Metering Size Press

Paper width: up to 10 m / 395 in
Sizing agent: starch, PVA, pigment
Solids content: up to 18% (starch)
Surface sizing weight: up to 8 gsm total
A structure made of high quality materials (carbon fiber, composites)

Press Section

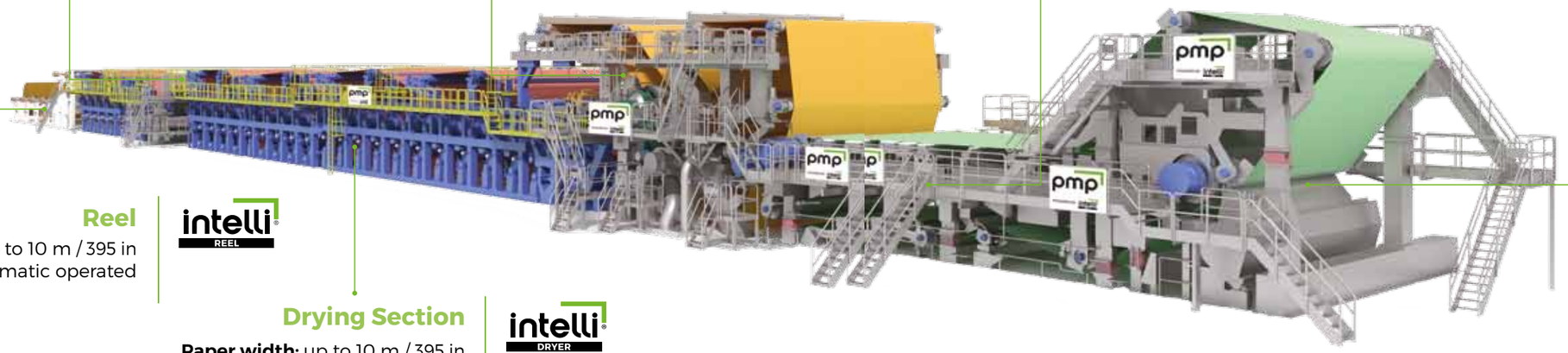
Paper width: up to 10 m / 395 in
Counter rolls: plain, Intelli-DCR®
Nip range: up to 1400 kN/m
Dryness after press: up to 53%

Former

Paper width: up to 7.5 m / 295 in
Type: 4 or 5 wire roll type

Hydraulic Headbox

Pondside: up to 10 m / 395 in
Type: hydraulic (with or without CP)
No. of channels: 2-12
No. of layers: single or multilayer



Reel

Paper width: up to 10 m / 395 in
Hydraulic or pneumatic operated

Drying Section

Paper width: up to 10 m / 395 in
Drying cylinders: up to 1830 mm / 72 in
Pressure ratings: 10 bar
Drive: by felt rolls (silent drive)
Steel type cylinders

Tissue Line Solutions

Delivery Program

TM Efficiency higher than **95 %**

Media Consumption

Steam as low as 1.9T/T
Electricity 345 kWh/T average

State-of-the-art Solutions
up to **220 t/d**
Premium Quality

reel trim up to **5.6 m** / **220 in**

SYD dia up to **22'** SYD

operating speed up to **2000** m/min / **6560** fpm

basis weight up to **42** g/m²

Intelli-Hood®
Gas or steam heated hood to ensure high thermal efficiency and energy savings

Intelli-YD®
– Steel Yankee Dryer
Steel Yankee Dryer combines high drying efficiency with ultra-low media consumption

Intelli-Reel®
& Tail Threading
Provides perfect parent roll structure and user friendly design

Intelli-Press® equipped with Intelli-SPR®
– Suction Pressure Roll
∅ up to 1420 mm
SPR maximize the amount of water removed from the sheet (high dryness up to 46% after press)

Intelli-Jet V®
– Hydraulic Headbox
Single or multi-layer headbox guarantees premium tissue quality

Intelli-Former®
– Crescent Former
Compact solution for perfect web formation

REBUILDS

A NEW VALUE FOR EXISTING MACHINERY

MAIN FEATURES:

- Precise calculation
- On site measurement
- Scheduling
- Design of the new equipment (tailor made solutions)
- Manufacturing of new core technological units
- Pre-Assembly at PMP facility
- All necessary tests
- Transportation to the mill site
- Adjustment
- Optical alignment and erection at site
- Engineering commissioning
- Technological start-up and post start-up assist
- PM/TM relocation
- PM/TM profile change

BENEFITS:

- **PM CONVERSIONS OPPORTUNITIES** (newsprint into containerboard / tissue or heavy into lighter containerboard grades)
- **CAPACITY INCREASE** up to **25%**
- **PAPER PROPERTY** improvement
- **UP TO 50%** investment cost savings
- **RELOCATION POSSIBILITIES**

ENERGY SAVING SOLUTIONS

CREATING AN ADDED VALUE FOR YOUR BUSINESS

MAIN FEATURES:

- Drying Systems (hood, steel dryer, steam & condensate system)
- Energy Improvement Solutions (recovery system)
- Sheet Stabilizing System (transfer box, stabilizing box)
- Eco Friendly Solutions (runnability improvements, dust system, mist system, building ventilation)
- Energy Management (plant surveys, plant upgrades, turn-key solutions)

BENEFITS:

- Opportunity to **REDUCE A TOTAL ENERGY** cost by 5 to 20%
- Improvement of **STEAM, FUEL, ELECTRICITY & COOLING WATER** management process
- Improvement of **PRODUCTION EFFECTIVENESS** due to increasing of drying capacity
- **ATTRACTIVE ROI** when investing in modern technological solutions (average payback time under 1 year)
- Improvement of **WORKING ENVIRONMENT**
- Operator **FRIENDLY SOLUTIONS**

ENGINEERING SERVICES

A GREAT PERFORMANCE IS OUR GOAL

MAIN FEATURES:

- Application/ Designing/ Detailing
- Product development
- Terminal points definition
- Approval meetings support
- In-house manufacturing with continuous supervision
- Technological Services (commisioning, start-up, PM/TM optimization)
- Existing lines troubleshooting (dynamic stability / vibration analysis and more)
- Safety analysis

BENEFITS:

- Wide process knowledge for **EFFICIENT PROJECT EXECUTION**
- **EXPERIENCED** & dedicated team
- **FLEXIBILITY** in action
- Total annual engineering capacity up to **100,000 HOURS**
- **MODERN ENGINEERING SOFTWARE** SolidWorks, CosmosWorks, CADSIM Plus, E-plan, DBWokrs) – shorter execution cycles
- Cooperation with industry
- **EXPERTS/ADVISORS**
- **METRIC & IMPERIAL** designs
- English as a **COMMON LANGUAGE** of communication

MILL SERVICES

KEEPING YOUR MACHINES IN A GREAT SHAPE!

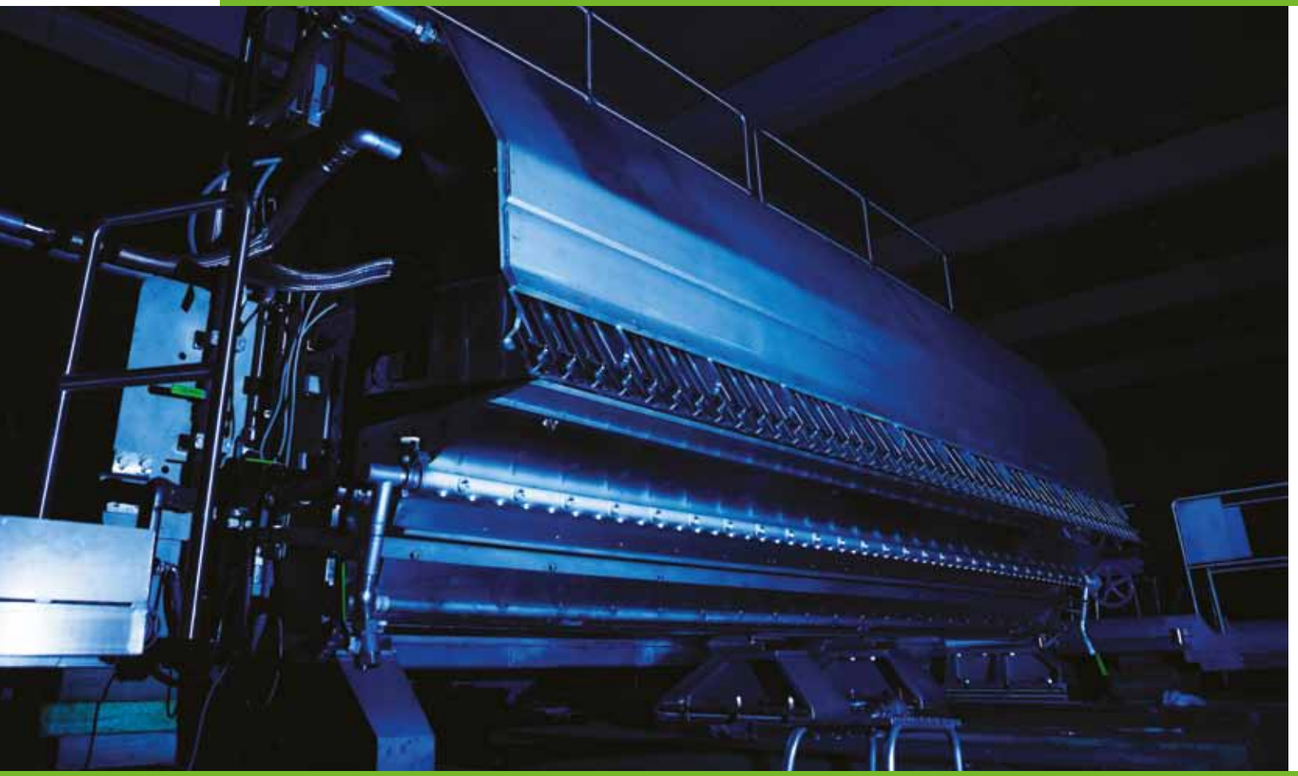
MAIN FEATURES:

- PM/TM pre-erection & erection at site
- PM units routine check-outs
- Emergency repairs
- Optical measurements
- Refurbishment services
- Disassembly & relocation of existing PMs

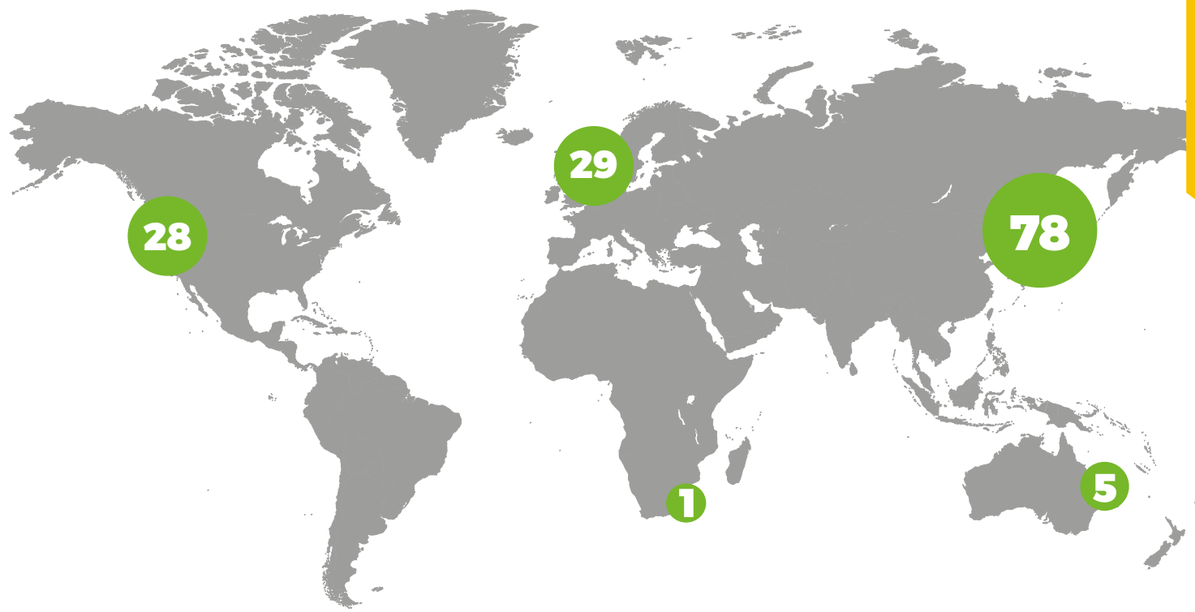
BENEFITS:

- **COMPLEX** approach
- Wide scope of **ACTIVITIES FROM A TO Z**
- Incorporation of refurbished machinery into **EXISTING PAPERMAKING LINES**
- **HIGHLY SKILLED SPECIALISTS** with vast experience collected worldwide
- Paper mills can be reached by a PMP specialist within **24 HOURS IN EUROPE, ASIA & NORTH AMERICA**
- Being in line with **EU REGULATIONS & RECOMMENDATIONS (CE)**

HYDRAULIC HEADBOX



REFERENCES MAP



Since 1854 - **771** headboxes designed and delivered worldwide including **141** units as PMP

Exemplary products

AN ICONIC SOLUTION FOR YOUR ULTIMATE SUCCESS

MAIN FEATURES:

- **PONDSIDE:** Up to 10 m / 395 in
- **DESIGN SPEED:** Up to 1500 mpm / 4920 fpm
- **BASIS WEIGHT:** 20-400 gsm / 12-250 lbs/3000ft²
- **TYPE:** Hydraulic (with or without CP)
- **NO. OF CHANNELS:** 2-12
- **NO. OF LAYERS:** Single or multilayer

BENEFITS:

- **IMPROVED PAPER QUALITY** - basis weight profile improvement up to 80%, formation & fiber orientation – (+-) 5 degrees
- **IMPROVED PM UPTIME** (high internal - surface quality - less cleaning operation & better runnability)
- **FLEXIBILITY OF PRODUCTION** (a wide range of adjustment)
- Link to **ANY QCS/DCS SOLUTION**

SAMPLE REFERENCE

Customer:	**Confidential**
Country:	**USA**
Grades:	Fluting
Basis weight:	118-223 gsm
Reel trim:	8966 mm / 353 in
Design speed:	915 mpm / 3002 fpm
Operating speed:	765 mpm / 2510 fpm
Capacity:	1680 t/d
Pondside width:	5842 mm / 230 in
Number of channels:	4
Number of layers:	Single
Type:	Hydraulic
Slice width:	9358 mm / 368 in

SHAKE UNIT

PROVEN TECHNOLOGY WITH SUPERIOR IMPACT ON THE WEB FORMATION AND FINAL PAPER STRENGTH PROPERTIES

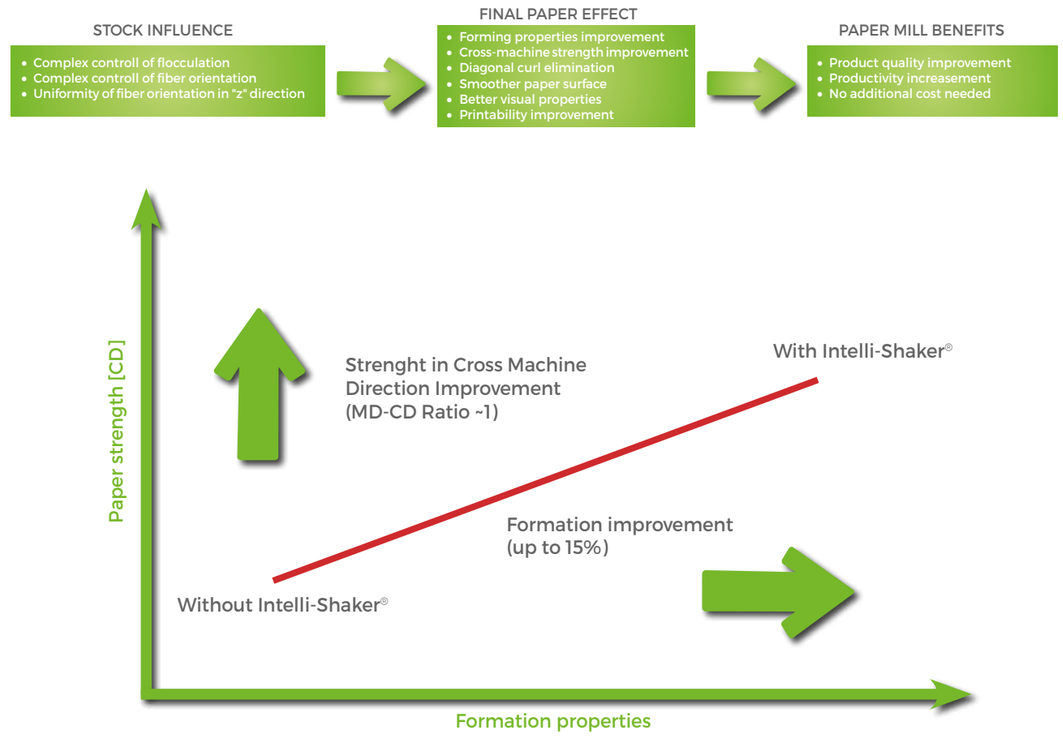
MAIN FEATURES:

- **WORKING PRINCIPLE:** By the use of four rotating imbalanced masses, the Intelli-Shaker® imposes the horizontal repeatable motion in the cross machine direction on the breast roll, while all vertical forces are being eliminated. The stroke and frequency is fully adjustable in the range of 0-25 mm and 1-10 Hz respectively.
- **LOCATION:** Attached to the Breast Roll on the Drive Side of PM
- **APPLICATION OPTIONS**: Fourdriniers & Hybrid Formers
- **WORKING CONDITIONS**:
  - 0-25 mm (0-1 in)
  - 1-10 Hz (60-600 strokes/min)

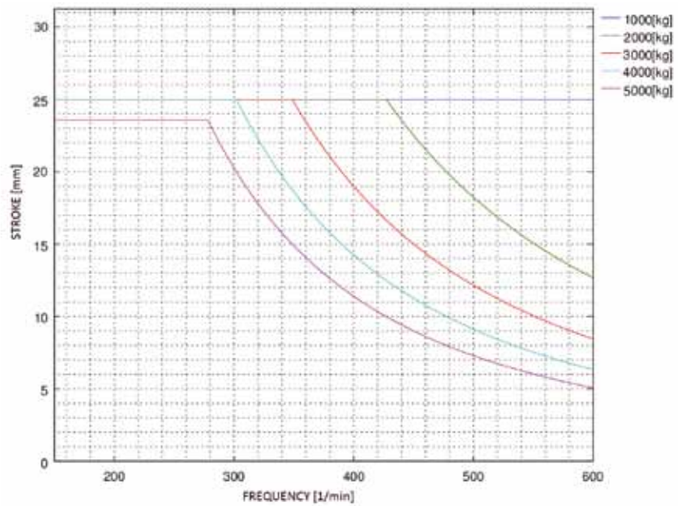
BENEFITS:

- **IMPROVES FORMATION UP TO 15%**
  - increased paper quality
  (MD/CD, SCT – for fluting)
- Enables PM **CAPACITY INCREASE** due to higher consistency in the headbox
- **HELPS TO IMPROVE PRODUCTION**
  - updating outdated headboxes
- Proper for **ANY PAPER GRADES**

IMPACT ON PAPER STRENGTH & FORMATION PROPERTIES



CORRELATION BETWEEN BREAST STROKE & SHAKE FREQUENCY



SHOE PRESS

GENTLE TOUCH WITH EXTENSIVE IMPACT

MAIN FEATURES:

- **PAPER WIDTH:** up to 10 m / 395 in
- **SHOE PRESS MODULE DIA:**
  - 1300 mm / 51 in
  - 1500 mm / 59 in
- **COUNTER ROLLS:** Plain, Intelli-DCR®
- **CONFIGURATION:** Up-right, converted
- **NIP RANGE:** up to 1400 kN/m
- Compact design

BENEFITS:

- **LOWERING THE COST OF PRODUCTION** – 4-10% higher dryness – compared to previous technologies - lower steam consumption
- **IMPROVED PAPER QUALITY** stiffness & higher bulk) – brighter & stronger paper
- ECO friendly Concept **(LOWER STEAM CONSUMPTION)**
- Better PM runnability **(STRONGER SHEET -** less breaks & higher felt lifetime)
- **LONGER PRESS** felt life

SAMPLE REFERENCE

CUSTOMER:	**CONFIDENTIAL**
COUNTRY:	**UNITED KINGDOM**
Grades:	Fluting, Testliner
Reel trim:	5070 mm / 200 in
Max operating speed:	1200 mpm / 3937 fpm
Basis weight:	80-120 gsm
Capacity:	250 000 t/a
Width of sheet:	5260 mm / 99 in
Module size:	1500 mm / 59 in
Mating roll:	Inteli-DCR®
Nip load:	1st: 80 kN/m 2nd: 140 kN/m 3rd: 1400 kN/m

Exemplary products

SAMPLE REFERENCE

CUSTOMER:	**JIANGSU CHANGFENG PAPER**
COUNTRY:	**CHINA**
Grades:	Testliner
Reel trim:	4860 mm / 191 in
Max operating speed:	850 mpm / 2789 fpm
Basis weight:	90-220 gsm
Width of sheet:	5000 mm / 197 in
Module size:	1300 mm / 51 in
Mating roll:	Plain
Nip range:	1050 kN/m
Nip load:	1050 kN/m

METERING SIZE PRESS

SAMPLE REFERENCE

CUSTOMER:	**CONFIDENTIAL**
COUNTRY:	**UNITED KINGDOM**
Grades:	Fluting, Testliner
Reel trim:	5070 mm / 200 in
Max operating speed:	1200 mpm / 3937 fpm
Basis weight:	80-120 gsm
Capacity:	250 000 t/a
Starch weight range:	3.5-7 g/m^2 (total)
Starch solids:	12-16%
Sizing temperature:	80˚C
Module size:	80 kN/m
Mating roll:	60 kN/m

Exemplary products

STRONGER PAPER WEB & PERFECT PRINTABILITY

MAIN FEATURES:

- **PAPER WIDTH:** up to 10 m / 395 in
- **DESIGN SPEED:** Up to 1500 mpm / 4920 fpm
- **SIZING AGENT:** Starch, PVA, pigment
- **SOLIDS CONTENT**: Up to 18% (starch)
- **SURFACE SIZING WEIGHT:** Up to 6 gsm / 1,2 lbs/3000ft^2

BENEFITS:

- **IMPROVED SHEET QUALITY** - uniform starch application – higher sheet smoothness – better printability
- Increased in **WEB TENSILE STRENGTH**
- Easy maintenance – **HIGHER UPTIME** (a full cantilever design/efficient cleaning)
- **USER-FRIENDLY DESIGN** – easy to operate (automatic mode)
- The after Size Press - **DRYERS CAN BE REDUCED**
- **HIGH QUALITY** rods and holders
- **QUICK CHANGE ROLLS**

SAMPLE REFERENCE

CUSTOMER:	**HUACHUAN PAPER**
COUNTRY:	**CHINA**
Grades:	Glassine
Reel trim:	3460 mm / 136 in
Max operating speed:	700 mpm / 2297 fpm
Basis weight:	28-90 gsm
Capacity:	80 000 t/a
Metering heads material:	composite
Surface sizing pick-up:	max 6 g/m^2 total borne dry
Starch solids:	3-12%
Sizing temperature:	75-80˚C
Design nip:	50 kN/m
Operating nip:	45 kN/m

PMP OPEN HOUSE 2017 POLAND CONFERENCE

PMP OPEN HOUSE POLAND 2017

After conducting three successful conferences (in May 2011, March 2012 and March 2013), in 2018 PMP took the opportunity to organize a technical conference, this time based on global mega trends and Energy Saving Solutions.The event was entitled "Save your Energy, Save your Money, Empower your Future". A 3-day event (21st-23rd May) positively influenced sales and PMP's image as an industry expert and technology integrator. There is no doubt that PMP presented itself as a strong, flexible and professional partner.

"SAVE YOUR ENERGY, SAVE YOUR MONEY, EMPOWER YOUR FUTURE"

21-23 May 2017, Karpacz, Poland

The conference took place in the modern and luxurious Hotel Gołębiewski, in Karpacz (Poland), which offered not only a great conference base, but also an attractive location in the heart of the Karkonosze Mountains. The location of the conference was for sure an additional advantage, which improved the high rank of the event.

ORGANIZERS & PARTNERS

PMP (Paper Machinery Producer) is a global provider of tissue, paper & board technology, and has been supporting the pulp and paper industry for over 160 years, executing projects on 6 continents, and in 33 countries. The Company owns 6 facilities in 4 countries (Poland, USA, China and Italy). The company has built its identity over the years under the names H.Füllner, Fampa, Beloit Corporation and, since 2000, PMP Group. PMP is a medium size Polish-American Corporation (privately owned) offering high quality products and services.

PMP organized the conference in partnership with known and valued companies from the paper industry:

CRISTINI – an Italian Company located in the most industrialized area of Northern Italy supplying the Pulp & Paper Industry with a range of paper-machine clothing;

HYDAC – offers a comprehensive range of products in hydraulics, electronic control technology, solenoid technology and control sensors as well as fluid sensors/condition monitoring and fluid control products;

SCHAEFFLER – a global integrated automotive and industrial supplier. The Schaeffler Group supplies high-precision components for automotive and rolling and plain bearing solutions for industrial applications.

In addition, the entire event was enriched by participation of other partners, including industry associations (TAPPI & Polish Papermakers Association), media (Paper 360° and The Polish Paper Review), banking organizations (Bank BGK, KUKE), as well as Wroclaw University of Economics and Papermaking Museum from Duszniki Zdroj.

PMP OPEN HOUSE CONFERENCE GATHERED PEOPLE FROM ALL AROUND THE WORLD

There were 105 participants in total (from 18 countries, 4 continents), including specialists working on the constant development of paper industry.

THE OFFICIAL CONFERENCE OPENING

The opening of the conference took place on the 21st of May in an 18-century "Palace on the Water" in Staniszow. PMP's new President – Mr. Mirosław Pietraszek cut the ribbon and officially welcomed guests to the conference.

A NEW FORM OF PRESENTATION: EXPERT PANELS

The idea of the conference was to exchange the knowledge about global trends in paper industry, especially around the energy consumption and energy saving solutions. The technical part of the conference was based on a discussion among industry experts. Expert Panels were represented by 29 leading specialists, well-known representatives of global papermaking corporations and industry leaders, including: YFY, International Paper, Universal Paper Manufacturers, Smurfit Kappa, Mondi Group as well as PMP representatives and partners.

During the conference, there were 7 sessions based on the ideas of the Expert Panels, including:

Session 1 – *Global Megatrends and Their Impact on P&P Industry – Challenges & Opportunities*

Session 2 – *A Successful Capital Project Execution in P&P Industry – Behind the Scenes*

Session 3 – *Innovations in Paper Making Production Technologies – Go Thinner, Go Stronger, Go Cheaper*

Session 4 – *Innovations in Tissue Making Production Technologies – Stay Flexible, Save Money and* Enter Undiscovered Market Niches

Session 5 – *Future Skills & Competences of Workforce – What Does P&P Industry Really Need?*

Session 6 – *The Paper Mill of the Future – Sustainable Approach and a Role of Energy*

Session 7 – *Navigating Towards the Future – Smart Financing Ideas and Maintaining Business Risk – (BGK Bank, KUKE)*

PMP COMPANY TOUR

During the conference all participants had a unique opportunity to visit PMP Headquarters in Jelenia Góra, Poland. The company tour included a workshop tour, where guests were able to witness paper machinery manufacturing, as well as to see components ready for shipment, including products from Intelli-Paper® and Intelli-Tissue® platforms, such as: Intelli-Jet V® Hydraulic Headboxes, Intelli-Former®, Intelli-Shaker®, Intelli-Sizer® Metering Size Press, Intelli-Reel®, as well as other products in the production stage.

EXHIBITION AREA AND ART GALLERY

One of the conference features was a small exhibition area, where PMP and partners have presented their offers, scope of supply and newest technological solutions.

Another interesting part of the conference was a gallery entitled: „Honoring Our Past and Empowering Our Future", which was related to the rich history of PMP. The whole gallery was prepared in cooperation with the Museum of Papermaking from Duszniki-Zdroj.

ADDITIONAL ATTRACTIONS

Conference guests had a chance to participate in a Virtual Mill Tour, which was presented in the cinema. The whole cinema show was based on a project executed by PMP in South Africa for UPM (turn-key green field tissue mill).

The conference program also included a Spouse Program as well. All spouses were able to visit the beautiful Książ Castle. In between sightseeing and evening events, there was also time to relax in the SPA.

After a busy day of conference panels, all guests had time to relax and meet each other during evening events, including the official gala dinner.

During the last day, PMP organized a tour of sightseeing in Wroclaw City by night. It was a great opportunity to meet polish cultureand traditions, including the most important attractions of this amazing city.

SUMMARY

PMP's Open House conference was a world class industry event. The event offered a big pill of knowledge, as well as additional attractions. All guests left Poland satisfied and with a promise of participating in future PMP Open House events. We can't wait for them!

Thank you for attending PMP Open House 2017 Conference:
„Save Your Energy, Save Your Money, Empower Your Future"!

21st - 23rd May 2017
Karpacz, POLAND

PMP OPEN HOUSE POLAND 2017

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HOW TO EFFECTIVELY IMPROVE PAPER QUALITY ?

– A MODERN HYDRAULIC HEADBOX AS A COST EFFECTIVE WAY TO ENHANCE PM PERFORMANCE

Maja Mejsner
Vice President Business Development & Marketing PMP (Paper Machinery Producer)

The Pulp & Paper industry is directly impacted by global megatrends nowadays. The papermakers responded pretty well to the business challenges by becoming more efficient. The use of highly advanced technological solutions such as multi-layer hydraulic headboxes, shoe presses and film sizers is getting to be more and more of a requirement. The main idea is to share with you PMP's global experience, connected with achieving premium paper properties while applying modern hydraulic headboxes. When papermakers look for opportunities to improve basis weight profile, sheet formation, fiber orientation, productivity improvement or better strength properties of paper, they are encouraged to take a closer look at the headbox currently installed on the papermaking line. Despite the fact that the headbox is only one piece at the beginning of the process but its impact on the whole project is significant.

"THE USE OF HIGHLY ADVANCED TECHNOLOGICAL SOLUTIONS SUCH AS MULTI-LAYER HYDRAULIC HEADBOXES, SHOE PRESSES AND FILM SIZERS IS GETTING TO BE MORE AND MORE OF A REQUIREMENT."

GLOBAL MARKET TRENDS.

Our industry is directly impacted by global megatrends. On the one hand, some of them like e-commerce development (more shopping on line and the need to protect the goods during transportation), fast-paced lifestyles (eating out, ready-to-cook products etc.), an increase in single person households (single portion packages), the aging of the population (higher demand for healthcare products) and higher sensitivity to sustainability (eco trend) fuel the growth. This is especially true for the tissue and containerboard sectors. On the other hand, as a consequence of digital media trends (e-technology), we have observed a drastic fall in the demand of newsprint & fine paper grades globally. In addition containerboard producers are forced to fight

with reducing basis weight while still trying to maintain product strength and production costs. Energy consumption is becoming crucial. There is also more dynamic competition (imports of paper from low cost regions) and more demanding retailer requirements, wanting to be able to pack more products on one pallet and make them stronger as transportation distances are becoming longer. Based on these trends the growth for packaging should continue smoothly. Perhaps we will see less consumption per capita due to basis weight reductions, however, we should also see more volume of product sold.

The paper industry has responded pretty well to the business challenges by becoming more efficient. The use of highly advanced technological solutions such as multi-layer hydraulic headboxes, shoe presses and film sizers is getting to be more and more of a requirement.

MARKET REQUIREMENTS WITH REFERENCE TO PAPER QUALITY.

How are global market trends influence the development of paper machines? To help to illustrate this point, let's take three big countries with a range of customer demand: USA, China and Russia.

In the growing tissue sector, quality level is determined by local consumers. As you may be well aware, when GDP growth and disposable income is observed, the demand for tissue is increasing in both volume and quality. Projects in this sector on emerging markets, are focused on replacing old machines by new ones (EcoEc type). This trend is especially observed in China and Russia. In more mature markets, such as the USA, most of the projects are focused on sophisticated rebuilds with installation of multilayer headboxes (2,3,4). In these markets, modern formers are already a standard, so the producers are focused on implementing highest product quality solution with an optimum web structure.

In graphic papers, demand has been decreasing in mature US and European markets. Papermakers there are more focused on cost optimization and PM runnability improvement. Many of them are looking for universal solutions, to produce paper suitable for both colour ink jet and colour laser jet printers (2 in 1 or dual purpose), a demand driven by today's office equipped with both types of printers.The demand is clear - to have repeatable performance (no jams in printers) and stable quality (excellent colour reproduction). The key for their success is to start with proper fiber orientation to avoid paper diagonal curl during the printing process. Excellent formation provided by a properly designed headbox will help greatly to reproduce consistent shape sharpness and brilliant colour. Rebuilds of graphic paper machines are applied within the wet end with a special attention to headboxes.

Unlike the maturing graphic paper, the containerboard sector has been developing and increasing step by step on all continents without exceptions. Basis weight of containerboard is decreasing from year to year by 1-2 gsm, especially in Western Europe and also in the USA. While this lower basis weight trend is observed, in many cases the expectations for the same or even higher sheet strength is expected. Fast Moving Consumer Goods (FMCG) producers push to optimize distribution and handling costs of ready-made products is a key driver for this trend. The whole supply chain must be optimized and the container box cost to performance ratio is their object of intense focus. The expectation is clear – the cost of packaging in the whole supply chain must be reduced (cost of the box, its efficiency to pack more in one common pallet, the max no of pallet per truck and disposable issues). Additionally, an attractive appearance of the box is now becoming more and more important as more and more boxes are used as shelf-ready display in retail stores. High quality of printability is critical to influence consumer's choice. For papermakers the challenges are clear: lower containerboard production costs, provide higher containerboard performance and improved printability.

"MANY PEOPLE SAY THAT THE HEADBOX IS THE HEART OF A PAPER MACHINE. THE HEART IS THE ENGINE FOR OUR BODY AND SO IS THE HEADBOX FOR THE PAPERMAKING MACHINE."

In Europe, this trend is fueling the strong growth of Kraft Top liners. These containerboard grades are typically made with a duplex structure whereas the top is made with virgin Kraft fiber while the bottom is made with recycled fiber. It offers to box converter a paper with the appearance of stronger Kraftliner grades but with a cost profile closer to Testliner. Higher printability on these new Kraft Top liner grades are typically made with hydraulic headboxes on a two layers Fourdriner machine, however, today even Gap forming is used more often. Common technology used is the hydraulic headboxes that offer superior sheet uniformity and formation - a critical element in the pursuit of better printability.

TIPS FOR A SUCCESSFUL REBUILD

It is important to understand the needs of your customers. There are a few important points to consider while considering a rebuild of a machine that involves a headbox.

First of all – it is critical to understand that a headbox is the beginning of the paper web forming process. If this step is done correctly, everything you do afterward (pressing, drying, sizing, calendaring etc.) is easier. In fact, reaching the high quality and productivity targets can only be possible with the highest quality hydraulic headboxes. Any compromises made at the beginning of the forming process will lead to other amplifications of defects requiring even more compensations. All these non-value added steps will ultimately drive up costs and lower productivity.

Problems, like poor sheet profiles from a headbox, will not only cause more paper rejects, it will also force you to slow down the line to dry up the moisture peaks. If there are web defects (stock lumps and edge defects) from the headbox, more web breaks will occur. An outdated headbox in poor technical conditions may cause problems but you may not noticed it and you may be led to believe, over the years, that these symptoms are somehow normal and the problems are somewhere else. Our experiences all over the globe has shown us that every time we put strong focus on the wet section and when our headbox technology in involved in our projects, we achieve success stories quickly. Acting smarter rather than harder is the process of rebuilding the line.

"EVERY PMP'S HEADBOX IS LIKE A UNIQUE LUXURY ITEM, IT IS CUSTOM, TAILOR MADE SOLUTIONS, PRODUCED BY US FROM A TO Z, UNDER FULL IN-HOUSE CONTROL, AT OUR HEADQUARTERS IN POLAND."

Secondly, a headbox is not a screwdriver to be used for everything. In today`s more demanding marketplace, a paper machine cannot be designed to produce, vastly different products – creating hybrid designs do not work well. A modern and efficient paper making line is designed and tuned to produce a relatively narrow range of products to avoid making compromises by trying to make grades at the far extremities of the spectrum.

Sometimes, when the solution is defined, we are requested to deliver a headbox proper for any scenarios. Precision calculations and proper design help to avoid troubles. We have proven in the past that we have the know-how and capability to tailor made a solution for any customer.

Coming now to the third point – a headbox is not a brick – it is a system. Before you decide to move forward with a papermaking machine rebuild for a new headbox, it is essential to analyze its application. Changing the headbox also requires modification of the stock approach system. Capacities of the fan pump, cleaners, screens and control systems, all need to be analyzed. The delivery of a sophisticated CP system and possible modification of a wire section must also be explored. However, it is very important to do things right. Our proposal always covers technical application analysis and indication of points that are essential to reach the goals. That is why headbox solutions are not delivered straight from a shelf. Each project, as well as a customer, is different and their needs are different. While having ambitious goals, professional execution is crucial to make returns on your investment efficiently and more quickly.

And finally, details matter. The devil always is in the details Many people say that the headbox is the heart of a paper machine. The heart is the engine for our body and so is the headbox for the papermaking machine. It should be in a good condition, and kept clean. Headboxes can last a long time. Every headbox is like a unique luxury item, it is custom, tailor made solutions, produced by us from A to Z, under full in-house control, at our headquarters in Poland. We apply modern manufacturing technologies, including laser welding and other automated steps . Our policy is based on continuous quality control. Surface flatness measurements by using a Faro Arm device. Once surface polishing is completed, the results are a mirror finish. Many critical part are hand- made and custom fitted by our specialists. For us, the use of manufacturing methods according to highest world standards to ensure excellent headbox performance and low maintenance costs is just what we do very well daily.

EXPERIENCE THAT COUNTS

Our experience has been collected on **6 continents** on both well-developed and emerging markets, in paper mills that produce almost all grades, including tissue, packaging, fine and specialty papers.

There are over **140** PMP Intelli-Jet V® hydraulic headboxes working around the globe. Our solution is patented design. Among our customers today you may find market leaders as well as other individual producers. We deliver hydraulic headbox with or without CP to machines of any type, up to 395 inch width, from 2 – 12 channels and working speed of up to maximum 6900 fpm.

Complex control of the headbox process, from the concept, through the design, manufacturing, quality control up to optimization, have been our core expertise in providing optimum solutions to papermakers. It is something we do very well. For over **160 years** of activity, over **770** headboxes of different technology have been built in our factory in Jelenia Góra, Poland, including rectifier roll headboxes, as well as hydraulic ones. Since 1990 our company was a part of Beloit Corporation and was named the Centre of Excellence for producing hydraulic headboxes. This tradition continues today.

In USA, we have been active for half a decade and established strong ties there. Until now we have been working with market leaders in both paper, packaging and tissue sectors.

CASE STUDIES

To better illustrate all the points above, below you will find two examples of such projects completed by PMP in US market.

Case study number 1 is a paper machine line wet end rebuild for a leading paper producer in US producing twin ply linerboard and corrugated medium.

The main goals of the rebuild were: to improve paper quality (dealing with a poor CD profile), to take care of layers' purity and to allow production a relatively thin top layer.

The scope of the delivery executed by us covered two hydraulic headboxes (primary and secondary), a Consistency Profiling System for the primary headbox, essential wire section modifications as well as pre-assembly, erection supervision and start-up services. The customer took care of the stock approach system for both units.

Both headboxes were designed and calculated carefully to meet specified basis weight splits between the top and bottom plies. There were several challenges at the beginning of the project. From the design perspective, taking into consideration an extreme pondside width (close to **350** inch), two factors were critical: understanding the process of papermaking and to compensate the deflections properly. As a company we have a rich experience in deliveries of that type of units including both primary and secondary positions. To make sure the deflection would be compensated well, we followed a tailored-made designing path exceeding the scope of thermal and hydraulic calculations. Our customer is very demanding and conscious, so each stage is always thoroughly checked. To achieve a proper quality of the top ply and ensure proper layer purity, the equipment was designed to minimize the jet impingement angle from the secondary headbox. Our solution ensured a production of pure, thin top layer as it was required. In addition, it is worth to mention that the logistic of the project was demanding as each headboxes' weight exceeded 44 tn, however erection and start-up process were completed within 19 days. As a result of the rebuild paper quality was improved significantly (CD 2 sigma less than 0.6%) and expected layer purity was achieved. This case helped us to obtain a similar applications for the same customer in US, that confirms the delivered solution fully met the user's expectations.

The second case study is a fourdrinier tissue machine wet end rebuild scenario for a tissue producer in US. The discussed tissue machine of reel trim 200 inch produces tissue with basis weight range 10-30 lbs / 3000 ft2 and working speed from 2700 to 4650 fpm. As the old headbox was outdated and not flexible enough, a main goal of the project was to ensure higher flexibility of production through applying of 4-layer type hydraulic headbox roof type and to meet the deadline (paper at reel within 9 months). This concept is innovative in the tissue industry as the most common solutions are single and from time to time double layer headboxes. The idea was to play with different mix of stock to produce products with varying layer compositions. As you may imagine this 8 channel, 66 tn unit is sophisticated and very complex. Taking care of proper calculations, applying of high quality materials and a logistics process were crucial. As a curiosity, during installation at site we had to rotate and lift the headbox using special helping tools. The main project goal – production flexibility increase was met followed by improved tissue properties (CD 2 sigma COV – 2%) immediately after start-up.

CONCLUSIONS:

To sum up. When you look for opportunities to improve basis weight profile, sheet formation, fiber orientation, productivity improvement or better strength properties of paper properties, take a closer look at your current headbox. Despite the fact that the headbox is only one piece at the beginning of the process but its impact on the whole project is significant.

Personally, I would like to encourage you to meet experts, who, I am sure, can help you to choose the best way for your success. You are warmly invited to Jelenia Góra to witness headboxes' designing and manufacturing process anytime. As an alternative, as PMP, we offer also mill audits and technical discussions for whom may be interested.

SPRAY APPLICATIONS FOR PAPER AND BOARD SURFACE TREATMENT

TAPPI PaperCon 2018
APRIL 15-18, 2018 • CHARLOTTE, NORTH CAROLINA
SHAPING THE FUTURE THROUGH INNOVATION
PAPERCON.ORG

ABSTRACT

Paper and board surface treatment is a science of itself. Certain combinations of chemicals and pigments are applied to the web to achieve the desired functional properties of the surface. With an ideally functioning applicator for surface treatment, the user can apply the desired amount of chemicals or pigments, or a mix thereof, thus achieving the desired property with a minimum use of energy and waste created. One further requirement is that the desired functionality of the surface is achieved in a minimum number of process stages to avoid overly complicated processes and extensive size of machinery. The existing concepts available today are compromises of the requirements and there is a gap for leaner manufacturing. For example, paper web sizing with a pond sizer provides a high internal strength but with high energy costs and run-ability problems at lower basis weights. A film sizer provides improved run-ability at lower basis weights and lower consumption of energy but does not provide the desired improvement in internal strength. Single coating does not provide top quality, seen from a printer's perspective, whereas coating with two layers provides a satisfactory visual look; however, double coating adds complexity, as well as an increase in costs and energy consumption. Applying barrier chemicals on the web surface would ideally require a separate surface treatment station for the purpose, but at significant investment costs.

Applications based on high-pressure spray technology have been developed and tested in pilot facilities. This concept is based on a special application of spraying technology and on a special design of the process for feeding and re-circulating the flow of material to and from the surface treatment units. Spray application for sizing has been tested in a full-scale pilot, showing that the combination of low energy costs and high quality can be achieved. In coating, the application of lighter and thinner pigment layers generates a high-quality, fully competitive paper or board surface. It has been found that two thinner layers of coating applied in only one surface treatment station provides superior quality, equal to that of conventional double coating. In addition, applying barrier chemicals on the paper web surface as an independent layer is possible with the high-pressure spray applicator. Another very significant advantage of the spray applicator is the small equipment size, which make retrofits of existing conventional surface treatment stations feasible and payback time fast.

The expected results of implementing this technology are improved production, lower energy costs and simplification of the product line. This article will present the arguments in more depth.

Case Study

INTRODUCTION

Let's focus on high pressure spray application systems for paper and board surface treatment. We have been developing this concept over the last several years and would like to share key findings regarding our progress and status.

We are motivated, as we believe that the paper and board industry could gain significant benefits by adapting this technology and implementing it into the manufacturing process.

NOVEL USE OF SPRAY APPLICATION

In short, spray coating or painting is a technique where a device sprays a coating through the air and onto a surface. Currently, there are a host of various spraying concepts developed for various applications. The majority of existing spray concepts are based on spraying with compressed air or on using an airless spray.

Spraying with compressed air can be traced back to the early 1880s. Airless spray technology, also called high pressure spraying, has its origin in the 50's.

The use of the spray technology for sizing and coating was introduced in the paper industry some 15 years ago. In fact, some variance of a high pressure spray surface treatment has been installed as far back as 15 years ago on a production line in Germany.

Later on, a few spray-sizers based on spraying with compressed air have been installed and started up. Furthermore, a few sizers based on high pressure spray-sizing have been installed for fluting.

In our spray coating concept, the spray technology used is high pressure spray. The high pressure spray application we are presenting today is an unique application of the spray technology, over-all, the high pressure spray concept is solid, simple and functional. The system can be used in surface treatment of a wide range of paper and board products.

COMPLEX PAPER AND BOARD PRODUCTS

The paper and board industry has been very adaptive and creative. There are some 300 different grades of paper, specifically developed for specific needs. Parallel with paper and board product development, paper and board making processes and machinery have been developed accordingly.

The interaction between fiber, chemical and pigment is complex and combining these substances to one functioning web is a challenging process.

Surface treatment can be categorized into sizing, application of barrier chemicals or coating with pigments and chemicals. The web is surface treated by applying one

or several layers of coating and pigments on the surface. Both sides of the web can either be treated in equivalent ways or differently.

Paper surface treatment in layers requires large machines with several surface treatment stations. For example, the demand for various barrier coated products is increasing. Successful application of barrier chemicals requires one or even two additional surface treatment stations. Adding such units on existing machines requires a high investment cost.

The challenge is to create the required functionality of the surface, with the required number of layers while at the same time minimizing the number of surface stations required. Such requirements put pressure on developing the machinery and the equipment further.

MULTI-DIMENSIONAL PAPER MAKING PROCESS

Paper and board making is a multi-dimensional process.

In general, the functionality of most paper and board products is a balance between the following criteria:

- functional properties of the surface; i.e the look of the printed image, the strength of the surface and the barrier properties,
- the stiffness, bulk and feel of the product,
- the specific surface area measured by m^2/ton of product.

The product is a result of compromises and vicious circles. For example, by improving the printability of the product with additional coating and calendering will lead to reduced stiffness and bulk, which again can be compensated for by increasing the basis weight of the web, which has a negative impact on the specific surface area.

In this process, surface treatment plays a significant role. For example, achieving the required surface functional properties with less coating applied makes it possible to reduce basis weight and to increase the yield.

The challenge is to apply each required layer with the minimum amount of chemicals and coating required. Such requirements add pressure to developing machinery and equipment to accomplish these goals.

WEAKNESSES IN CURRENT SURFACE TREATMENT TECHNOLOGY

Blade Coating

As well known in the art of coating, one of the basic issues in surface treatment is the penetration of water into the web. Water penetration negatively affects fiber bonding which in turn reduces the strength of the paper during the surface treatment process. Furthermore, water penetration causes fiber swelling which has a negative effect on the surface's capability to carry high quality images.

The widely used blade coating method, which produces surface properties suitable for high quality images on paper and board, is also very efficient in rewetting the web. In the conventional blade metering system, a massive amount of coating is applied on the web and thereafter the coating is pressed into the web structure by a blade with high pressure. The excess coating is removed and fed back into the supply tank. A substantial amount of energy is used for just pumping of the coating, as roughly 90% of the coating applied before the doctor blade is removed and re-circulated back. Furthermore, application of several coating layers requires huge multilayer surface treatment units and requires high investment where installed.

Due to these issues, significant efforts and research have been spent on ways to increase water retention and solids content in coating.

Film Coating

The film metering coater was developed in the end of the 80's and represented a breakthrough in coating. This method is limited to printing papers where the demand on quality of the printed surface is lower. The film splitting effect is a well-known phenomenon. The operating window of the film coater is relatively narrow. The amount of coating that can be applied is limited to around 10 g/m^2. The solid content of the coating is on the level of 60%. Controlling the amount of coating to be applied is not very accurate and is based on changing the applicator rod and possibly the coating solids content. In addition, over time, the amount of coating varies as the applicator rod wears.

Conventional Surface Sizing

Today in surface sizing, the film sizer is the most common application method. However, the maximum solid contents of starch is on the level of 15%. This means that the amount of water transferred with the starch is 6 to 7 times the amount of starch to be applied. Sizing of lower basis weight grades, where both sides have to be surface sized simultaneously, is challenging.

Barrier Coating

The rod metering system is used for barrier coating. The solids content is usually 45 - 50% and the amount applied is on the level of 7 – g/m^2 (dry). The best result in barrier coating is achieved with two barrier layers. Double barrier coating with conventional equipment is not feasible.

HIGH PRESSURE SPRAY COATING BUILDING BLOCKS

In the High Pressure Spray blade method of coating, each layer of coating is applied via a high concentrated spray directly onto the web surface and smoothed with a light pressure, low impact blade.

By breaking up the slurry into a fine spray and applying that spray onto the surface, a uniform and even surface is achieved. The low impact blade is required for the coating to get anchored onto the web surface. With the blade a small amount of excess coating is removed. With this application and metering concept, the range of coating that can be applied to the surface is between 1 to + 20 g/m^2 in one or two layers, and in exact amounts. A high pressure hydraulic system is designed to handle slurries with solid contents up to 70%.

Based on pilot testing, it has been found that with high pressure spray coating, rewetting of the web is lower than that of blade coating. This has been verified on the pilot machine and with printing tests. This is a result of several factors, such as the following:

1. High solids content of the coating.

2. Small amount of excess coating.

3. Lower blade pressures.

The re-wetting of the web can be decreased further by applying the coating in two layers against one backing roll. The first layer is adjusted to a maximum of 5 g/m^2 of coating. There is a low amount of water in 5 g/m^2 coating at a high solid content close to 70%. Trial results suggests that first layer formed can carry the next layer without the need of interim drying between the two layers applied. This means less penetration of water into the web and less mottling. As a result, a double coating effect is achieved with one coating station. Double coating with the high pressure application method without interim drying also called wet-on-wet spray coating.

HIGH PRESSURE SPRAY SIZING BUILDING BLOCKS

In High Pressure Spray sizing, a controlled amount of high solids starch solution is applied to the paper or board surface, followed by a nip formed by two rolls for the purpose of controlled starch penetration into the web.

The re-wetting of the web is a critical issue in sizing of paper. In spray sizing, the solids content is higher than what can be achieved with conventional methods. Thus, with the High Pressure Spray sizing process, water penetration is less when compared to conventional methods.

The pick-up of starch and the penetration of starch into the web structure can be influenced by starch solids content and the nip pressure of the two backing rolls. The operating window is wide when compared to that of the conventional methods.

The key parameters for controlling the concentration of starch in the z-direction are the following:
1. The starch solids content and viscosity.
2. The nip load of the backing rolls.

Sizing is used for reducing dust, improving stiffness or for sealing of the surface. The High Pressure Sizing Application method can be a flexible tool to accomplish the desired results for the sizing. For example, mills may want the sizing to be concentrated on the top layer or concentrated deeper into the sheet depending on the desired goal of the sizing. For example, to reduce ink penetration, concentrating the starch onto the surface layer is desired. This can be done by using low nip loads ~20 kN/m, in combination with high solids starch. If improving internal strength is a priority, the starch should be directed into the web structure. In this case, the nip load used is high, up to 60-80 kN/m depending on the grade. In each case, the starch solids content and nip loads can be optimized for the desired result.

OPERATING WINDOW

The operating window regarding coating solids content and the amount of coating and sizing to be applied is large.

In High Pressure Spray Coating the operating window is as follows:

Single coating:
- Single Layer, Application 5-15 g/m²
- Viscosity up to 2,500 mPa-s (100 Br)
- Solids content up to 70%

Double coating:
- First layer layer 5 g/m²; solid content and viscosity as above
- Second layer; 5-15 g/m²
- Viscosity 2,000 – 2,300 mPa-s (100 Br)
- Solids content 67-68%
- In High Pressure Sizing the operating window is as follows:
- Application and metering between 1 and 15 g/m²/side
- Solid contents up to 35%
- Viscosity up to 500 mPa-s (100 Br)

BENEFITS TO BE CAPITALIZED ON

For the paper mill, the drivers for converting a single coating station to a double wet-on-wet spray coating station can be found in the following situations:
1. Improving surface quality; ink-holdout & mottling.
2. Maintaining surface quality; improving yield (lower basis weight by reducing the amount of coating).

In sizing; the drivers for converting an existing film-sizer or pond-sizer to spray-sizing and increasing the solid content of the starch apply as follows:
1. When increased production or reduced steam usage is required.
2. In situations where the paper basis weight is low and sizing is required.

RETROFITS – HIGH RETURN PROJECTS

High Pressure Spray technology is based on specific nozzle design and on special hard metals such as tungsten carbide. A high pressure pump feeds the liquid or the suspension to the application bar and a small portion is returned back to the feeding tank. Cleaning water circuits and showers are integrated with the process. Further, the system consists of the application bar including hood and ventilation system.

Over-all, the equipment is small in size. When compared to equipment built for conventional surface treatment, the installation of a High Pressure Surface Treatment station can in most cases be handled as retrofit projects, where the existing equipment would be used to the extent possible.

In most cases, the major part of the installation can be handled during operation and routine maintenance down-time.

GREEN VALUES

The realization of the benefits in added EBIDTA and payback time of the capital invested varies from case to case. From a larger perspective, the added value of the High Pressure Spray Surface Treatment concept is based on reduced water evaporation after the surface treatment stage, on increased production and increased yield m²/ton paper

The payback on implementing the High Pressure Surface Treatment system can be traced to the following issues:

- Energy savings.
- Improved yield.

There are also other factors contributing to added value such as improved run-ability of the web, or perhaps lower amounts of long fiber such as kraft. However, such parameters are influenced by many other factors and are case dependent. A case-by-case in depth study is required to identify and quantify the relationships.

DEVELOPMENT & REFERENCIES

This High Pressure Spray application as presented above is for the time being, unique, and covers various surface treatment needs, such as coating, sizing and the application of barrier chemicals. The development of this concept has its origins in Aalto University, Laboratory of Paper Technology. Based on our findings, this style of high pressure spray coating system was installed in KCL (Oy Keskuslaboratorio - Centrallaboratorium Ab; Otaniemi, Finland) on their pilot coater capable of speeds over 2,000 m/min. In KCL today, spray-coating, spray-sizing and various barrier applications by high pressure spraying are possible. Furthermore, KCL is also in process to install a curtain coater.

Currently, an agreement to test the new method on a production machine was made with a mill belonging to a large international paper company. The results have been very good, proving the functionality of the concept.

With equipment available, we are now in process to test various barrier coatings and wind the right concepts for implementation.

RESEARCH TOOLS

COMMITTEMENTS TO FURTHER RESEARCH

In surface treatment, with an ideally working surface treatment applicator, the user can apply the desired amount of chemicals or pigments, or a mix thereof in the desired thickness and in the desired number of layers.

The desired paper or board property is achieved with a minimum use of material and energy.

There are steps to take in order to achieve the above, but the ideal working surface treatment applicator is not a dream. We believe the concept will be based on High Pressure Spray technology.

The next Level of sophistication (short term):
- Adjustable Coating Amount Without use of Metering Blade.
- Low Pressure Doctoring; To Be Developed Further.
- Simultaneous Spray Coating of Both Sides of the Web; Directed by the spray-nip concept.
- Applications for barrier coating to be tested and developed further

CURRENT FOCUS AND PRIORITIES

We are targeting low-cost retrofit projects, where the opportunity applies.

In line with project installations, we are developing the standardization of parts and sub-equipment, and to streamline delivery. Other essential areas are pre-assembly and package delivery.

We are on the go and we ask you to join!

Pemo Klimczak
- Vice President Technology - PMP Group
Patrick Sundholm
- Associate, Spray Applications for Paper and Board

PMP ANNOUNCES PARTNERSHIP WITH ROLLMEISTER,

WHO BECOMES A PMP ROLL SERVICE CENTER!

Case Study

PMP is proud to announce the beginning of a partnership with Rollmeister Inc. Rollmeister became PMP's tier-one supplier for roll services in the US market, expanding PMP's portfolio together with PMP Americas Inc.

PMP Americas is one of PMP's divisions, located in Machesney Park, Illinois, USA. PMP's US division expands its portfolio by offering new replacement simple felt, spool and wire rolls as well as more complex rolls such as suction rolls and cc rolls in the North American market place. PMP Americas is leveraging their manufacturing plants in Poland and Asia to get optimum cost solutions while at the same time maintaining the same high quality final product. A flexible approach and on time delivery are the main priorities for PMP Americas. Engineering is provided out of the Illinois office as the best way to ensure high quality service.

"I AM VERY EXCITED WITH THE NEW PARTNERSHIP WITH PMP. THIS WILL ALLOW ROLLMEISTER TO SERVICE MORE ROLLS IN THE NORTH AMERICAN MARKET. IT ALSO GIVES US THE ENGINEERING EXPERTISE THAT WE DID NOT CURRENTLY HAVE IN OUR OFFERINGS. WE EACH BRING OUR OWN SPECIALTIES TO THIS PARTNERSHIP WHICH WILL BENEFIT CURRENT AND FUTURE CUSTOMERS."

MIKE WALLER
– PRESIDENT ROLLMEISTER, INC.

"IT IS MY PLEASURE TO ANNOUNCE
THE PARTNERSHIP BETWEEN PMP
AND ROLLMEISTER. I BELIEVE ROLLMEISTER'S
DEDICATION AND EXPERIENCE
WILL BRING EXCEPTIONAL VALUE TO
PMP'S BUSINESS IN NORTH AMERICA.
THE ROLLMEISTER TEAM HAS IMPRESSIVE
CAPABILITIES AND THEIR WORK ETHIC
AND MANAGEMENT STYLE BLENDS
WELL WITH OUR COMPANY.
WE ARE LOOKING FORWARD TO
A LONG AND FRUITFUL RELATIONSHIP."
ROCKY MATUSKA
– GENERAL MANAGER PMP AMERICAS, INC.

In addition to the new offerings, PMP Americas has signed an agreement with Rollmeister, Inc. located in Neenah, Wisconsin. This agreement provides a PMP Service Center for PMP's roll market.

Rollmeister is a recognized service supplier in the Midwest of the USA with an excellent reputation for high quality service and competitive pricing and understands customers' needs and expectations in the market. They have been serving the paper industry for the past 23 years. Rollmeister has expertise in precision roll grinding, suction roll maintenance, paper machine roll inspection and roll mechanical repairs for the paper industry. Their team is comprised of highly skilled personnel that have an average of over 25 years of experience.

An official announcement was made during an Open House that took place on the 26th of September 2017 at Rollmeister's facility in Neenah, Wisconsin, USA. The event was a great opportunity to present Rollmeister's capabilities and announce the partnership to local mills. The event was supported by government representatives including Neenah Mayor - Mr. Dean Kaufert, State Representative - Mr. Mike Rohrkaste and District Director - Mr. Bill Kloiber.

After signing and announcing the agreement, both companies are working toward the common goal of growing the business in North America by offering high quality products and services for the paper industry.

pmp AMERICAS

ROLLMEISTER Inc.

How Does PMP & Rollmeister Roll in North America?

PMP and PMP's North American Service Center, Rollmeister, provide:

- **Assembly**
- **Maintenance**
- **Grinding**
- **Balancing**
- **Complete Engineering**
- **Measure Up & Reverse Engineering**
- **Replacement Parts for your Rolls**
- **Upgrades**
- **CC Roll and Suction Roll Rebuilds**

Our team supplies high quality Rolls from PMP Global manufacturing and can also supply domestic Rolls for those quick turnaround projects.

- **Competitive Pricing**
- **High Quality**
- **On Time Delivery**
- **Suction Rolls**
- **CC Rolls**
- **Reel Spools**
- **Paper Rolls**
- **Felt & Wire Rolls**
- **Fabricated Dryers**

That is How PMP & Rollmeister Roll in North America!

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Case Study

PMP'S GREEN FIELD TISSUE MILL
FOR UNIVERSAL PAPER MANUFACTURERS

– A NEW ERA FOR PREMIUM TISSUE PRODUCTS IN SOUTH AFRICA
– A GOLD EAGLE SPREAD ITS WINGS

IN BRIEF

In December 2014, PMP (Paper Machinery Producer) signed a contract with Universal Paper Manufacturers (UPM), part of the Universal Paper group, for a turn-key, green field tissue mill based on the Intelli-Tissue® Advanced 1600 tissue making line.

Universal Paper Manufacturers (UPM) has been set up as a sister company of Universal Paper & Plastics (UPP), a company which is active in tissue conversion. The Company is based in Ga-Rankuwa, near Pretoria and in South Africa. UPP's products portfolio covers high quality printed serviettes and napkins, bathroom tissue, household towels and hankies. Before the investment, company already owned 4 tissue machines, but was still looking for opportunities to grow its business further. That is why in 2014 UPM made a decision regarding a significant expansion plan to shift its family-owned business to the next level.

"WHAT I'VE GOT AFTER WORKING WITH PMP FOR ALMOST 2,5 YEARS ON THIS PROJECT IS A WHOLE BUNCH OF FRIENDS."
CRAIG FOSTER, OPERATIONS MANAGER, UPM

A green field tissue mill project was an exciting step in the South African's market development. At present UPM covers around 12% of the 300 000 tpa tissue market in South Africa, with a plan to continue its increase of the countries market share. Universal Paper's biggest goal is to become the preferred tissue supplier in the Southern African region, offering a wide span of ultra-premium, 100% virgin fibre tissue paper products. Its mission is to develop innovative products for the most demanding consumers adding flavors of creativity and education. Universal Paper branded products (FSC-certified) have already gained a significant number of enthusiasts who are fascinated with their uniqueness on a worldwide scale. Universal Paper is the proud manufacturer of Dinu, one of South Africa's leading household tissue brands. The investment in tissue production was a logical step in the development of Universal Papers business, which started a new era not only for the company, but also for whole country's tissue market. Today "Gold Eagle" is first new state of the art tissue machine installed in South Africa in the last 20 years and at the same time it is the fastest tissue machine in the whole country!

Project Information:

Customer:	UPM
Location:	South Africa
Machine:	TM5
Project:	Green Field Tissue Mill
Scope of supply:	Intelli-Tissue® Advanced 1600 tissue making line
Capacity:	28 000 tpa
Operating speed:	1600 m/min
Reel trim:	2670 mm
Tissue grade:	13-40 gsm

TM5 TECHNICAL SPECIFICATIONS – TECHNOLOGY THAT COUNTS

PMP's 2.67 m wide Intelli-Tissue® Advanced 1600 Crescent Former tissue making line was the best response for UPM's defined needs. TM5 is based on a tailor made solutions provided by PMP in order to meet UPM's expectations. PMP's scope of supply covered collaboration with the building design engineers, a tissue making line (starting from stock preparation, a broke line, stock approach, baseplates, a tissue machine itself excluding shaft puller), all auxiliary systems (a lubrication and hydraulic systems, a steam & condensate system, MCC and el. Motors, DCS, scanner QCS, mechanical drives), field installations (pre-piping and pre-conduit) as well as rich a scope of engineering services (pre-erection, erection and start-up supervision). TM5 has a total capacity of 28 000 tpa and an operating speed of 1600 m/min, depending on the tissue grade. The machine produces tissue in the basis weight range of 13-40 g/m^2 for conversion into tissue house hold products from 100% virgin fibers.

Among the scope of supply, it is worth mentioning key PMP products from its Intelli-Tissue® platform, such as a single layer Intelli-Jet V® Hydraulic Headbox, a 4-roll Crescent Former Intelli-Former®, Intelli-Press® with a single press configuration, and a large diameter suction press roll Intelli-SPR® equipped with a 16ft steel Yankee Dryer, as well as the Intelli-Reel®. All of those together with great knowledge and experience, ensured the best quality final tissue product – softness at a premium level and excel-

"WE'VE GOT A VERY GOOD, STRONG RELATIONSHIP WITH PMP, AS THEY'VE ALWAYS BEEN OPEN AND HONEST WITH US, AND THEY'VE REALLY CREATED A FAMILY ATMOSPHERE. WE ARE MORE THAN JUST BUSINESS COLLEAGUES, WE'RE ACTUALLY FRIENDS AND PART OF THEIR FAMILY, AND THEY ARE PART OF OURS."
JONATHAN SHER, DIRECTOR, UPM

"WE HAD A PLEASURE TO MEET BARRY AND CRAIG HERE IN CHINA AND SHOW THEM OUR FACILITY AS WELL AS OUR REFERENCE MACHINES IN YFY CORPORATION. IT WAS GREAT TIME SINCE WE COULD PRESENT THE BEST OF OUR TISSUE MACHINES AND EXPLAIN WHY IT IS WORTH TO HAVE ONE FROM PMP."
– PRZEMYSŁAW PIETRZYK, PMP AREA SALES MANAGER TISSUE LINE

lent hand feel, which opened the door to new market niches.

UNIQUE TEAM SPIRIT

Technical details of each project are always most important and interesting to the audience, but this time we are surprised with the spirit of common cooperation. It made this project a unique experience to all involved, both for UPM and PMP team members.

While the technical point of view of this project can be easily shown with words and pictures, the exceptional experience of partnership between PMP and UPM is not that easy to describe. The entire project was an excellent experience, which meant a lot to all involved. Members of PMP's team have travelled thousands of kilometers and most of the time were far away from home, but they could not have felt more welcomed. From the very beginning, this project was a blend of friendly relations, respect, and a feeling of being one team with a strong desire to make it a successful project.

GOLD EAGLE PROJECT STORY – WE ARE STRONGER TOGETHER

The first meeting which brought together PMP and the UPM took place in 2014. The decision about a common project was based on a reference visit at Yuen Foong Yu, Yangzhou mill in China in November 2014. UPM's team travelled to China to see PMP's tissue machines in operation. They visited PMP IB in Changzhou (PMP's Chinese division) and YFY's Yangzhou mill.

Directly after the visit to China, UPM's team visited PMPoland (PMP's Headquarters) in Jelenia Góra, Poland. It was the right time to negotiate contract details. After successful negotiations, the contract was signed in December 2014. That was the moment when the project started in full swing.

Your mind might wonder why the project was named "Gold Eagle". The answer is simple, however has a special meaning for both UPM & PMP. One is the word Gold which is in memory of Dr Guy Goldstein, who was UPM's consultant at the beginning of this project. He tragically passed away and was not able to see the final result of the project. The second is the word Eagle, which obviously relates to the Polish heritage and major symbol of Poland. One of PMP's employees created a unique Gold Eagle logo which was a main emblem for the project and used extensively to decorate TM5.

The project was officially launched in December 2014 and was divided between two PMP facilities: PMPoland (Poland) and PMP IB (China). Crucial systems like the hydraulic headbox and SPR were designed and made in Europe. Other parts including press section and reel were built in China. All parts of the machine were pre-erected and fully tested at PMP's facilities. After the factory acceptance tests all equipment was sent to the mill directly.

Pre-assembly was finished in June 2016 and equipment was shipped in July 2016. In August 2016, machine erection as well as all paper mill installations began. After many days and weeks of hard work at the Ga-Rankuwa mill in South Africa, both teams succeeded with the start-up of the machine on the 19th of February 2017 at 11:20 a.m. local time. It was one joyeous occasion and everyone celebrated when TM5 was

"WE WOULD NOT HAVE BOUGHT THE MACHINE FROM PMP IF WE WOULD NOT BE HAPPY WITH THE QUALITY. WE VISITED FEW INSTALLATIONS, EVEN VISITED PMP'S WORKSHOPS IN POLAND AND IN CHINA. THERE IS NO WAY WE WOULD MADE THIS INVESTMENT IF WE WERE NOT ABSOLUTELY, 100%, SURE OF THE QUALITY."
CRAIG FOSTER, OPERATIONS MANAGER, UPM

brought on stream and the first paper appeared on the reel.

It is worth mentioning that the saleable paper was achieved almost right-away after start-up. It is very important because in the case of an ineffective start-up, each hour lost generates huge losses.

GOLD EAGLE TODAY

The main technological goals were focused on energy savings, premium quality of the final product and production flexibility. Thanks to applied state-of-the-art solutions, TM5 presents attractive media consumption levels per ton of paper: steam up to 2.3 t, water up to 6-7 kL/t and electricity up to 700 kWh/t (for the entire building). All of those parameters are on or even below guaranteed levels.

As the quality of final product is one of the main priorities for UPM, it is important to underline that paper produced on TM5 is of the highest quality with UPM's converting factory showing a 30% increase in output. Scrap is less than 2% at the moment. Tensiles are regularly above 140 N/m with furnish mixes ranging from 80/20 to 100/0 hardwood/softwood.

"WHEN I WALKED INTO THE BUILDING AND APPROACH THE MACHINE, I SAW A LOT OF HAPPY FACES AND EVERYONE WAS CHEERING, SMILING AND TAKING PICTURES. IT WAS A VERY COMFORTING AND NICE FEELING TO SEE THAT EVERYONE WAS SO HAPPY THAT WE FINALLY MADE PAPER."
JONATHAN SHER, DIRECTOR, UPM

"MACHINE IS RUNNING VERY SMOOTHLY, THE QUALITY OF THE PRODUCT IS REALLY VERY GOOD, SO WE'RE PRETTY HAPPY. THANKS TO APPLIED TECHNOLOGY WE CAN ACHIEVE PRETTY GOOD BULK AND SOFTNESS, VERY HIGH SPEED AND GOOD DRYING, WHICH IS OBVIOUSLY WHAT WE ARE ALL ABOUT."
CRAIG FOSTER, OPERATIONS MANAGER, UPM

It is also worth mentioning the impressive capacity of the machine. The highest production was just over 72 t/d (on a 16.5 g/m^2 product). While the highest instantaneous output was 3.35 t/h, which is equivalent to 79.9 t/d. The machine was designed for 70 t/d to make over 72 t/d on a light grade and with potential to make almost 80 t/d on heavier grades.

Another important factor is TM5 downtime, which is reduced to a minimum. For the first months of commissioning TM5 had an uptime of 80% with this improving to 95% at present (5 months after start-up). Overall the finished estimate for the factory on a commercial basis should be not more than 5%, with 80% of this being planned downtime for maintenance. So overall 18 days a year downtime, with 14 days planned and 4 days unplanned. Those are possible thanks to the modern and compact design of the machine.

Gold Eagle's operators appreciate smart and user-friendly solutions applied on TM5. Production flexibility is achieved also thanks to optimized clothing changes time. The average change time is 3 hours for a felt, and 1 hour for a wire. Even more important is the lifetime of both felts and wires. At present there are two felts running for almost sixty days each and the current wire is already at around 80 days with no sign of needing a replacement soon. Those numbers were a total revelation for UPM's team and will for sure lower TM5 maintenance costs.

Besides that the number of staff could be reduced due to smart maintenance solutions. There are

6 people in total per shift operating the entire machine from the pulper to the reel (1 person at the pulper, 1 in stock preparation, 1 on the machine, 1 at the pope reel and 1 driver with 1 supervisor). 6 people provides a smooth operation of the machine, which ensured the opportunity to reduce employment costs by around 60%.

"I DON'T THINK IT WILL BE VERY DIFFICULT FOR US TO PURCHASE A SECOND MACHINE FROM PMP. [...] THEY WILL DEFINITELY BE THE FIRST PEOPLE WE WILL APPROACH FOR A NEW MACHINE."
JONATHAN SHER, DIRECTOR, UPM

"NOW WE HAVE A MACHINE THAT ONE MONTH AFTER COMMISSIONING IS FLYING, WITH THE EXPERIENCE I HAVE IN THIS INDUSTRY, THIS DOESN'T HAPPEN LIKE THIS, IT JUST DOESN'T. ALL COMMISSIONING IS DIFFICULT, BUT THIS ONE WAS AN ABSOLUTE PLEASTUALLY."
CRAIG FOSTER, OPERATIONS MANAGER, UPM

"THE MACHINE STARTED-UP VERY WELL, WE'RE VERY HAPPY WITH THE MACHINE, IT'S RUNNING WELL. THE WHOLE PROJECT WAS A BIG CHALLENGE, BUT IT WAS OBVIOUSLY WORTH IT."
BARRY SHER, MANAGING DIRECTOR, UPM

SUMMARY – FUTURE LOOKS BRIGHT

Gold Eagle has reached all the goals that were set at the beginning of the project. As UPM's team said, the machine is almost flying. The whole project opened the door to success both for UPM, that is continuously developing in the South African market, but also for PMP, as their first project in South Africa turned out to be a real revelation. UPM has planned a Grand Opening of the Tissue Manufacturing Facility, which is going to be held at Ga-Rankuwa's mill on the 8th of September 2017. It is going to be a great summary of common partnership. All invited will be able to visit the whole plant, including TM5 and to witness the history on the South African tissue market being made.

As for the future, UPM would like to see another tissue machine running alongside TM5. This is a long-term idea, but the growing demand for tissue products in the African market is a certain thing.

At that moment, the most important thing is that "Gold Eagle" has spread its wings empowering the future of UPM and bringing all involved pride and satisfaction.

(9) NEW PMP INTELLI-TISSUE® ECOEC 1600 PREMIUM TISSUE

MAKING LINES WILL BOOST CHINESE TISSUE MARKET DEVELOPMENT!

Tissue sector is performing a continuous growth worldwide, and this trend is about to even strengthen in the coming years. Currently tissue papers are daily necessities of every human being. For the past few years there are few big, strong markets, that are leading the global tissue market. No doubts, China is among those markets, and it is actually a leader in this process. Chinese tissue business shows a very strong performance, which is driven not only by impressive GDP growth, but also by progressive urbanization, steady population growth and rising of the hygienic standards. All of those factors results witch rapid tissue consumption growth, influencing a huge tissue business investment boom.

According to above tissue market trends PMP is supporting the dynamic development of one of the leading Chinese tissue producers (Confidential Customer – CC) with (9) new Intelli-Tissue® EcoEc 1600 Premium Tissue Making Lines! All (9) TM's will add total of around 300,000 t/a (assuming a 95% efficiency and maximum grade).

The partnership between both companies has begun on 30th November 2016 with a contract sign for (3) Tissue Machines design and delivery. An official partnership opening ceremony took place on 4th August 2017 in Karpacz, Poland.

The first start-up took place on 7th November 2017, followed by start-ups on 17th January 2018 and on 4th February 2018. It is worth to mention, that the first Intelli-Tissue® EcoEc 1600 Premium Tissue Making Lines for this customer have started-up in less than 12 months from the contract sign! Thanks to dedication and hard work of both teams currently all (3) Tissue Machines are up & running with great results, brining pride to all involved!

Thanks to successful partnership, PMP was awarded with another contracts for a delivery of (6) more Tissue Machines to its mill in Hubei Xiaogan City, China. It's a true example of great cooperation between both companies.

The idea of whole investment was to expand customer's share on the Chinese Tissue market. CC has decided to execute the project together with PMP, due to excellent references of the state-of-the-art technology implemented by PMP worldwide. CC has chosen Intelli-Tissue® EcoEc 1600 Premium, from a wide span of tissue making solutions offered by PMP. Chosen solution was a perfect match, due to premium tissue quality provided from the 1st day, TM efficiency higher than 95% and high return on the investment.

All (3) Tissue Machines were designed and manufactured with the same concept to produce wide tissue products range, including facial tissue, toilet paper and napkins. All products are made with 100% virgin pulp resulting with basis weight range from 12,5 up to 31,0 gsm at reel, depending on a tissue grade. Machines are working at maximum design speed of 1600 m/min, which brings a perfect balance between achieved capacity and optimum energy savings.

Among the scope of supply of each machine there are PMP's core technological items such as:

- **Intelli-Jet V®** - 4-channel, single layer, hydraulic headbox. Implementation of Intelli-Jet V® headbox resulted with hydraulic stability, sheet edge quality, perfect paper quality & PM uptime, as well as flexibility of production,

- **Intelli-Former®** - Crescent Former type, a compact design assuring improved production at high speeds with positive impact on sheet quality and machine efficiency,

- **Intelli-Press®** - Single press with Air Cap. Air cap is dedicated to remove water evaporated from paper web. Special internal structure designed using CFD software boost drying capacity of machine and ensures no water condensation under the air cap. In addition, Intelli-Press® is equipped with Intelli-SPR® - Suction Pressure Roll dia 1400 mm. This solution enables to maximize the amount of water removed from the sheet, while keeping machine efficiency and product quality at the highest level,

- **Intelli-YD®** - Steel Yankee Dryer dia 16 ft (4880 mm) manufactured with highest quality, certified materials brings high drying efficiency with ultra-low media consumption,

- **Intelli-Reel®** - Reel providing efficient, high speed, continuous paper winding.

As an addition, PMP has provided parts of approach flow equipment, mechanical and electrical drives, steam & condensate system, lubrication system, hydraulic system, dust removal system, machine controls, DCS system as well as all necessary trainings, shop floor assembly and start-up supervision.

Today (3) tissue machines are on stream, each of them is producing more than 90 t/d of premium quality tissue. Thanks to applied state-of-the-art solutions, each TM presents attractive media consumption levels: steam up to 1,8 T/T and electricity up to 340 kWh/t. All of those parameters are on or below guaranteed levels. (6) more Tissue Machines are planned to be brought on stream by the end of 2019.

CC has strengthen its position on Chinese tissue market and its future looks bright. All (3) TM's have reached the goals that were set up at the beginning of the project. As for the future, CC is planning to expand its business even more, by adding several more tissue machines to its fleet. Certainly the growing demand for premium tissue products in China is a great opportunity for tissue producers' development and their future success.

TISSUE TRENDS: INTERVIEW

Maja Mejsner – Vice President Business Development & Marketing – PMP Group

1/ What were your key technical developments during 2017? What are the key issues that your tissue customers are facing and how are you addressing them?

2017 has been very busy for us in both the tissue and paper segments, filled with successful start-ups around the globe. On the tissue side, we have put 5 new tissue machines on stream adding in total almost 115,000 t/a in Asia and Africa and completed 13 rebuilds in Europe and North America focused on final product quality and/or TM efficiency improvements.

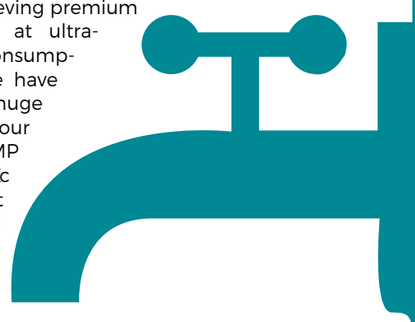
Compared to our previous experience, in 2017 we have started up our first turn-key tissue mill for Universal Paper Manufacturers in South Africa (the 5th machine in their fleet that has added 28,000 t/a). It was also PMP's first project in Africa and the 1st state-of-the-art tissue machine installed in South Africa in the last 20 years by any supplier. Just recently, on the 1st of October, the machine reached a production level of 10,000 t. We have also installed our first Integrated Tissue Mill with medium size, twin tissue machines (Intelli-Tissue® 1200 EcoEc, 3.65m @reel) for Hebei Jinboshi in China. Both projects were based on the philosophy of Optimum Costs Solutions and a blend of deliveries from our facilities in Poland (PMPoland) and China (PMP IB).

In the case of both projects, a driving force was achieving premium tissue quality and an impressive Return on Investment. We helped our customers to fulfil those goals.

2/ What changes have you seen in the global tissue market in terms of changes in demand, and what new challenges and opportunities has that presented for paper machine suppliers? (E.g. are you seeing increased demand for higher or lower quality tissue products, a need for more and more wider paper machines, etc?)

Consolidations in the tissue business are even stronger than in the past on a global scale. Large tissue corporations take the lead. They've got a number of tissue machines in their fleets and they have a chance to optimize their production and minimize operation costs. In the case of new investments, they prefer to add more capacity at once. That is logical, as the process of getting permission to build a single width machine is almost identical with a double width machine. Taking the last decade into account, the most aggressive players, in most cases, decided to pick double width machines – especially in mature markets. Esteemed players have been also focused on upgrading their assets to optimize production costs. We have provided several projects of that type in USA for one of the leading tissue corporations.

In the case of emerging regions, players are more focused on achieving premium tissue quality at ultra-low media consumption costs. We have noticed a huge interest in our product: PMP Intelli-Tissue® EcoEc line (Crescent Former tissue machines, with a 16 foot or larger steel Yankee dryer, a large Suction Press Roll o~1400 mm and a steam heated hood). The main interests are extra bulk and a high dryness up to 46%. We are able to achieve the best figures of steam consumption on the market on those machines. Lower than 1.78 t/t (note: with a steam heated hood). Also in this case, customers decided to go ahead with bigger machines - a medium size: 3.5-3.6 m @ the reel – we have sold 10 projects of that type in China recently. In addition, those projects are executed based on an Integrated Tissue Mill concept (twin machines, one control room, a simplified building with a smaller footprint - no basement). The point is again, – cost optimization.



I believe we should expect more new, larger, lower-cost and more efficient machines. More expansion projects will be observed within existing mills with their own, existing infrastructure – that will help to optimize investment costs. Existing producers with older assets will have to think about rebuilds to stay competitive. Smaller ones (with outdated lines) won't be able to compete any longer and they will be closed.

3/ What new challenges do you face in terms of providing energy efficient machines for your customers? How are you dealing with this?

We are observing two trends: energy cost reduction through lowering energy consumption and looking for alternative energy sources.

Our efforts are focused on applying robust solutions like large diameter steel Yankee dryers (we consequently extended our portfolio in this field following market trends), large diameter suction press rolls and highly efficient hoods. In addition, our PMPower division provides smart ideas for existing mills like new recovery steam generator systems from the hood exhaust fumes. For instance, in Wepa Lille in France, a recovery energy system allowed them to save more than 25% of steam flow from the main generator to the machine and consequently fuel consumption is reduced as well.

4/ What geographical areas do you forecast to have the most tissue growth in 2018 and beyond and why are these areas seeing this?

The tissue sector is healthy and grows in a global scale by almost 4% per year. Themarket is pretty dynamic: today China is the leading producer of tissue followed by North America and Western Europe. Recently we observed local overcapacity (like for example in Turkey) caused by active investments. On the one hand, the tissue sector attracts investors as hygiene was, is and will be a pillar of an economy and society needs tissue products, so a good ROI is a temptation. On the other hand, overcapacity and strong competition decreases margins so being cost consciousness is crucial.

Nevertheless, we believe tissue production will grow steadily. According to industry experts, we should expect an additional 1 mln tonnes of tissue every year worldwide. New trends such as closures of unproductive, outdated lines (for instance in China) and potential conversion projects of newsprint machines (in North America) will become more visible. Latin America is in need of growth, however, political instability may cool down that process. I strongly believe

that emerging economies like Eastern European countries (Russia especially),China and Latin America will show their strength and will shift their tissue production to a higher level soon. More mature economies like Western Europe and USA will have to focus more consciously on production costs (through tissue machine upgrades) to stay in the game. More and more modern tissue lines have been put on stream bringing high quality products at lower production costs. There is also huge pressure from private labels against branded products.

The point is to act smarter rather than harder and find a way to stay competitive.

5/ How are new paper machine technologies in the market changing your R&D strategies? What key technical areas will you be looking into in 2018?

First of all, we need to adjust our offer to our customer depending on where they need to act. The most important is to listen carefully. Crescent Former technology (especially our EcoEc line) will still play an important role in the tissue world as this technology is proven and operator-friendly. With all the extras like multilayer hydraulic headboxes, large steel Yankee Dryers, a large SPRs (or alternatively a shoe press) it is an optimum concept for emerging economies. More mature markets like Western European countries and USA will have to pay more attention to costs. Structured tissue and utilizing shoe press technology might be an answer for this trend.

We should also remember about upgrade potential. Sometimes something like changing only the headbox can bring a significant improvement. We are also watching conversion projects (PMP Phoenix Concept® rebuilds). We have collected lots of experience within the paper side of the business, however, there are more and more examples of this trend in tissue as well (a profile change from newsprint into tissue) and as PMP we are ready to support our customers.

I believe that energy will play an even more important role in the next couple of months. That is why we are planning to intensely develop our Intelli-Nip® shoe press to be a part of the new line Intelli-Tissue® Ultra line to bring even higher dryness and offer more production flexibility.

6/ What overall trends in tissue machine manufacture will have the greatest impact on the production process in five years time?

Actually, there are no drastic changes from our conversation last year. There are, in my opinion, three main drivers that fuel technological growth in tissue machinery: an energy saving need, a tissue quality improvement and an increase of safety. In addition, there is a need of higher system automation according to a philosophy of industry 4.0.

Energy saving solutions are directly connected with activity especially in the area of the drying section: huge steel Yankee dryers (up to 20-22 feet), large diameter suction press rolls or shoe presses, highly efficient auxiliary systems (Steam & Condensate system, Vacuum systems, High-efficient hoods) should be the first to mention. The game is to keep the balance between as low as possible media consumption rates (as highest dryness level as possible) and the softness of the product.

Tissue quality should surprise consumers in a positive way and it varies depends on the region. Mature economies will look for premium softness, whereas emerging markets will compare achieved quality to previous technologies. Technologies that guarantee success are multilayer headboxes (double, triple or even 4 layer), large diameter suction press rolls or shoe press technology, a vast range of machine clothing and alternative roll covers.

Finally, safety is of highest importance. The experience level of staff is decreasing, so solutions provided within a tissue line should somehow prevent hazardous situations, and protect the operators. The philosophy of industry 4.0 should help to create a smart factory where data can be easily stored and analysed and processes can be optimized. Then best situation is to have a chance to practice on a virtual model before the operator starts to perform in a real situation. We also should not neglect understanding of the local market requirements, taking care of good communication with future users (name tags in a local language, periodical safety training) and observing daily operations to implement additional protection.

MEET PMP DURING THE FOLLOWING

INDUSTRY EVENTS IN 2018:

28th FEBRUARY – 2nd MARCH 2018
ASPI SPRING MEETING USA

15th-18th APRIL 2018
PAPERCON, USA

18th-20th APRIL 2018
CIDPEX, CHINA

1st-3rd OCTOBER 2018
ASPI FALL MEETING USA

2nd-5th OCTOBER 2018
TISSUE 2018, USA

10th-12th OCTOBER 2018
MIAC, ITALY

13th-16th NOVEMBER 2018
PAP-FOR, RUSSIA

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