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INSIDE:

PEER-REVIEWED PAPER: An approach for selection of coating colour formulation using TOPSIS Multi Criteria Decision Making Design

USING PROCESS GRAPHICS TO MAXIMISE OPERATOR EFFECTIVENESS

Mandatory alcohol testing in paper mill environments

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Dear Reader,

Making it better.

I like books. I like buying books. As with many, I am sure, I buy more books than I could ever read. While my Kindle contains a compendium of light-hearted leisure reads, I find that my paper books enjoy pride of place in our home. As I look at my bookshelves, the books spark a memory or invoke an emotion. I have read some of them three times over; others haven't kept my attention past the first five chapters.

I am currently reading *On Paper: The Everything of its Two-Thousand-Year History* by Nicholas A. Basbanes who labels himself a 'self-confessed bibliophile'. While I am only a few chapters in (remember, I have two young sons), I'm finding it absorbing and enriching.

Even the preface contains a wealth of paper nuggets. Basbanes refers to Robert Lang, a master origami folder, who said that 'anything is possible in origami'. Basbanes argues that same can be said about paper itself, being 'light, absorbent, strong, plentiful and portable; you can fold it, mail it, coat it with wax and waterproof it, wrap gunpower or tobacco in it, boil tea in it'. Add paper's hygienic applications, and we have a different world than what we would have without it.

The Chinese claim paper as one of their "four outstanding inventions of antiquity" and we can thank its inventor Cai Lun that the TAPPSA Journal hasn't been printed on stone, posted in envelopes of cured animal skins. Instead he made paper from tree bark, hemp, old rags and fishing nets. Since then paper and tissue makers have continued to improve paper products and the processes to make them; while also striving to conserve more water, recoup more energy and reduce waste.

In this issue, on page 4, you will find the Call for Papers for the 2016 TAPPSA Conference and Exhibition. Themed 'Pulp, Paper and Beyond', next year's event hopes to attract ground-breaking research, exciting technologies and inspiring case studies.

You will also read how Mondi and Aesseal saved a considerable amount of water at the Richards Bay mill. Paper meets digital in a guest piece by Bill Hollifield from PAS, Inc. on maximising operator effectiveness by using process graphics.

On page 14, we have a prime example of how scientists are developing new uses for wood fibre with Innventia's development of a bio-based carbon fibre.

From its earliest origins on the banks of the Nile to nanocellulosic innovation, paper (and its predecessor papyrus) has, over time, evolved and thus been labelled many things by many people. Cassiodorus, a sixth-century Roman statesman and writer praised papyrus as both a "faithful witness of human deeds" and "the enemy of oblivion".

Before the year draws to a close, take a moment to preserve some of your 2015 memories on a sheet of paper. If the memories are not good ones, make a list of ways in which to make 2016 better. There is also a way to make something better.

I wish you and yours a blessed festive season and an even better 2016.

Samantha

Get recycling!

CLEAN-UP SA AND RECYCLE WEEK

12-18 September

NATIONAL RECYCLING DAY

16 September

INTERNATIONAL COASTAL CLEAN-UP DAY

17 September



Get connected!

INTERNATIONAL PRINT DAY #IPD16

19 October | Global

ipd.printmediacentr.com

Participate in 24 hours of global knowledge sharing via social media.



Get South Africa reading!

WORLD BOOK DAY

3 March

www.worldbookday.com

SOUTH AFRICAN NATIONAL BOOK WEEK

5-11 September

www.sabookcouncil.co.za

INTERNATIONAL LITERACY DAY

8 September

www.internationalliteracyday.org



Africa Energy Indaba**16-17 FEBRUARY | SANDTON**www.africaenergyindaba.com**Institute for Commercial Forestry Research
annual research meeting****1-2 MARCH | JOHN FISCHER AUDITORIUM,
CEDARA COLLEGE, KWAZULU-NATAL**Sally Upfold | sally.upfold@icfr.ukzn.ac.za**PAPER2016****6-8 MARCH | NEW YORK CITY****Co-hosted by the American Forest and Paper
Association and the National Paper Trade Association**www.paper2016.com**Propak Africa****15-18 MARCH | EXPO CENTRE, NASREC,
JOHANNESBURG**www.propakafrica.co.za

Parallel conferences and workshops will be hosted by the Institute of Packaging of Southern Africa (IPSA), Plastics SA and Printing SA.

In addition, Pavlo Phitidis, owner of business incubator company Aurik, and regular co-host on Talk Radio 702's The Money Show, will be running adjacent sessions aimed at industry executives. Topics will include: how to grow your SMME into a medium-sized or large organisation, how to do business into Africa and how to tackle legislative requirements, including BEE.

IPSA Propak Africa Packaging Conference - 17 March 2016 - will bring the African packaging industry together to share insights into new innovations, stimulate and motivate developments, and encourage knowledge sharing. IPSA will also be hosting interactive sessions facilitated by leading specialist in their fields. Workshop topics being considered include: packaging supply chain management, packaging quality control, corrugated and paper board packaging, packaging and the environment – the law and the facts, and an overview of statutory requirements for food packaging.

**Ninth CTP International Symposium on
Packaging Design and Recycling****22-23 MARCH | CENTRE TECHNIQUE DU PAPIER,
FRANCE**www.webCTP.com**International Pulp and Paper Week |
Bioeconomy Innovation Forum****24-26 MAY | STOCKHOLM, SWEDEN**www.iwbweek.com**RISI Asian Conference****21-23 JUNE | SHANGHAI, CHINA****17th Conference of the Parties to CITES*****24 SEPTEMBER-5 OCTOBER | JOHANNESBURG**www.cites.org

*Convention on International Trade in Endangered Species of Wild Fauna and Flora

RISI European Conference**29 FEBRUARY-2 MARCH | BERLIN, GERMANY****Programme topics will include:**

- Risks and opportunities in eastern Europe
- The global economy: emerging market troubles
- Panel discussion: the financial state of Germany
- Global boxboard outlook
- European packaging grades
- Global outlook for pulp
- Boosting pulp and paper with science
- Industry 4.0: transforming the industry from the inside
- European graphic paper outlook
- Outlook for the global tissue business: economic recovery helping but clouds on the eastern skyline
- State-of-the-art tissue production
- Mill intelligence: benchmarking asset quality and cost competitiveness

TRAINING COURSES AND SEMINARS

SPIRAX SARCO STEAM SEMINAR

Day one – Introduction to steam fundamentals

Day two – Introduction to steam and condensate control

16-17 March | 20-21 July | 19-20 October**R3,000 per day or R5,000 for two days (excl. VAT)**

One CPD credit per day

Email: debbiegroenewald@za.spirax.sarco.com**ENERGY TRAINING FOUNDATION COURSES****CERTIFIED ENERGY MANAGER (CEM)****Cost: R16,450 (excluding VAT)**

Five CPD credits / 7.2 Association of Energy Engineers
(AEE) credits

30 May – 3 June | Pretoria and Cape Town**17-21 October | Pretoria****CERTIFIED RENEWABLE ENERGY PROFESSIONAL (REP)****Cost: R13,450 (excluding VAT)**

Four CPD credits / 4.8 AEE credits

24-27 May | Pretoria**20-23 September | Port Elizabeth**www.entf.co.za



PULP, PAPER AND BEYOND*

2016 TAPPSA CONFERENCE AND EXHIBITION



**21-22
SEPTEMBER
2016**

**VENUE:
UNITE, SCHOOL
OF ENGINEERING**

Gate 8, Rick Turner
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UKZN, Durban



**CALL FOR
PAPERS**

Abstracts to be submitted
by **31 March 2016**

Full manuscripts to be
submitted by **18 July 2016**



*** POTENTIAL TOPICS INCLUDING BUT NOT LIMITED TO:**

- State of the art and/or predicted progressive systems in pulp, paper, paperboard and tissue manufacturing
- Cutting-edge and next generation developments in the chemistries of pulp, paper, paperboard and tissue additives
- New developments in biorefinery and nanotechnology processes

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DUT students impress with their research and presentations

In October, Bachelor of Technology: Pulp and Paper Technology students from the Durban University of Technology's coastal and inland regions congregated in Durban and Pretoria to present their paper industry project reports in the presence of their lecturers, peers and industry representatives.

The presentations represented a summary of their research reports and were adjudicated by a panel of lecturers and paper industry professionals. The students were rated on, among other things, organisation and structure; problem formulation and motivation; knowledge and use of literature; research methods; processing of data; validity of deductions and conclusions; and technical complexity.

COASTAL REGION

Topics covered the breadth of the value chain, including the optimisation of hydrochloric acid in the demineralisation process, quality problems as a result of silica content, redesigning heat exchangers, the benefits of a reverse cleaner cone, paper loss reduction from dry-end and winder areas, and determining the effects of an oxygen bleaching stage enhanced with peroxide.

In the end, it was Emmanuel Mchunu from Mondi Richards Bay who clinched the title and trophy for 'Best Coastal Presentation' with his work on the optimisation of the vacuum pumps sealing an operational water system.

INLAND REGION

A few days later it was the turn of students based at the inland mills. Again, the variety of studies was vast: the importance of process monitoring cameras, evaluating the possibility of using modified 100% recycled flute as a corrugated medium in corrugated shipping containers, investigating the possibility of using cheaper, alternative fibres to substitute expensive virgin fibre and the effects of pre and post screen retention aid dosing on the wet end, paper strength properties and chemical costs.

Mpact Piet Retief's Matthys Odendaal took first place with his research into reducing greenhouse gas emissions, and received the trophy for Best Inland Presentation. ■



Jimmy Pauck presents Emmanuel Mchunu with his trophy.



Coastal presentation students. Back from left: Christopher Pillay (Saiccor), Sayoshan Padayachee (Saiccor), Emmanuel Mchunu (Mondi Richards Bay), John Ndlovu (Mondi Richards Bay), Juandre Manefeldt (Mondi Richards Bay). Front from left: Banothile Myeza (Saiccor), Mxolisi Ntshangase (Mondi Richards Bay).



Jane Molony presents the trophy to Matthys Odendaal.



Front from left: Adushen Rajpal (Kimberly-Clark), Pulane Jele (Sappi Technology Centre), Rudzani Ravele (Mpact Springs). Back: Francois Schenck (Mpact Springs), Matthys Odendaal (Mpact Piet Retief), Jimmy Pauck (DUT), Hendrik Viviers (Mpact Piet Retief), Ashley Smith (Sappi Technology Centre) and Abongile Qwebane (Neopak).

IBS mini-conference

Talking tissue

Devden, specialist supplier to the South African paper industry since 1982, hosted two mini-conferences in Durban and Johannesburg, and visited major tissue producers in November. Tissue machine and process optimisation experts Dietmar Schatz and Michael Mortsch from the Austrian-based IBS Paper Performance Group shared some practical solutions to reducing the consumption of energy and water – two particularly scarce and expensive resources in South Africa – in the tissue-making process.

Through its partnership with Devden, IBS supplies dewatering systems, fabric tensioners and guides, doctors and showers, special products, engineered consumables and technological services.

With tissue being an essential and multi-functional product in today's world, there are a number of players, large and small, in the manufacturing market. Devlyn Fraser, founder and managing director of Devden, says, "Keeping customers informed about new products and technologies provides opportunities for the exchange of ideas, sharing of experiences from other markets and introducing new concepts. This is especially so with respect to key issues like energy, water and other resources. Papermaking involves using a lot of energy and water and thus there is significant potential for savings in both. This is good for the environment and good for the bottom line too!"

Mortsch covered the four typical tissue machines – Fourdrinier, crescent former, through air drying and combination – and said that no matter the machine, there is always potential to optimise and that 'what we can achieve before the Yankee will improve machine and resource efficiency'.

Mortsch shared some examples where IBS' variety of efficient single products can improve tissue machine performance which, when combined in an intelligent closed loop, can deliver unparalleled strength.

"You can only control what you can measure," noted Mortsch, adding that the i-press concept which allows the lowest possible energy input to achieve the highest possible efficiency and output.

By way of example of intelligent press felt conditioning, Mortsch explained that a specially designed pressMaster felt suction box cover installed in combination with the automatic EPB+ vacuum valve and the IBS flowMaster would result in the minimum necessary vacuum height to measure the actual flow out of the felt suction box. This set-up would ensure the most energy efficient and gentle felt conditioning on the lowest necessary vacuum height. (energy input).

He explained that optimisation not only improves dry content through reduced re-wetting, increased fabric lifetime and enhanced fabric conditioning but extends maintenance intervals, yields higher paper quality, results in better cleaning and reduces the use of cleaning chemicals and detergents.

"While some investment is required, all of these improvements have a cost saving benefit, with an excellent return on investment, usually in a very short time," said Herman de Bruyn, national sales and service manager for Devden. ■



Mondi products attract hundreds of visitors at FachPack, Scanpack and Labelexpo 2015

Mondi recently met with more than 1,500 customers, potential customers and business partners during the FachPack trade fair in Nuremberg, Germany, the Scanpack trade fair in Gothenburg, Sweden, and the Labelexpo in Brussels, Belgium.

Visitors could learn first-hand about the latest in packaging solutions, such as easy-pak for large-volume shipments and e-commerce packaging from Mondi Corrugated Packaging, the water-repellent HYBRIDPRO from Mondi Industrial Bags, SKOG paper liner from Mondi Extrusion Coatings and PaperPack from Mondi Consumer Goods Packaging.

Albert Klinkhammer, director of marketing and communications, Mondi Europe and International, said, "We were pleased with the strong turnout at all three fairs, and in particular with the quality of the conversations with our visitors. At these fairs, we can present our wide variety of packaging solutions to targeted European audiences. We enjoy the chance to showcase the latest in product development and customisation, innovative features, sustainability and recyclability." ■



Mondi showcased Hybrid Pro at FachPack 2015.



Mondi's containerboard on show at Scanpack.



Atrojet.T

Tune your tissue – with perfect felt designs

Atrojet.T is ideal for use in tissue production thanks to its tailored multiaxial non-woven module:

- highly flexible and adaptable **yarn structure**,
- tailor-made felt designs – **precise and even**,
- very **fine or coarser** open designs available,
- **high dewatering** and even **CD profiles** due to high contact area,
- improved void volume retention and **effective felt cleaning**,
- high tensile strength potential **for economic life time**.



Andrew Etzinger



Karel Steyn

Bright minds think efficiently

SOUTH AFRICAN ENERGY EFFICIENCY CONVENTION

At the United Nations in September, the Sustainable Development Goals were adopted with the seventh goal concentrating on ensuring access to 'affordable, reliable, sustainable and modern energy for all'. Furthermore, by 2030, the UN also aims to double the global rate of energy efficiency and enhance international co-operation to facilitate access to and promote investment in clean energy infrastructure, research and technology.

It was no surprise that the 10th annual Energy Efficiency Convention attracted 471 delegates over two days in Kempton Park. With as many as nine different and parallel tracks, the convention shed light on something for everyone.

President of the Southern African Association for Energy Efficiency (SAEE) Karel Steyn said in his welcome that it is general knowledge and well accepted that energy efficiency has by far the largest potential to effectively deal with [the climate change] challenge. "While it is not surprising that energy efficiency is the focus of most countries, governments, corporates and organisation, it is somewhat surprising to find that many of the countries - who have been implementing energy efficiency since the first oil crises during the late '70s - are still achieving substantial energy savings of up to 30% annually."

"This shows that the energy efficiency industry can find opportunities, develop and implement solutions." Steyn put out a challenge, asking how much more could South Africa do given that it only started with energy efficiency just over 10 years ago?

CONDUIT FOR EMERGING ESCOS

Interestingly, the opening day of the event happened to be South Africa's 94th day without loadshedding. This was confirmed by Andrew Etzinger, Eskom's senior general



manager, as he delivered an update on Eskom's integrated demand management (IDM) programme which was halted for 18 months when the power utility shifted its focus to simply keeping the lights on. Two key components of the IDM programme are the Energy Services Company (ESCO) funding model and the roll-out of residential energy efficiency lighting.

Etzinger was upbeat about the potential of smaller ESCOs to further drive focused energy efficiency in the commercial, industrial, mining and agricultural sectors and identify and implement opportunities for customers to lower electricity consumption on site.

He is encouraged by some of the proposals from emerging ESCOs, noting that there is an added win of transformation in the sector. He concluded by inviting further ideas and proposals on demand side management and energy efficiency.

ENERGY EFFORTS OF GOVERNMENT

Speaking on behalf of the Director General of Energy Thabane Zulu, Dr Rebecca Maserumule, Energy Efficiency Specialist at Department of Energy, outlined the efforts being made by government to improve the production and consumption of energy.

South African Industrial Energy Efficiency Programme – a collaboration between the SA government, Business Unity South Africa and the United Nations Industrial Development Organization – focuses on technical support for the roll out of energy management and energy systems optimization in the industrial sector.

Mention was made of There is also the Private Sector Energy Efficiency (PSEE) Initiative under the National Business Initiative (NBI) which has conducted detailed energy audits for over 900 companies across different business sectors to increase the awareness of energy savings.

One of the barriers to the implementation of more efficient technologies is the investment cost and to this end the government through the South African National Development Institute (SANEDI) launched the 12L Energy Efficiency Tax Incentives to reduce the barriers as well as to stimulate investment in more efficient technologies and the adoption of more efficient processes. The scheme, introduced in the form of section 12L of the Income Tax Act, will allow companies to claim tax rebates after the successful implementation of energy savings measures within companies.

It must be noted though that Etzinger, in the context of incentives, told the audience that more stringent verification and coordination would be needed across the various programmes to avoid “double paying for the same kilowatt”. “Incentives are a sweetener,” Etzinger said, noting that to be sustainable, the country cannot rely on incentives in perpetuity.

HIDDEN FUEL TO FIRST FUEL

In the context of the Sustainable Development Goals, Maserumule said that extensive efforts have been taken by the International Energy Agency to elevate energy efficiency as a hidden fuel to the ‘first fuel’ of choice. “Global studies show that half of the potential for reducing global greenhouse gas emissions stems from reducing energy consumption through the implementation of energy efficiency initiatives. This will work towards effectively decoupling the GDP growth from energy consumption while improving the future of the environment and simultaneously improving the socio-economic status of the global population.” ■

Editor’s note:
We hope to bring you further insights from the 2015SAEE in the coming months by way of case studies on heat recovery opportunities in steam and condensate systems as well as the use of lubricants to improve energy efficiency.



Dr Rebecca Maserumule

- One in five people still lacks access to modern electricity.
- Three billion people rely on wood, coal, charcoal or animal waste for cooking and heating.
- Energy is the dominant contributor to climate change, accounting for around 60 percent of total global greenhouse gas emissions.
- Reducing the carbon intensity of energy is a key objective in long-term climate goals.

Source: www.un.org

HRS Process Systems highlights need for energy efficient heat transfer equipment at Paperex 2015

HRS Process Systems Ltd (HRS) participated in the 12th International Paperex 2015, held at Pragati Maidan, New Delhi in November where it highlighted the significance of innovative technology in paper industry with its latest product range including Ecoflux Corrugated Tube Heat Exchangers and HRS Funke Plate Heat Exchangers.

Ecoflux Corrugated Tube Heat Exchangers (CTHE) are used for important processes like steam condensation, exhaust steam heat recovery, gland cooling, oil cooling, and closed loop water cooling etc. Funke Plate Heat Exchangers are used for water cooling, hydraulic oil cooling and heat recovery.

HRS offers cost effective heat transfer solutions through application engineering and design expertise to optimise the energy consumption in paper manufacturing processes such as cellulose production, pulp production, heat recovery and waste water treatment.

Recent statistics revealed that India has emerged as the fastest growing paper market in the world, jumping from 7.5kg per capita consumption in 2007-08 to 8.3kg with an overall 7-8% projected growth over the next decade. Majority of paper pulp is produced by recycling waste paper. Other sources for paper production are through agricultural residues and a small portion from wood as the raw material. Domestic demand for paper is expected to rise by 53% in the next few years. In the last five years, the Indian paper sector has invested about Rs 20,000 crore (nearly three billion US dollars) on capacity enhancement, technology upgrade and acquisitions. ■



Sappi secures FP&M Seta recognition award



On Monday 23 November Sappi South Africa received an FP&M Seta Recognition Award as a 'Best Practice Workplace Provider for Apprenticeship Training'. It is an award given to a company that addresses artisan development – a critical and scarce skill.

Chris Gengan, learning and development manager for Sappi SA, said, "We graciously received this award on behalf of all our mill-based colleagues – learning and development consultants, artisans, engineering foremen and engineers – all of whom played a vital role in coaching, mentoring and developing our apprentices."

Seen here at work under the guidance of Rob Griffith, learning and development consultant (front right) and Gengan (back right) are, from left, Lucas Magubane, Frederick Malaza, Mthokozisi (Smiley) Dube, Lwazi (Chillie) Cliliza and Nkosinathi (Sguh) Ndlovu.

The apprentices are restoring a scrapped bakkie into a services maintenance vehicle, saving over R180,000 on a new one. The team handles everything from panel beating to fixing the engine and painting. ■

Seta CEO scores a hat-trick



Felling Yende

Felling Yende, CEO of the Fibre Processing and Manufacturing Sector Education and Training Authority (Seta), received the Public Sector Visionary Award at the 2015 BBQ Awards on 30 October, making it her third business award in as many months.

The BBQ award will no doubt sit alongside her other two accolades: Africa's Most Influential Women in Business and Government from CEO Global and

the Youth Employment Award from the South African Council for Graduates Co-operative.

This latest addition to her trophy cabinet acknowledges a person who has made a significant impact in the public sector by demonstrating commitment to the advancement of excellence within the sector and furthering the interests of South Africans through innovation, creativity and integrity.

Recipients must have a proven record of achievement, leadership, perseverance and endurance as well as active involvement in the public sector for a minimum of three years.

The overall performance of the Seta, since inception, has increased significantly from 49% during the 2011/2012 financial period, to 64% in 2012/2013, 80% in 2013/2014, and an impressive 86.2% during 2014/2015.

Instrotech appoints new sales manager



Gerrit Steyn (NH Dip Electrical Eng, MBA) recently joined Instrotech as sales manager for its product portfolio of instrumentation and process control products, test and measurement equipment. Steyn has 20 years' experience in technical sales and marketing.

70% success rate in tackling 'Global Greenwash'

Two Sides, the global initiative to promote the sustainability of print and paper, has reported a 70% success rate in persuading global organizations to remove misleading green claims from their communications as part of its worldwide anti-greenwash campaign.

Of the 377 banks, utilities, telecoms and insurance companies researched by Two Sides, 240 have used misleading greenwash statements in marketing and communications activities. To date, 168 of them have removed such statements as a direct result of ongoing lobbying by the Two Sides initiative.

Valmet announces executive team changes

Kari Saarinen has been appointed chief financial officer at Valmet. Saarinen was previously senior vice president, strategy and operational development. In his new position he continues as a member of Valmet's executive team, reporting to president and CEO Pasi Laine.

Saarinen takes over from Markku Honkasalo who leaves Valmet to pursue other endeavours. "I thank Markku for his contribution to Valmet during a very interesting and demanding time. Markku has been a great support in these first years as an independent, stock listed company," says Laine.

"Kari Saarinen has a strong background in finance and business controlling in large, international organisations in addition to his expertise in the field of strategy and operational development. After four years at Valmet, Kari knows the company well and is the perfect person to take over on the good foundations built by Markku," continues Laine. ■



Kari Saarinen



AF&PA praises paper industry

The American Forest & Paper Association (AF&PA) presented its 2015 *Better Practices, Better Planet 2020* Sustainability Awards at its annual meeting on 13 November in San Antonio, Texas.

Designed to recognise exemplary sustainability programmes and initiatives in the paper and wood products manufacturing industry, the awards are given based on the merit of entries received across multiple categories.

This year, seven companies received eight awards from 26 outstanding submissions across the industry:

- **Leadership in Sustainability – Paper Recovery for Recycling** – Evergreen Packaging: On-Packaging Recycle Use
- **Leadership in Sustainability – Energy Efficiency/ Greenhouse Gas Reduction (Large Company)** – WestRock Company: Covington Power Island Project
- **Leadership in Sustainability – Energy Efficiency/ Greenhouse Gas Reduction (Small Company)** – Seaman Paper Company: Soft Steps Forward Initiative
- **Leadership in Sustainability – Sustainable Forest Management** – Domtar: Marlboro FSC Partnership
- **Leadership in Sustainability – Safety** – Resolute Forest Products: Working Towards Zero Incidents
- **Leadership in Sustainability – Water** – International Paper: Pensacola Mill/Emerald Coast Utilities Authority (ECUA) Partnership
- **Innovation in Sustainability**
 - Domtar: Plymouth K-Lime Project
 - Verso Corporation: Identifying and Mapping Vernal Pools on State Lands in Michigan's Upper Peninsula

"The award-winning initiatives are representative of our members' commitment to better practices in their businesses and to the industry's Better Practices, Better Planet 2020 sustainability goals. Through hard work, ingenuity and innovation, these companies are helping to create a better future," said AF&PA President and CEO Donna Harman. "The growth in project submissions represents the concrete actions taking place in our industry to improve the sustainability of our processes and products." ■

Permanent recycling exhibition installed at iconic Delta Environmental Centre

The Delta Environmental Centre (DEC) and National Recycling Forum have unveiled a contemporary and refurbished walk-through display that helps visitors grasp how they can make a difference by recycling various materials and packaging.

Situated in the heart of the beautiful 104-hectare Delta Park, north west of Johannesburg, the 40-year old environmental centre provides education and training on the sustainable use of resources. The centre has been open to the public for generations and the recycling displays had become dated.

“With the new exhibit, visitors are introduced to a delightful alien ‘Zork’ who helps to interpret the information about the things we use, discard or recycle everyday,” says Delta executive officer Di Beeton. Zork is gender and culture-neutral, which allows no bias in ‘his’ observations on earth.

“Of course, we need to do more. And the ‘more’ is through separation-at-source and recycling of paper, cardboard, beverage cartons, cans, plastic, glass, used oil, aerosols and electronic waste,” adds Beeton.

The upgrade of the recycling display was sponsored by the NRF along with additional financial support from the Paper Recycling Association of South Africa, Tetra Pak, the Plastics SA, the Glass Recycling Company, the Aerosol Manufacturers Association, the e-Waste Association and ROSE Foundation (oil).

The recycling exhibition adds to the centre’s existing education displays: a natural history museum displaying a variety of biomes and ecosystems; the geology of the Witwatersrand, the Lesotho Highlands Water Scheme and the Discovery Centre which offers supervised experiments and activities on soil, energy, air and water. ■

1. School children interact with the new exhibit.
2. Ursula Henneberry shows off the new paper display.
3. Children complete an exercise on recycling.
4. Representatives from the NRF and Delta Environmental Centre.



High-performing single-stream recycling systems more effective

An economic and policy study commissioned by the American Forest & Paper Association (AF&PA) and developed by engineering firm Burns & McDonnell shows that high-performing single-stream recycling systems recover more paper and other recyclable materials than mixed-waste facilities that combine wet and organic waste with dry recyclables.

Mixed-waste processing recovers much less mill-quality paper, but more metal and plastic, and requires 2.5 times the facility capital cost of single-stream recycling.

“Paper recovery is the economic foundation for many successful community recycling programmes,” said AF&PA Executive Director of Recovered Fibre Brian Hawkinson. “Every situation is unique and there is no “one-size-fits-all” solution. The size of a community, its recycling rate, goals for materials recovery, markets for recovered materials, landfill disposal costs and other factors all impact the economics of any recycling system.”

AF&PA conducted the study to help communities better understand whether mixed-waste processing could

assist them with meeting their recycling goals. As the composition of the waste stream continues to change and communities’ interest in diversion evolves, seeking cost-effective options to increase overall recycling rates is a challenge.



Recognizing that multiple technical, economic and environmental questions exist concerning the feasibility of mixed-waste processing, the study focused on recovering recyclable materials from residential sources and assessed several scenarios comparing mixed-waste processing to single-stream recycling in a representative large U.S. city.

The U.S. paper and paperboard manufacturing industry relies on a continuing, expanding supply of mill-quality recovered paper fibre from community single-stream recycling systems for feedstock to manufacture new products. In a mixed-waste system, clean, dry recyclable paper is mixed with wet and organic waste, which increases the potential for contamination of the fibre and, thus, limits its availability and viability for reuse in manufacturing new paper and paperboard products. ■

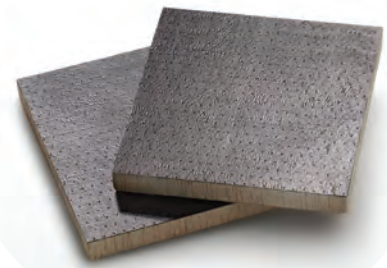
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Swedish researchers develop bio-based carbon-fibre

From aerospace to a bicycle race, from prosthetic limbs to water filtration, the applications for carbon fibre (CF) are endless however the demand for CF composites is mainly limited by cost. Consequently the material which has an exceptional strength to weight ratio is used primarily in specialised products such as aircrafts, racecars and sporting equipment where performance supercedes price.

Of course, where there is wood, there is an opportunity to discover something else to make with it. The research institutes Innventia and Swerea SICOMP recently collaborated to develop a world-first: a carbon-fibre composite 'demonstrator' from softwood lignin.

Conventional fossil-based CF is made from polyacrylonitrile (or PAN). Also known as Creslan 61, PAN is a vinyl polymer with properties of a synthetic, semicrystalline organic polymer resin.

Innventia and Swerea's cost-effective lignin-based CF focus the low strength segment for use in 'normal' cars and other bulk products. Lighter cars would mean lower fuel consumption, and would also make electric cars more viable.

Conventional production methods require the raw materials to undergo several processes including stretching, oxidation and carbonisation under high temperature.

Current methods for manufacturing fossil-based CF tend to be energy intensive and production is based on a relatively expensive raw material, making it costly for use in mass-produced applications.

Commenting on how their production method compares, Per Tomani, Focus Area Manager for Lignin and Carbon Fibres at Innventia, says, "PAN is quite an expensive raw material and accounts for about 50% of the CF production cost. The process to spin PAN is a wet spinning process in which solvent is used.



This way of producing filaments is more cost-intensive in total compared to the melt spinning technology we develop."

He adds that keeping costs down is a great challenge. "We are improving and we recently won project funding from the EU's BBI Programme. Our GreenLight project, a four-year undertaking is funded by Södra and EU in which the automotive manufacturer Fiat and other partners are also involved. The project covers the complete value-chain. This is crucial for the development from black liquor to parts in automotives."

The demonstrator – a sandwich structure in which balsa wood is laminated with CF – is the first proof that it is possible to manufacture lignin-based CF, even if this is still only on a laboratory scale. The production of another demonstrator is already under way to demonstrate a future application within the automotive industry, a model car powered by a lignin-based battery.

"Our first demonstrator is helping us and our different partners to understand where we need to focus our R&D work, so it's particularly pleasing that we have now taken a big leap forward in the value chain. One of the biggest needs right now is to scale up for a continuous production process so that we can identify the challenges that always arise during upscaling. We hope that both industry and society will be bold enough to invest in this upscaling," says Tomani.

Tomani notes that the 'demo team' (Swerea SICOMP, KTH and Blatraden) will soon have an improved demonstrator ready - a toy car with the roof in a sandwich construction. The lignin-based CF is used together with a polymer core. The car will be operating using Lithium batteries where we use lignin-based CF in the battery as well as a binder based on lignin. He says that they hope to be successful and have the demo ready by the end of this year.

"Alongside this development, intensive work is also taking place to develop the existing manufacturing methods for CF composites," adds Birgitha Nyström, Research Leader for Materials Technology at Swerea SICOMP. "We believe in the large-scale production of lightweight materials, and the manufacturing methods for composites must therefore become more cost-effective. There's no reason to believe that today's fossil-based CFs can't be replaced directly with lignin CF in these production processes."

The research institutes Innventia and Swerea SICOMP are both part of RISE, Research Institutes of Sweden. ■

LEFT: The demo team.

TOP: Composite laminate (85x95 mm), reinforced with 1.8g woven carbon fibres made from 100% Swedish softwood lignin, on balsa core.

Leading pulp and paper producers showing improvement, says WWF

The WWF Environmental Paper Company Index (EPCI) 2015 shows a positive trend towards more transparency and sustainability by the world's more progressive pulp and paper manufacturers. The 31 voluntary participants in this year's Index together produce 15% of the world's paper and board and 15% of the world's pulp. While all participating manufacturers demonstrated outstanding transparency, more than 90% of product categories reported since 2013 showed improvement.

The 31 companies participating in EPCI 2015, up from 25 in 2013, disclosed the ecological footprint of 85 million tonnes of pulp and paper. This represents 30% of the world's tissue, 28% of the world's graphic paper, 16% of the world's newsprint, 7% of the world's packaging and 15% of the world's pulp.

The EPCI is based on voluntary data disclosure by the companies. WWF evaluated environmental policies and targets as well as environmental performance in the production of newsprint, graphic paper, tissue, packaging and pulp. Scores were assigned on responsible sourcing, clean production, Environmental Management Systems and reporting. The Index

also shows progress between 2013 and 2015 for companies that have participated in both of those years.

WWF's Living Forests Report projects paper production and consumption may double in the next three decades, and overall wood consumption may triple. The key challenge for forest-based industries is how to supply more wood products with less impact on nature. This challenge spans the whole supply chain, from where and how wood is grown and harvested to how wisely and efficiently it is processed, used and reused.

"The pulp and paper sector has unique potential to supply renewable materials that help do things as diverse as share knowledge, improve sanitation and keep food safe. However, this potential is diminished if poor logging practices degrade forests and deplete carbon stores, if plantations take land away from traditional communities, if dirty pulp mills pollute air and water or if paper fit for recycling is dumped or burned. The EPCI helps us assess if industry is making good on its promise of supplying essential products with reduced impact on nature," says Rod Taylor, Director of WWF's Global Forest Programme.

ZEST WEG DONATES EQUIPMENT TO TSHWANE NORTH TVET COLLEGE

Zest WEG Group recently donated electrical equipment to the Tshwane North Technical and Vocational Education and Training (TVET) College. The Group's relationship with TVET colleges dates back to 2011, when the group committed to help address the shortage of technical skilled trades through equipment donations to a number of colleges.

The equipment, which includes motors, contactors, relays, starters, circuit breakers, fuses and other accessories, will be utilised in the workshop of Tshwane North's Rosslyn, Temba, Soshanguve North and Mamelodi campuses, where electrical engineering courses are offered. Technical support for the products will be provided by the group when necessary. ■



Tebatso Seema and Catherine Chipane, Level 3 electrical infrastructure learners at Tshwane North TVET College during a practical lecture using a WEG CWM 50 contactor.



Veronica Ramashala, Level 3 electrical infrastructure learners at Tshwane North TVET College during a practical lecture demonstrating the WG MDWH miniature circuit breaker.



Sappi Stanger.

Sappi takes Typek to Stanger

It's the end of an era for Enstra and Cape Kraft mills and the beginning of another. Following its announcement in July, Sappi has officially transferred the Springs-based Enstra Mill to the new owners, Corroseal, which takes ownership of the recycled containerboard and kraft papers business produced on PM6, as well as the fine paper and security paper portfolio produced on PM2.

The iconic Typek copy paper has moved to Stanger Mill in KwaZulu-Natal where Sappi is making significant capital upgrades in 2015 and 2016 to position the mill as "a world-class office and tissue paper producer," said a statement issued by the company.

PHASED APPROACH

Through the R30 million injection, the first phase is complete including the upgrade of various aspects of the paper machine to ensure that the paper meets the quality and standard that the market demands.

During the next five months, Sappi will invest a further R70 million in Stanger Mill's sheeting and finishing operations with a focus on speed, increasing the throughput of finished A4 products, as well as improving the packaging quality products.



Tugela mill.

These investments in its office paper grade will see the Stanger Mill delivering numerous benefits:

- Paper bulk and stiffness improvement for better runnability in printers and copiers as it contains sugar cane bagasse pulp
- Smoother surface for excellent print quality
- Finishing house upgrade for higher throughputs, packaging quality improvements, and
- Supply chain optimisation for higher product availability and better service levels.

Golden Era takes ownership of Cape Kraft Mill

In the second of two sale transactions which signals Sappi's exit from the recycled paper packaging market, Cape Kraft Mill in Milnerton was transferred to the Golden Era Group on 23 November.

Going forward, the southern African region will focus on, among other things, enhancing its dissolving wood pulp capacity at Ngodwana and Saiccor Mills; investing in containerboard capacity at the Tugela and Ngodwana Mills; increasing its by-products offering including lignosulphonate from Tugela Mill.

Upping the energy ante

During the course of 2016, Sappi will invest in projects to increase the company's energy self-sufficiency through the installation of new turbines at the Tugela and Saiccor Mills. The turbines will produce approximately 23MW of power and contribute to increasing Sappi Southern Africa's self-sufficiency from 56% to 72% by the end of 2016. This will help mitigate against any future power shortages but more importantly will lower Sappi's energy costs.



Saiccor mill.

Successful start-up of wet-laid spunlacing line at Hangzhou Nbond Nonwoven

Hangzhou Nbond Nonwoven in the Zhejiang province of China successfully started up a new flushable wipes production line in April 2015. The new production line is the first one on the Chinese market to utilise the innovative wet-laid spunlacing (WLS) concept of Voith's HydroFormer and Truetzschler AquaJet's technology. Within three days of start-up, the operating speed of 200 m/min was reached.

Through the combined efforts of Nbond, Voith and Truetzschler, the project took only five months from completing plant construction and installation to commissioning. The production line uses wet-laid technology with cellulose fibre as raw material for the production of flushable wipes and is Nbond's eighth line. With a 3,750 mm wire width and 250 m/min design speed, Nbond produces flushable wipes within a basis weight range of 50 to 80 g/m² and will achieve an annual capacity of up to 15,000 tonnes. The flushable wipes will have excellent dispersibility and are 100% biodegradable.



Wet-laid spunlacing production line at Hangzhou Nbond Nonwoven.

With HydroFormer technology the suspension is highly diluted, so nonwovens can be produced entirely from cellulose. In addition to the HydroFormer, Voith delivered the entire stock preparation, the approach flow system, auxiliaries and onsite service along with an entire automation and control package.

Truetzschler supplied the AquaJet technology, a drum dryer and a winder which were adapted to the needs of the WLS process. ■

OJI develops ground-breaking production process for cellulose nanofibres

OJI Holdings Corporation (OJI) has developed a ground-breaking production process for cellulose nanofibres (CNF) which applies a phosphate esterification chemical treatment method.

Practical use of CNF has been largely impeded by the burdensome energy requirements of the pulp refining process from which CNF are derived.

After evaluation of a variety of chemical processes which could potentially reduce the energy requirements of the refining process, OJI determined that the new process involving phosphate esterification is the most feasible technology at the present time to achieve practical implementation. OJI has decided to install a manufacturing demonstration facility to further inspect this production process.

With the demonstration facility, OJI will not only inspect the energy reduction, but also broaden the array of samples to be provided to users at the implementation stage. This will also expedite the initiative towards commercialisation. ■


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Hubert Lienhard, President and CEO of Voith Group, and Chairman of the Asia Pacific Committee of German Business (APA) and Jianhua Li, Chairman of the Board of Huatai Group, one of the largest paper manufacturers in China, signing a strategic partnership agreement in Beijing on 29 October.

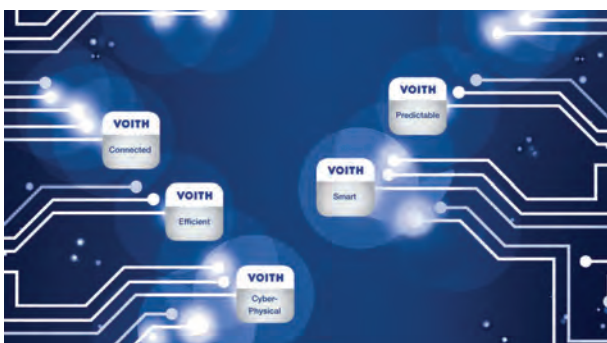
In it for the long haul

Voith and Huatai Paper enter strategic partnership agreement

On 29 October, Voith signed a strategic partnership agreement with Shandong Huatai Paper Co. Ltd at a signing ceremony witnessed by Chinese Premier Li Keqiang and German Chancellor Angela Merkel during her visit to China.

Backed by a successful relationship spanning over a decade, the event marked an agreement for a further five years of co-operation between the two companies. Together they will upgrade Huatai's existing production lines, expand research and development (R&D) activities, and implement 'Industry 4.0', representing an investment to the tune of around €120 million (R1,8 billion) by Huatai.

Huatai Paper, which operates six newsprint production lines with a total annual output of 1.8 million tonnes, will collaborate with Voith to see through the enhancement of five newsprint production lines and an increased capacity for the production of graphic paper and packaging paper. There are also plans to found a joint R&D centre focused on papermaking.



Papermaking 4.0

PAPERMAKING 4.0

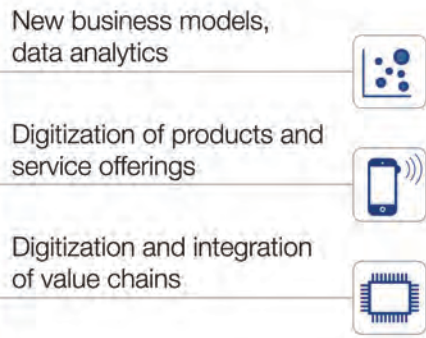
Huatai will also work with Voith to adopt 'Papermaking 4.0', a concept modelled on Germany's Industrie 4.0 (Industry 4.0) to achieve smart manufacturing in the papermaking process.

According to Voith's news portal *Twogether Online*, the company is making an intelligent contribution towards efficiency, productivity and quality of the entire paper production process supply chain, even in existing systems and equipment. "The term has been chosen deliberately to address Industry 4.0," said Dr Christian Naydowski, Vice President Technology for Papermaking 4.0 at Voith Paper.

The same article states that 'the future is all about being more productive and less expensive' and elaborates with some big numbers: A modern board machine already incorporates 20,000 input/output processes; transmits around 160,000 data signals per second, and uses 7,000 actuators. This would all need to be connected by 900 metric tonnes of copper cable.

As a result of technological advances, these figures, Naydowski believes, will "definitely multiply" with the next machine. But the industry doesn't want more. Today, for example, copper cable can be reduced thanks to fast LAN networks, although the number of signals will increase substantially. The Internet is now making this possible."

For the 4.0 age of manufacturing to be sustainable, there are five crucial areas of technology that must be mastered: embedded systems (cyber physical systems or CPS), smart factory, robust data networks, data transfer in real time and IT security.



He highlights three critical activities to bring this altogether: visualisation, stabilisation and optimisation. “We are creating processes that work transparently in our customers’ paper machines and can be stabilised by means of actuators and controls,” Naydowski says.

He explains that if you can visualise a process, you can stabilise it, and only then optimise it. By connecting the various sub-processes, from stock preparation through to the finished product, for example, the customer can derive measurable monetary benefit as well as reducing excessive use of valuable resources such as energy, chemicals, fibres and time.

Voith is confident that Papermaking 4.0 approach is suited to China’s efforts to positively transform key manufacturing sectors, including paper, steel, and nonferrous metal.

This Voith-Huatai contract represents a meaningful milestone in a market where Voith already has a footprint, not only in the delivery of modern and efficient paper machines to Chinese customers but also through Voith Paper City, located in Kunshan in the southeastern part of Jiangsu province. This multimillion Euro entity is the largest production site for paper machines in the Voith Group. From here, Voith serves paper customers all over China and the Asia-Pacific Region. ■



ABOUT VOITH PAPER CITY KUNSHAN

Established: 26 October 2007

Size: Land Area: 195,710 m2
Building Area: 119,937 m2

Currently produces:

- Projects/paper machines: Eight sets machines pre-assembly per year. Maximum width: 10 m
- Products and services: QCS Scanner, spare parts assembly, screen elements, refurbishment
- Fabric and roll systems: Roll covers and service, forming and press fabrics, transfer belt

An approach for selection of coating colour formulation using TOPSIS

Multi Criteria Decision Making Design

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ABSTRACT:

Paper is pigment coated to get a smoother and glossy surface. The properties of coated paper are the function of many variables such as type and amount of pigments, binder, base paper properties and calendering parameters like temperature, pressure, speed etc. In such a multivariate system, properties of coated paper vary significantly due to intricate correlation of one parameter with another parameter. To obtain the quantitative estimates of these parameters on the coating process, a well-planned, coordinated approach is necessary. Multi Criteria Decision Making (MCDM) is one such approach to solve these types of multivariate problems by deciding the most appropriate solution. In the present investigation different characteristics of coated paper viz. surface roughness, gloss, brightness, opacity, static and kinetic coefficient of friction were studied using the fifteen alternatives based on different pigment formulations. The MCDM approach was used to opt for coating formulation using Technique for Ordered Preference by Similarity to Ideal System (TOPSIS). The best coating formulation was selected with optimum values of different coated paper properties using the above approach.

Keywords: coating formulation, china clay, TOPSIS, multi criteria decision making, gloss, paper friction

1. INTRODUCTION:

In the present age of advertising, the demand for better graphic reproduction on paper is ever increasing. To meet this demand, paper is pigment coated for enhancing its surface and optical properties. Pigment coating is the application of a concentrated suspension of inorganic pigments and polymers dispersed in water along with other additives on the paper surface. The pigment alone used in coating formulation plays a major role in deciding the end use properties of coated paper (Carter et al. 1999). They constitute about 80-95% by weight of total coating formulation. Binder which comprises 5-20% by weight of dry pigment primarily binds pigment particles to base paper and among themselves. Besides, they also play an important role in gloss development during the calendering process. Other additives, such as rheology modifier, dispersing agent, optical brightening agent, microbiocide etc., are usually

added below 2 wt. % of the total solids.

Apart from the above mentioned parameters, base paper properties and calendering parameters like temperature, pressure, speed etc., also affect different properties of coated paper. This makes the coating of paper a multivariate system. Obtaining the quantitative estimates of each of the above parameters on the coating process for its evaluation becomes complex as the set of variables increases. The complexity of this situation is compounded by the interaction of different variables as the interaction effect of these parameters cannot be separated from the main effect of a variable. The lack of co-ordinate, planned and complete investigation (which is due to the magnitude and complexity of the problem) gives rise to several misconceptions about the effect of some variables. For producing a certain grade of coated paper the coating formulation components are altered in different proportions. Since coating pigments constitute the major component of formulation, major attention was paid on their compositions (Tyagi et al. 2010). Experience based estimates by the plant personnel play a major role in such an exercise. Step by step procedure where fixing the level of each component in the formulation, one at a time, is carried out but it suffers the drawback of eliminating the interaction effect of different variables. Some statistical approach had been followed by researchers to study effect of coating colour formulation constituting different pigments on coated paper properties (Ray et al. 2009). However a compromise result between different conflicting criteria cannot be achieved by any such methods.

It is the end-use of paper which determines the desired properties which are achieved by different formulations. Therefore industries use different formulations to get the desired properties on trial and error methods based on experience. Until now, no optimised use of pigments has been studied to get the desired properties in paper. For optimizing the coating colour formulation for desired properties, it is always necessary to take into account the multiple alternatives with multiple criteria. In present work, an attempt has been made to evaluate these coating formulations using Multi Criteria Decision Making (MCDM) approach. Since the desired properties required by the

paper maker change with respect to end-use of the finished product, incorporation of user preference in decision making and selecting the best of the prevailing formulations is preferred. MCDM techniques have played an important role in solving spatial decision problems (Huang et al, 2011). In the present investigation, MCDM can prove to be the proper tool for analysing decision problem and evaluating alternatives independent of decision maker's values and preferences. Different MCDM techniques suit a different kind of decision situation. There are eight different methods in this category (Eldrandaly et al. 2009). MCDM method has already been used by many researchers in different problems (Anupam et al. 2014, Balin et al. 2012). TOPSIS is chosen as the main body of development as it has fewest rank reversals among the group. The basic idea of TOPSIS is rather straight forward which originates from the concept of displaced ideal point from which the compromise solution has its shortest distance (Pavic et al. 2013, Shih et al. 2007).

2. TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SYSTEM (TOPSIS):

Hwang and Yoon introduced the TOPSIS method (Hwang et al. 1981). This is a useful technique for solving multi-criteria decision making problems in the real world. It works on the concept that the chosen alternatives have the shortest Euclidean distance from the ideal solution and farthest from the negative ideal solution. This is a broadly applicable decision making methodology which helps the decision maker to select the best option for a given problem through hypothesized positive ideal and negative ideal solution. Positive ideal solution has the best level for all attributes considered and negative ideal solution has the worst attribute values. Alternative that is closest to the ideal solution and farthest from the negative ideal alternatives is selected by using TOPSIS technique. TOPSIS is considered as a compensatory method which allows compromise between different criteria where a bad result in one criterion can be compensated with the good result in other criterion. Due to the possibility of criteria modelling, compensatory methods, including TOPSIS, are widely used in various sectors of multiple decision making (Balin et al. 2012). Sarraf et al. 2013 developed a TOPSIS method using statistical normalization for selecting knowledge management strategies. The positive ideal solution and the negative ideal solution lie opposite to each other when represented geometrically. The best possible solution will exist somewhere between the opposite poles.

2.1 Steps involved in TOPSIS:

There are a total of six steps involved in solving the problem using TOPSIS as described here.

Step 1 is the construction of normalized decision matrix. For solving problems using TOPSIS, we assume to have m alternatives with n attributes or criteria. There are scores of each option i with respect to each criterion.

Matrix $X = (x_{ij})$ of order $m \times n$ is formulated such that x_{ij} is the score of option i with respect to attribute j .

Step 2 involves normalization of the decision matrix. To allow comparisons across criteria, various dimensional attributes in

the matrix are transformed into non-dimensional attributes. Data is normalised according to following relation:

$$r_{ij} = x_{ij} / (\sum x_{ij}^2)^{1/2} \quad i=1,2,3,\dots,m; j=1,2,3,\dots,n \quad (1)$$

Step 3 is formulation of weighted normalised decision matrix. Weight for each criterion w_j is either known or evaluated by some method and a weighted normalised decision matrix is obtained by multiplying each unit with its associated weight as depicted below:

$$v_{ij} = w_j \times r_{ij} \quad i=1,2,3,\dots,m; j=1,2,3,\dots,n \quad (2)$$

Step 4 includes determination of the positive ideal and negative ideal solutions. Positive ideal and negative ideal solutions for a beneficial and non-beneficial attribute are recognized from the weighted normalized values of the particular attributes as evaluated in step 3. In the case of beneficial attribute set J , the largest weighted normalized value is regarded as positive ideal solution and the lowest weighted normalized value is deemed as the negative ideal solution while in the case of a non-beneficial attribute set J' the order swaps around. Beneficial and non-beneficial attributes have been described in the section 2.2 in the text. The positive and negative ideal solutions are expressed by equations 3 and 4 respectively.

$$A^* = \{v_1^*, \dots, v_n^*\} \text{ where } v_j^* = \begin{cases} \max(v_{ij}) & \text{if } j \in J \\ \min(v_{ij}) & \text{if } j \in J' \end{cases} \quad (3)$$

$$A' = \{v_1', \dots, v_n'\} \text{ where } v_j' = \begin{cases} \min(v_{ij}) & \text{if } j \in J \\ \max(v_{ij}) & \text{if } j \in J' \end{cases} \quad (4)$$

Step 5 is to calculate separation measures. Separation measures indicate the deviation of an alternative from its positive ideal solution as well as from its negative ideal solution and are respectively designated as positive and negative separation measures. Positive and negative separation measures are calculated using the expressions 5 and 6 correspondingly.

$$S_i^* = \left\{ \sum (v_j^* - v_{ij}^*)^2 \right\}^{1/2} \quad i=1,2,\dots,m \quad (5)$$

$$S_i' = \left\{ \sum (v_j' - v_{ij}')^2 \right\}^{1/2} \quad i=1,2,\dots,m \quad (6)$$

Step 6 Finally, relative closeness of the alternative to the ideal solution is calculated using following mathematical relation:

$$C_i^* = S_i' / (S_i^* + S_i') \quad 0 < C_i^* < 1 \quad (7)$$

Relative closeness is considered as the overall performance score of an alternative. Alternatives are then ranked in descending order on the basis of an overall performance score calculated in the above steps. The best solution takes the first position and least suitable solution takes the last position.

2.2. Beneficial attribute and non beneficial attribute:

Attributes are primarily categorised as beneficial and non-beneficial. Beneficial attributes are those, whose higher values are coveted while non beneficial attributes are those whose lower values are sought. Attributes considered in this work are roughness, gloss, brightness, opacity, kinetic coefficient of friction (Kinetic COF) and static coefficient of friction (Static COF). In coated paper low roughness and low

friction are desired for good quality of paper. Therefore, roughness and friction can be considered as non-beneficial attributes. However brightness, opacity and gloss are desired to have higher values for good quality of paper. So brightness, opacity and gloss have been taken as beneficial attributes. Table 1 lists beneficial and non-beneficial attributes on the basis of the above discussions.

TABLE 1: List of beneficial and non beneficial attributes

Attributes	Desired value	Remarks
Roughness	Lower	Non beneficial
Gloss	Higher	Beneficial
Brightness	Higher	Beneficial
Opacity	Higher	Beneficial
Kinetic COF III	Lower	Non beneficial
Static COF III	Lower	Non beneficial

2.3. Determination of weight using entropy method:

The relative importance of an attribute in a decision matrix is denoted under the term weight which plays a vital role in solving MCDM problems. It is necessary to calculate the relative weight of the attributes with respect to an objective as each attribute influences the decision-making process. There are two types of weights, subjective weight which depends upon preference of decision maker and objective weight which is independent of fondness of decision maker. There are various weight determination methods (Olson et al. 2004, Huang et al. 2009). In our present study we used an entropy method for evaluation of objective weight. There are five steps included in determination of weight using entropy method.

Step 1 involves construction of a decision matrix. This decision matrix is the same as that considered in TOPSIS method.

Step 2 is to evaluate projection values. Projection values p_{ij} are obtained after normalisation of the decision matrix as per the formula given below:

$$P_{ij} = x_{ij} / \sum_{i=1}^m x_{ij}, i = 1,2,3,\dots,m; j = 1,2,3,\dots,n \quad (8)$$

Step 3 involves evaluation of entropy of each attribute using following relation:

$$ent_j = -1/\ln m \sum_{i=1}^m p_{ij} \ln p_{ij}, i = 1,2,3,\dots,m; j = 1,2,3,\dots,n \quad (9)$$

Step 4 is to determine the degree of dispersion d_j which is given as $d_j = 1 - ent_j, j = 1,2,3,\dots,n$. Higher value dispersion suggests greater importance of a given attribute.

Step 5 Finally, the objective weight of each attribute w_j is calculated as shown below:

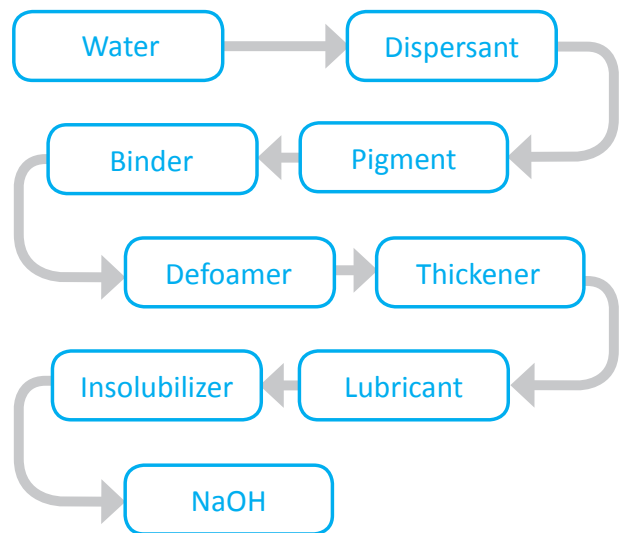
$$w_j = d_j / \sum_{k=1}^n d_k \quad (10)$$

It should be noted that sum of the objective weights of each attributes should be equal to one.

3. EXPERIMENTAL PROCEDURE:

Different coating formulations were prepared in the laboratory using different ratios of pigments for different formulations. Table 2 shows different ratios of pigments viz. clay, ground calcium carbonate (GCC) and precipitated calcium carbonate (PCC). These formulations were applied onto common base sheets which were tested for their surface, optical and printing properties. The coating colour material used in the study consisted of commercial coating pigments, binders and additives collected from the paper mill. The ingredients were added in the order as shown in Figure 1. Fifteen formulations of varying composition were prepared keeping the amount of binder and additives constant. The prepared coating formulations of 60-61% solid content were applied on base paper of 70 gsm which was also collected from the mill. The coat weight on base paper varies from 15.5 to 16.3 g/m². The coated paper samples were then calendered under similar conditions of temperature, pressure and number of nips as shown alongside: mode of calendaring = soft nip; nip load = 100 N; temperature = 60 °C and number of nips = 3. The paper samples so obtained were evaluated in the laboratory for physical and optical properties. Table 3 displays different paper properties with different formulations.

FIGURE 1: Order of adding coating colour ingredients:



4. RESULTS AND DISCUSSION:

The laboratory results of different coated sheets are given in Table 3 which serves as the decision matrix for TOPSIS method.

From the values of different properties obtained during experimental evaluation (Table 3) one can easily find the effect of different variables on paper properties individually. Of the fifteen types of coating formulations prepared at the same solid level of 60% and calendered under the same conditions, it was found that roughness of sheet coated with formulation 11 had minimum roughness while formulation 5 had the maximum value of roughness. Packing density of coating pigments plays a crucial role in deciding

the roughness of coated sheets (Muller et al. 2006). It was observed that when pigments were used as 100 parts pure pigment, maximum value for PPS roughness was obtained with the formulation 5 (i.e. 100 parts PCC). However the lowest value for PPS roughness is obtained when these pigments are used in combination of 70 parts clay, 10 parts PCC and 20 parts GCC. Gloss values were measured by gloss meter at 75° angle. It was found that maximum gloss was obtained with formulation 1 having 100 parts clay and least with formulation 5 having 100 parts PCC. This may be attributed to the fact that higher gloss was achieved by clay due to compact packing of clay particles. The clay was used in coating and showed more of a responsive attitude towards calendering as compared to other pigments. This is due to the platy structure of china clay particles which flatten more easily during calendering. PCC being spherical in shape showed least gloss development because of high light scattering and poor specular reflection. For brightness, maximum value was obtained with formulation 5 having 100% PCC as pigment constituent and least value was reported in case of formulation 1 having 100% clay constituent. This feature may be due to the fact that PCC being spherical in shape and having narrow particle size distribution scatters light more effectively than platy clay particles having broad particle size distribution. Similar findings were also obtained by Climpson et al. (1976) with particle size distribution of clay particle.

Same trend was observed in the case of opacity of the coated samples. The highest value was obtained in sample sheets coated with formulation 15 having 50% clay as major

pigment constituent and 20% and 30% of GCC and PCC respectively. This is because of close rigid packing of clay due to its structure. It was observed that 100% clay composition slurry gave lower opacity than the formulation 10 with only 70% clay. This is due to the embedded particles of PCC and GCC in between the interstitial gaps of china clay particles which form the compact structure over the paper surface thereby increasing opacity value (Engstrom et al. 1997). The lowest value of opacity was observed with formulation 9 having 100% GCC. GCC has needle shaped structures which get entangled amongst themselves and during calendering are unable to fill up the gaps between themselves resulting in poor opacity. Paper friction is an important property for printing. Multiple sheet feeding problems during printing are a result of improper paper friction. Paper friction is linked with the constituent of coating formulation significantly by pigment particle and binder (Rättö et al. 2000, Toshiharu et al. 2006). Therefore, in present work paper friction was studied as an important property of coated paper. The kinetic and static coefficient of friction was studied using friction/peel tester as per ISO 15359:1999. Static coefficient of friction is the force which a sheet of paper exerts to resist the movement of a sledge on the paper surface and kinetic coefficient of friction is the opposing force which the paper surface exerts on the moving sledge. Kinetic coefficient of friction was highest with formulation 5 having 100% PCC and lowest value was reported with formulation 11 with 70 parts clay, 20 parts GCC and 10 parts PCC. In the case of static coefficient of friction the highest value was obtained with formulation 4 having 80 parts PCC and lowest with formulation 15 having clay, GCC and PCC in ratio 50:20:30.

TABLE 2: Different coating formulations with varying pigment ratios

Formulations	Pigments Ratio		
	CLAY	GCC	PCC
1	100	0	0
2	80	20	0
3	50	50	0
4	20	80	0
5	0	100	0
6	80	0	20
7	50	0	50
8	20	0	80
9	0	0	100
10	70	20	10
11	70	10	20
12	70	30	0
13	70	0	30
14	50	20	30
15	50	30	20

TABLE 3: Results of different paper properties with different formulations

Formulations	PPS Roughness (μ)	Gloss (%)	Brightness (%)	Opacity (%)	Kinetic COF III	Static COF III
1	1	70.4	72.12	91.09	0.328	0.36
2	1.2	60	78.72	92	0.353	0.372
3	1.4	51.6	85.64	90.1	0.367	0.389
4	1.6	42	90.16	92.07	0.37	0.39
5	1.7	30.5	94.26	93.81	0.377	0.389
6	0.8	59.8	76.91	90.99	0.33	0.366
7	1.3	53.4	80.43	89.47	0.338	0.364
8	1.4	51.8	86.17	88	0.321	0.332
9	1.5	41	89.67	87.26	0.324	0.29
10	1.2	61.4	88.01	92.07	0.258	0.301
11	0.6	59.7	87.73	94.24	0.221	0.284
12	1.1	60.1	88.71	89.47	0.358	0.341
13	0.9	62.7	87.32	90.13	0.297	0.284
14	1.3	58.1	88.36	92.76	0.329	0.376
15	1.4	58.4	88.94	95.28	0.298	0.251

This is due to spherical PCC which has a narrow particle size distribution thereby increasing the surface area and exerting more friction on the sledge. Lower values were obtained with high clay content due to platy structure of clay also having broad particle size distribution and relatively low surface area of the pigment particles. Thus it is difficult to select a combination which gives optimum values of each property. For selecting the best suitable combination we have subjected the laboratory findings to a MCDM technique using the TOPSIS method as explained above and obtained different ranking of coating formulations based on best suited values of coated paper properties.

The laboratory results of different coated sheets are given in Table 3 which serves as the decision matrix for TOPSIS method. The normalised decision matrix was prepared for all attributes of the fifteen different formulations (Table 4) as per equation 1 described in step 2 of TOPSIS method. The weighted normalized decision matrix was prepared by multiplying the values of normalised matrix with weight of each attribute (Table 5). The weight of each attribute was evaluated by the entropy method as described in section 2.3. The values of entropy, dispersion and weight are given in Table 6. Based on the list of beneficial and non-beneficial attributes as given in Table 1, corresponding values of ideal and negative ideal solution were selected from Table 5. For gloss, brightness and opacity the highest weighted normalised values were taken as ideal solution values. For non-beneficial attributes roughness, kinetic COF and static COF the lowest values were considered for ideal solution. Similarly, the selection of negative ideal values for gloss, brightness and opacity minimum values were taken from weighted normalised decision matrix. For non-beneficial values roughness, kinetic COF and static COF the highest values were considered for negative ideal solution. The

values for positive ideal solution and negative ideal solution were calculated as given according to equations 3 and 4 respectively. The values of ideal solutions are given below:

$$A^* = \{0.05533172, 0.083862, 0.009490723, 0.001138, 0.021848, 0.024641\}$$

$$A^- = \{0.15677321, 0.036332, 0.007262, 0.001043, 0.037271, 0.038286\}$$

To find out the deviation from the positive ideal solution, separation measures were determined as per equations 5 and 6. Now the relative closeness to ideal solution was found using equation 7. The highest numerical values obtained shows more relative closeness to the positive ideal solution as compared to the values with lower numerical values which shows relative closeness to the negative ideal solution. Based on the values of relative closeness the ranking of different formulations was done, which is given in Table 7. It can be observed that formulation 11 having 70 parts clay, 20 parts GCC and 10 parts PCC occupies the first rank and hence is the best suited formulation for coated paper for the particular pigments used in this study. Thus formulation 11 can be considered as the optimum condition of pigments for the smoothest sheet. This is well in accordance with the work of Tyagi et al. (2010).

5. CONCLUSIONS:

The application of a MCDM technique using entropy based TOPSIS provides an efficient tool for the selection and ranking of coating pigment composition best suited for different coated paper properties. Fifteen formulations of coating colours were studied to demonstrate the application potentiality of TOPSIS for six different variables. The result obtained by this method is well correlated with results available in literature. Hence, we can conclude that the suggested approach can be used for selecting the best suited formulation of coating pigments to get the desired end-use properties. ■

TABLE 4: Normalised decision matrix of TOPSIS

Formulations	PPS Roughness (μ)	Gloss (%)	Brightness (%)	Opacity (%)	Kinetic COF III	Static COF III
1	0.204722	0.326935388	0.21720271	0.257674386	0.258830392	0.271663
2	0.245667	0.278638115	0.23707983	0.260248584	0.278558319	0.280719
3	0.286611	0.239628779	0.257920689	0.254873885	0.289605957	0.293547
4	0.327555	0.19504668	0.271533504	0.2604466	0.291973309	0.294302
5	0.348028	0.141641042	0.283881412	0.265368692	0.297497128	0.293547
6	0.163778	0.277709321	0.23162868	0.257391508	0.260408627	0.276191
7	0.266139	0.247987922	0.242229811	0.253091748	0.266721563	0.274682
8	0.286611	0.240557572	0.259516882	0.248933429	0.253306573	0.250534
9	0.307083	0.190402712	0.270057778	0.246840125	0.255673924	0.21884
10	0.245667	0.285139671	0.265058382	0.2604466	0.203592199	0.227141
11	0.122833	0.277244924	0.26421511	0.266585072	0.174394868	0.214312
12	0.225194	0.279102512	0.267166561	0.253091748	0.282503904	0.257326
13	0.18425	0.29117683	0.262980319	0.254958749	0.234367764	0.214312
14	0.266139	0.269814574	0.266112471	0.262398464	0.259619509	0.283737
15	0.286611	0.271207765	0.267859249	0.269527012	0.235156881	0.18941

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TABLE 5: Weighted normalised decision matrix

Formulations	PPS Roughness (μ)	Gloss (%)	Brightness (%)	Opacity (%)	Kinetic COF III	Static COF III
1	0.09221954	0.083862	0.007261521	0.001088	0.032427	0.035341
2	0.11066345	0.071473	0.007926053	0.001099	0.034898	0.036519
3	0.12910735	0.061467	0.008622804	0.001077	0.036282	0.038188
4	0.14755126	0.050031	0.009077908	0.0011	0.036579	0.038286
5	0.15677321	0.036332	0.009490723	0.001121	0.037271	0.038188
6	0.07377563	0.071235	0.00774381	0.001087	0.032624	0.03593
7	0.1198854	0.063611	0.008098227	0.001069	0.033415	0.035734
8	0.12910735	0.061705	0.008676168	0.001051	0.031735	0.032592
9	0.13832931	0.04884	0.009028572	0.001043	0.032031	0.028469
10	0.11066345	0.073141	0.008861432	0.0011	0.025506	0.029549
11	0.05533172	0.071116	0.00883324	0.001126	0.021848	0.02788
12	0.10144149	0.071592	0.008931912	0.001069	0.035392	0.033476
13	0.08299758	0.074689	0.008791958	0.001077	0.029362	0.02788
14	0.1198854	0.06921	0.008896672	0.001108	0.032525	0.036912
15	0.12910735	0.069567	0.00895507	0.001138	0.029461	0.024641

TABLE 6: Table showing entropy, dispersion and weights of different attributes

Attributes	Entropy	Dispersion	Weights
PPS Roughness	0.98874	0.01126	0.450462
Gloss	0.993588	0.006412	0.256509
Brightness	0.999164	0.000836	0.033432
Opacity	0.999894	0.000106	0.004224
Kinetic COF III	0.996868	0.003132	0.125281
Static COF III	0.996748	0.003252	0.130092

TABLE 7: Ranking as per TOPSIS

Ranking	Formulations	CLAY	GCC	PCC
1	11	70	10	20
2	6	80	0	20
3	13	70	0	30
4	1	100	0	0
5	12	70	30	0
6	10	70	20	10
7	2	80	20	0
8	14	50	20	30
9	7	50	0	50
10	15	50	30	20
11	8	20	0	80
12	3	50	50	0
13	9	0	0	100
14	4	20	80	0
15	5	0	100	0

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Using process graphics to maximise operator effectiveness



BILL HOLLIFIELD, PRINCIPAL ALARM MANAGEMENT AND HIGH PERFORMANCE HMI CONSULTANT, PAS, INC.

For three decades, the process industries have been using sophisticated Distributed Control Systems (DCS) or Site Control And Data Acquisition (SCADA) systems for process control. These use real-time process control graphics as the Human-Machine Interface (HMI) for the operator. But when we installed these systems, there were no available guidelines as to what constituted a “good” graphic.

Mostly for convenience, we chose a P&ID view covered in live numbers. This set in place a low-performance paradigm for HMI, and inertia has done the rest.

Poorly performing HMIs have been cited as significant contributing factors to major accidents. The principles of High Performance HMI (HPHMI) provide for improved operator situation awareness, better process surveillance, better abnormal situation detection and response and reduced training time for new operators. Many major companies have HMI improvement efforts underway.

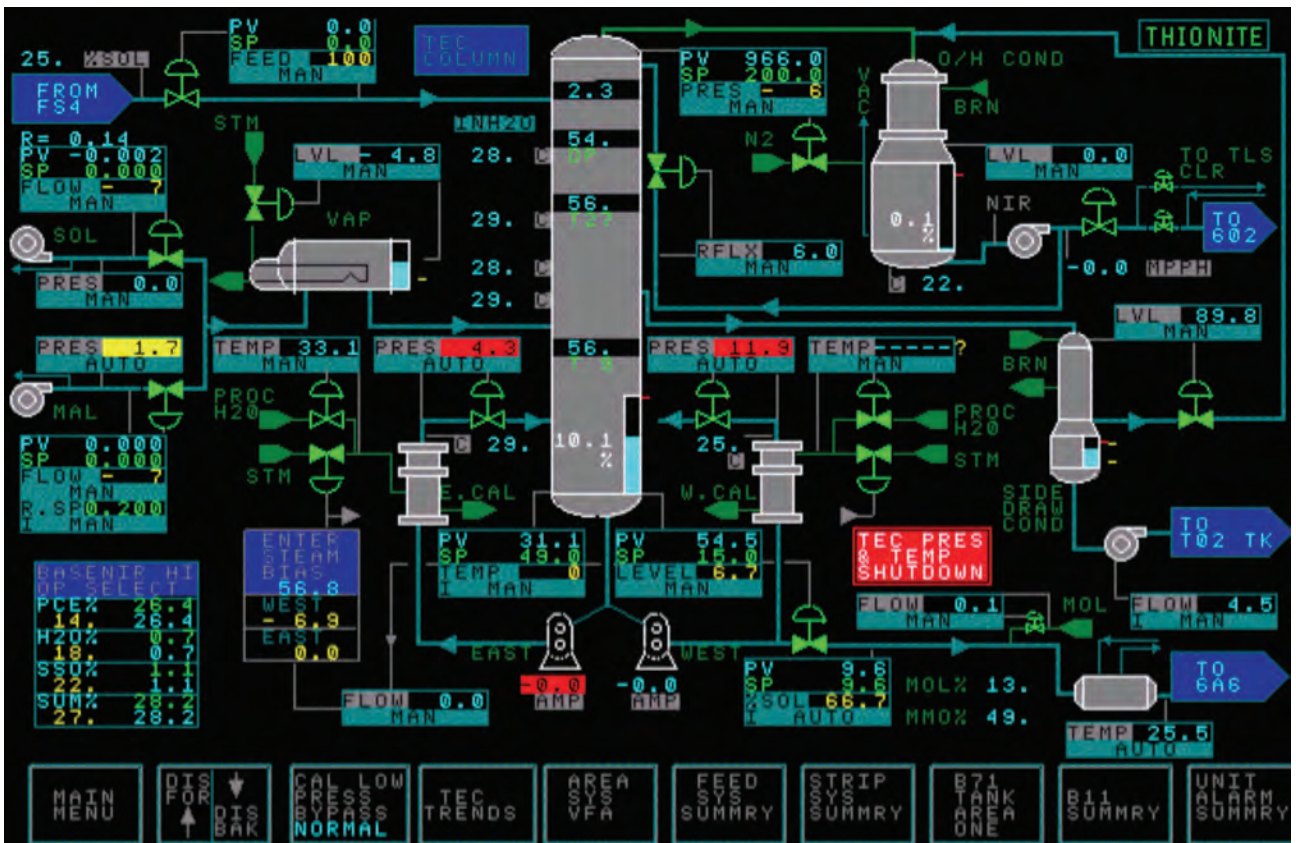


FIGURE 1: A typical 1990s graphic screen based on a P&ID

DISPLAYING INFORMATION

The Figure 1 graphic does not show the operator if the process is running well or poorly. That requires specific training and months to years of experience in normal and abnormal situations.

Operators must compare each number to a memorised mental map – a difficult cognitive process. Most operators have well over a thousand such numbers

and status indications spread over dozens of graphics. Detecting abnormal conditions is difficult.

High performance displays depict information. *Information is data, in context, made useful.*

In Figure 2, the indicators show the process value, plus where it is compared to “good,” and to alarm and interlock ranges.

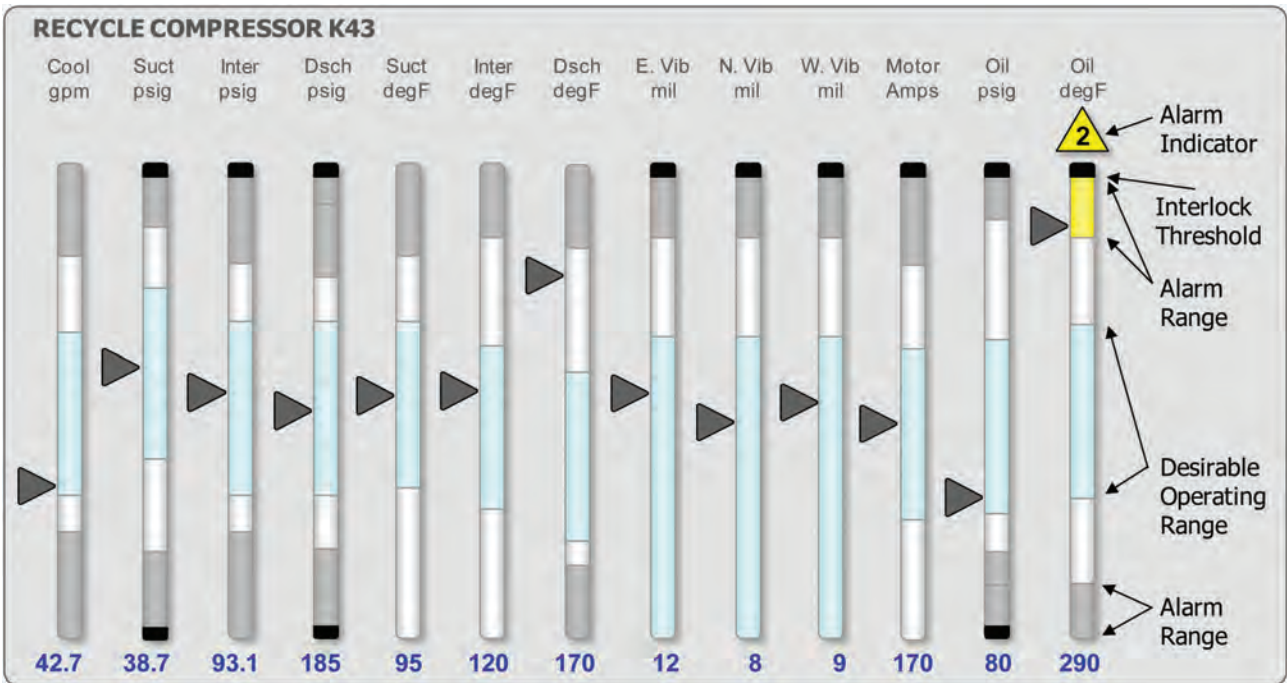


FIGURE 2: Analog depiction of information

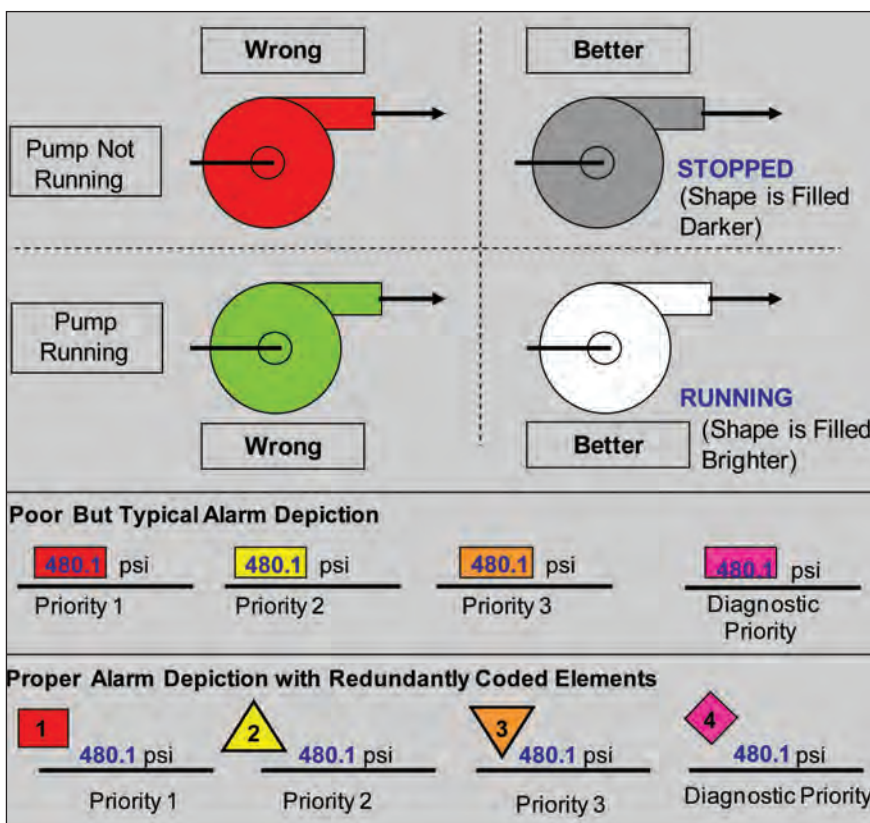


FIGURE 3: Depicting status and alarms with redundant coding and proper colour usage

Abnormal conditions stand out clearly. Humans intuitively understand analog depictions. An operator can spot a problem with a single, two-second glance. Operators can effectively scan dozens of these values in a few seconds. This supports surveillance of the process and early detection of abnormalities. The best knowledge of desirable operating conditions is coded into the display and in view all the time. Variability in the proficiency and knowledge of individual operators is reduced. Operator training time is also significantly reduced, since important knowledge is not acquired through hit-or-miss experiences.

USE AND ABUSE OF COLOUR

HPHMI eliminates the common overuse and misuse of colour. Colour alone is not used as the sole discriminator of an important status condition. Use of colour is augmented by text and shape redundancies. The same colours designated for alarms must not be used for other trivial purposes.

Figure 3 indicates some poor colour coding vs. proper practice. Colour is used consistently, effectively and sparingly. Bright colours are used to draw attention to abnormal situations.

GRAPHIC HIERARCHY

Displays are designed in a hierarchy providing progressive exposure of detail. A Level 1 Process Area Overview is a “big picture” showing the operator’s entire span of control. It depicts the most important information and the key performance indicators. The Overview is a good use of a large-format wall screen. Figure 4 is an Overview display of a

large power plant. At a glance, the operator can detect if the various parts of the process are running well.

Every process consists of smaller, separate unit operations. A Level 2 Process Unit display (Figure 5) for each one is designed for detailed surveillance and control manipulations. It contains all the information and controls required to perform most operator tasks. A typical operator might have about a dozen Level 2 graphics.

Selecting any value or element brings up the detailed faceplate, in the reserved area, for control manipulation. Embedded trends are used in all HPHMI graphics.

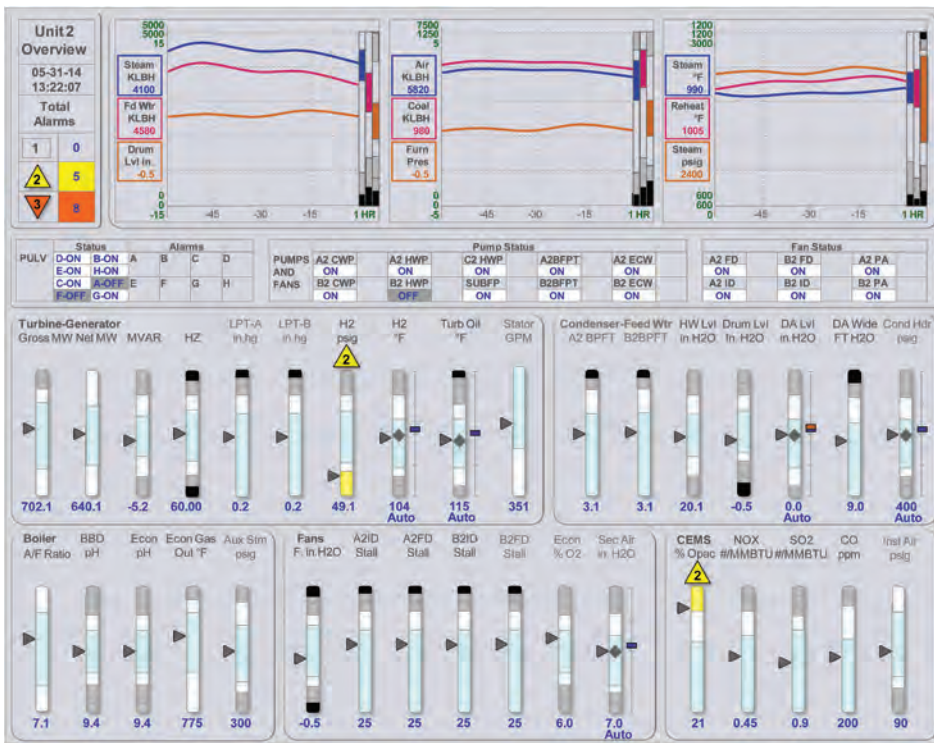


FIGURE 4: Example level 1 display

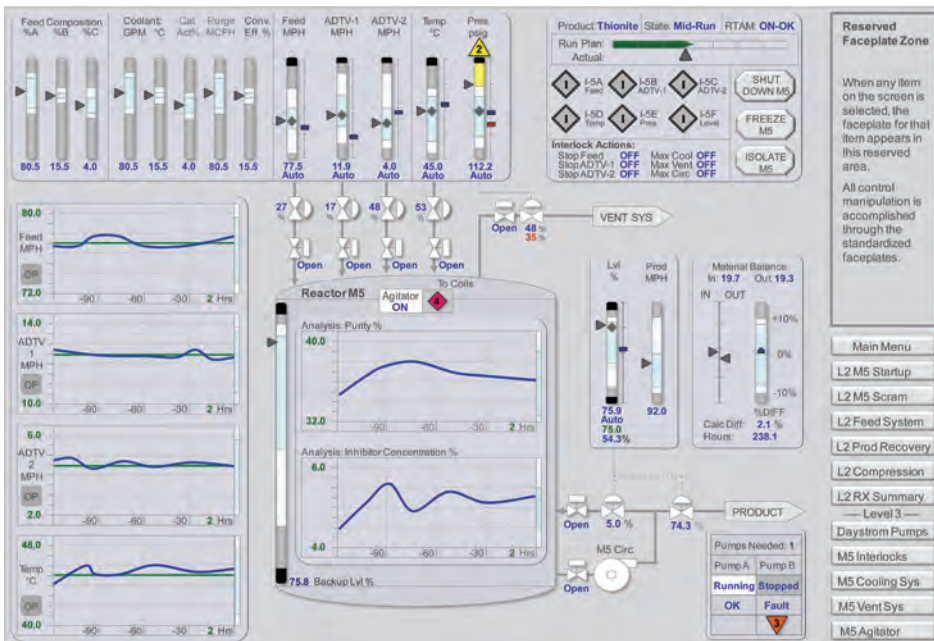


FIGURE 5: Example Level 2 Display of a Reactor

Level 3 Process Unit Detail graphics are used for a detailed troubleshooting. A P&ID type of depiction is often desirable. Level 4 Diagnostic Displays show detail of subsystems, individual sensors, or components.

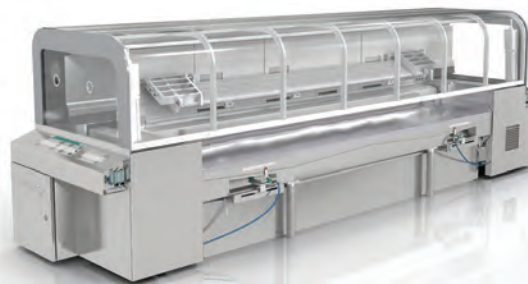
For existing systems, most of the benefits of HPHMI can be obtained by creating about 20 new displays – typically a Level 1, a dozen or so Level 2s, and a few new Abnormal Situation displays. The existing graphics are used for Level 3. Inertia, not cost, is the primary force preventing HMI improvement.

There are dozens of additional HMI topics and examples in “The High Performance HMI Handbook,” and in a free, 60-page white paper available at PAS.com. The white paper includes detailed case studies proving the benefits of these concepts. Operators respond positively when shown examples of HPHMI concepts.

CONCLUSION

The HMI is the primary tool for the operator to successfully run the process. Today’s sophisticated control systems are typically operated via ineffective and problematic HMIs. Operator performance can be greatly enhanced by HMIs reflecting proper principles. A High Performance HMI is practical, achievable and affordable. ■

Green light for Valmet's coaters on Mayr-Melnhof Kolicevo board machine in Slovenia



Valmet OptiCoat Layer curtain coater.

Valmet has successfully started up new coating technology, featuring multilayer curtain coating at Mayr-Melnhof Kolicevo board machine 3 (BM3) in Slovenia. The delivery included an OptiCoat Layer curtain coater with supply system and an OptiCoat blade coater.

Compared to other curtain coating solutions OptiCoat Layer is compact in size and straightforward to install which enables lower investment cost and shorter shut-down time. According to Valmet, the start-up was smooth due to pre-assembly and pre-testing as well as the good co-operation between Valmet and the experienced Kolicevo team.

"The assembly was finished on time and the start-up was done by just pushing the button. We are happy that the high targets set for this project have been met. The co-operation with Valmet was very good, on an open base during the whole project and start-up phase, preventing all possible disturbances, before they even could occur," says Technical Mill Manager Rado Kunavar from Mayr-Melnhof Kolicevo.

BENEFITS OF CURTAIN COATING

Mayr-Melnhof has been using curtain coaters from different suppliers for several years but it was the compact design of Valmet's coater, the coating trials performed in Järvenpää and the exceptional teamwork that sold it for the customer. The selected coating concept including the two-layer curtain coating makes it possible to reduce coat weight resulting in cost savings.

OptiCoat Layer uses slide dye curtain coating, which enables versatile use of coating colour substances and layer thicknesses. The method also provides flawless coating coverage. The supply system includes the necessary degassing equipment, essential in curtain coating as even the smallest air bubbles affect the stability of the curtain.

"Two-layer coating has been tested with dry edges, and equipment works as expected. It has proven to be very good that we chose the degassing system from Valmet. We are very pleased with it," says Production Manager Aljaz Hafner at Mayr-Melnhof Kolicevo. ■

WEG adds to its MPW range of electric motor protection

The addition of two new models to the WEG MPW range of motor protection circuit breakers will offer customers a broader range from which to select the most appropriate protection for electric motors. All motor protection circuit breakers in the range are manufactured in accordance with IEC 60947 and UL 508 international standards giving absolute assurance in terms of operational parameters and quality.

These devices are compact and modular, which allows space saving within the electrical panel itself. This means that the panel can be smaller or where necessary more components can be included in the panel. Engineered to withstand harsh operating conditions, the WEG MPW range of motor protection circuit breakers are robustly constructed for optimal reliability.

The range facilitates the protection of a wide range of electric motors from 0.16

A up to 100 A. Significantly, the WEG MPW range has both thermal magnetic versions which provide protection against any potential short circuit and overload conditions and magnetic only versions which provide protection against short circuits.

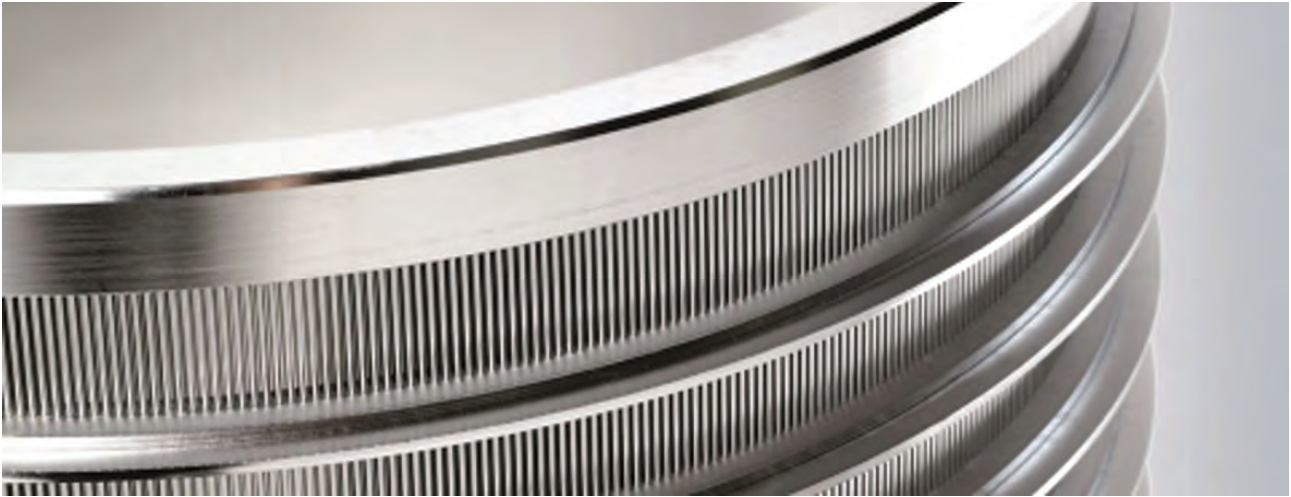
"Use of the thermal magnetic device will reduce the amount of components required when manufacturing a motor control centre and this can translate into a significant cost saving," says Stephen Cook, manager: switchgear at Zest WEG Group, who adds that the magnetic-only version allows the use of electronic overload protection devices which can reduce costs further.

This motor protection circuit breaker is available with a full range of accessories including auxiliary contacts, shunt trips, under voltage releases, door mounting handles and free standing enclosures. The devices are certified to

Type 2 allowing continuous operation until replaced. "This is important in a production critical environment such as a paper mill," concludes Cook. ■



All motor protection circuit breakers in the WEG MPW range are manufactured in accordance with the IEC 60947 and UL 508 international standards.



Voith C-bar HerculeX has very high open screening areas.

New C-bar HerculeX is the strongest screen basket on the market

Voith's new screen basket – C-bar HerculeX – is made of wear-resistant material and is suitable for various applications in pre-screening and fine screening, fractionation, broke and thick stock screening and also in the approach flow system.

Able to withstand very high loads, C-bar HerculeX has high open screening areas and a special bar geometry. The new screen basket can be tailored to the respective screening requirements and production conditions by varying the widths, slot widths and angles of the bars.

Its exceptionally high stability and strength are thanks to its patented hybrid technology, an improvement of Voith's clamping technology. An individually customisable chrome layer provides wear protection and the screen basket can be used in all Voith and third party screening machines and is suitable

for all paper grades. The best screening results are achieved in combination with a Voith rotor application. ■

Graco launches electric double diaphragm pump



Graco has released a new addition to its transfer pumps product line - the Husky 1050e. The electric operated 1" pump combines the advantages of an air-operated double diaphragm pump (stalling, running dry, self-priming and seal-less design) into an electric pump (fives times more energy efficient than an air operated pump and quieter operation).

It is also the only electric diaphragm pump that can stall without damaging the pump or the production line negating the need for pressure sensors. It can also be set to almost completely remove the pulsations, thus a surge suppressor does not need to be installed. The pump can be used in non-ventilated areas.

Benefits include the reduction of energy costs and noise levels. It also lowers maintenance costs by minimising pump failures with other technologies due to running dry or over-pressurising issues.

Key features:

- 1" pump size
- Volume: up to 159l/min;
- Max 4,8 bar fluid pressure
- Aluminium, polypropylene and stainless steel wetted parts
- AC, AC Atex and brushless DC motors
- Aluminium and stainless steel centre sections
- Large choice of wetted materials (PTFE, Buna, polypropylene)



Masslift-Carer alliance raises the bar in paper handling solutions

Masslift Africa is a market leader in the provision of high-quality material handling solutions across southern Africa, and its recent alliance with Carer, an Italian manufacturer of forklift trucks, brings with it extensive experience in the pulp and paper industry.

“Carer has spent almost five decades serving this important sector, and the knowledge it has acquired in handling paper makes it the first choice for major international industry players,” says Masslift sales director Marco Caverni.

He explains how the company has become a world leader in providing specific solutions for handling products in the paper industry, from paper and cardboard production facilities, to companies that process waste paper and large printing works.

“The paper business is increasingly turning to Carer to replace forklifts driven by internal combustion engines with electric options to eliminate emissions that are both harmful to operators and the environment.”

Power plus autonomy

Carer products combine power with autonomy through their advanced electronic management systems that use high amperage batteries that enable machines to work several shifts without interruption thanks to the quick and easy replacement of the battery.

They also mitigate a range of workplace health and safety risks, with reduced noise and vibration and a substantially lower risk of fuel and oil-related warehouse fires.

Capable of handling capacities between 2,7 tonnes and 18 tonnes, the models offer an array of useful features designed by Carer’s special engineering department. This team of engineers continually works closely with customers to meet their most complex and demanding needs.

Fueling cost efficiency

Fuel efficiency is an important purchasing decision. The capital cost of a forklift truck is minimal when compared with operational and fuel costs.

“Apart from the brand’s proven performance, it offers noteworthy savings,” says Caverni, describing how it has been determined that by using a Carer Z80H eight-tonne electric forklift instead of a diesel forklift for eight hours a day, 250 days a year, customers save up to R940,000 in diesel costs.

High profile Carer users in the paper sector include the DS Smith Group, SMURFIT KAPPA, SCA Hygiene, Burgo, Fedrigoni and Kimberly-Clark.

So, why choose Carer?

The performance, design, and structure of Carer forklift trucks make them ideally suited for an industry that requires a specific solution for the handling of paper rolls.

What sets them apart from competing brands?

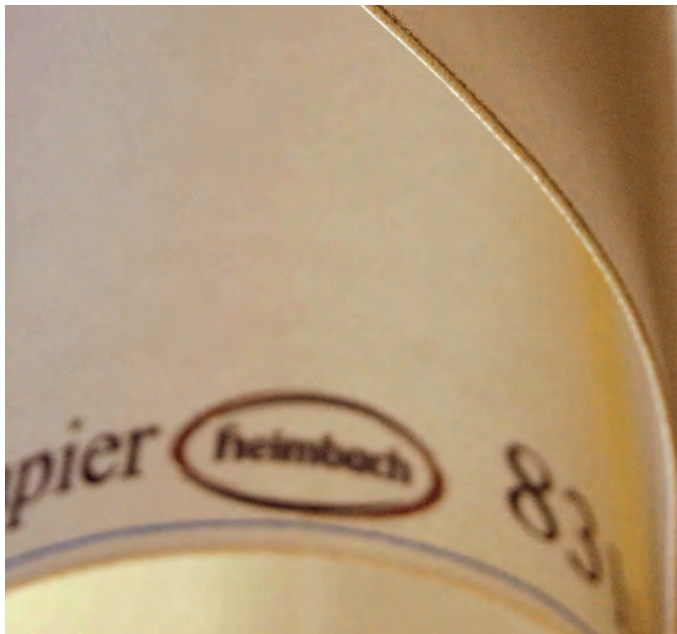
- Residual capacities for high lifting heights for maximum safety in the handling and storage of rolls.
- Compact dimensions and short turning radius for easy maneuverability in tight spaces.
- Raised driver position for operator visibility.
- Zero dust and gas emissions to avoid product contamination.
- Extended battery-life for superior performance.

A range of electric forklifts from 800kg – 20 tonnes available.

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Get more life out of your felt

LEADER OF HEIMBACH'S TECHNICAL DEPARTMENT TASK
– TECHNICAL ASSISTANCE SERVICE AND KNOW-HOW



HEIMBACH'S THOMAS FISCHER SHARES HOW TO COMBAT FELT WEAR

Papermakers sometimes experience wear on the paper side of the felt and have difficulty in finding the exact cause of the problem. Even if the machine is stationary, a close examination of the area around the Uhle box, the outer edge of the felt guide rolls, the deflectors, save all and other parts of the press section, can still fail to identify the problem.

IT'S GOT A LOT TO DO WITH THE WIDTH

Heimbach recently responded to a situation where the felt had trimmed itself at the drive side after only three days in operation. As a result, the trimmed piece was damaged through contact with the press nip. A new press felt was fitted and subsequently examined during a routine shutdown. Examination of the front side clearly showed a high level of wear caused by the felt overlapping the roll face by an excessive amount. Simply put, the felt was too wide (figure 1).

FRICION IS THE ENEMY

The felt protruded by 250mm on either side (figure 1) and consequently stood proud of the roll face. As there is a speed differential between the latter and the roll deckle the effect creates friction between the edge of the roll and the felt. In this specific instance the effect was further intensified as the roll edge was extremely dry and it was calculated that the customer's machine was subjected to a frictional path of as much as 28km a day.

LESSER WIDTH, LOWER FRICTION

The problem was solved by advising the customer to reduce the width of the press felt, thereby preventing contact with the roll deckle and eliminating friction. However it's not always that simple.

What alternatives are there when the nature of the operation means that a protruding felt cannot be avoided?

WATER AND AIR PROVIDE TEMPORARY SOLUTIONS

A possible alternative in this type of situation is to apply a continuous spray of water over the deckle. This could at least reduce the problem to a state known within the industry as 'gentle friction'. It has to be understood, however, that ideally there should be no friction at all as even at reduced levels it still causes damage.

Another method of reducing friction is to use air jets although the success of this technique is heavily reliant on the specific felt tension of the machine in use.

It is not practical to make definite recommendations within the scope of this article, but Heimbach is ready to arrange a visit from its TASK force to view the problem at first hand and make detailed recommendations.

GUIDE ROLL SURFACES CAN DICTATE FELT WEAR

There are occasions when it is not the width of the press felt that is problematic; felts can also abrade for other reasons. A customer contacted the Heimbach team because stripes were identified on the press felt but the cause was unknown. A visit from the TASK team soon confirmed that the excessive wear was entirely due to the poor surface condition of the felt guide roll.

Inferior surface conditions are often the result of contamination. If rolls are used in combination with doctors it is always likely that the different hardness of the roll covers will instigate surface damage. As a consequence, the roll and the doctor sporadically make contact which soon results in the 'milling' of the roll (figure 3).

The damage to the customer's felt roll was 2mm which for a press felt equates to a differential travel of an astounding 160km within a run of 40 days. It is impossible for a felt to withstand this type of treatment so it is very much in the user's interest to ensure that the doctors are set correctly.

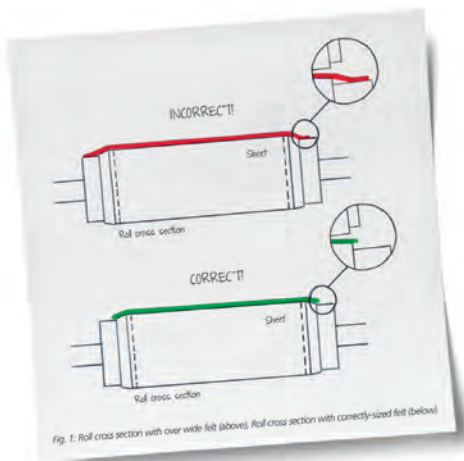


Figure 1

$$\Delta = \left[v - \left(\frac{v \cdot D2}{D} \right) \right] \cdot 1.44$$

$$\Delta = \left[1050 - \left(\frac{1050 \cdot 1570}{1600} \right) \right] \cdot 1.44$$

$$\Delta = 28.35 \text{ km/day}$$

Δ = Path difference in km/day
 v = 1050 m/min (Press rolls)
 D = 1600 mm (Roll shell diameter)
 $D2$ = 1570 mm (Roll shell cover)

Figure 2: How the friction path is calculated.

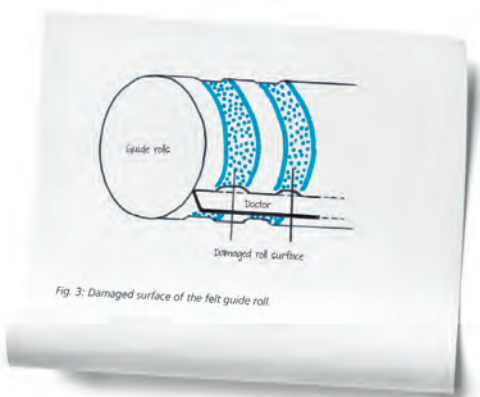


Figure 3



Figure 4 and 5

UHLE BOX SURFACES CAN FATIGUE FELT

Another useful piece of advice is to regularly inspect Uhle box covers as damaged or uneven units can also be a source of felt wear. Plastic coated covers are heavily worn in the edge zone and if dirt has been deposited, the combination has a deleterious effect on press felts (figure 4).

In the case of ceramic Uhle box covers, meticulous care must be taken as units are constructed using a number of individual components. The slightest variance in thickness between different pieces can result in high rates of felt wear (figure 5) and it is not unusual to encounter felts that have been cut in the machine direction due to minimal differences in level. On occasion, the unevenness can be so small it is impossible to feel. This means it is imperative to regularly examine the areas around the joints using a knife-like object.


Of course, the main driver in achieving objectives regarding felt life will always be to choose the optimum felt design for each individual machine and conditions. For this Heimbach supports its customers with a highly skilled and active applications team who are always happy to discuss design developments and alternatives.

“Life potential is a key parameter when developing new products as well as continuous improvement. Nevertheless there will always be issues affecting felt life during day-to-day operation and we hope the above examples may be of assistance whenever similar problems are encountered. ■

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Mondi's Richards Bay mill.

Sealing the deal in water conservation at Mondi Richards Bay

Mention the word 'water' anywhere in South Africa and you will be met with sighs of despair and desperation. Currently climatic conditions have pushed the country into a drought situation with numerous municipalities imposing water restrictions. KwaZulu-Natal however has been on restricted water use for a number of years.

Seizing the opportunity, Easy Coat, a fluid sealing and wear resistance company and the AESSEAL agent for Richards Bay, presented Mondi with a water saving strategy and has since then yielded a remarkable reduction in water conservation.

The mill has replaced 167 quench-to-drain flushing and lubricating systems fitted to mechanical seals and incorporated a continuous loop water management design avoiding the average monthly water loss of 63,210 kilolitres – which equates to around 25 Olympic-size swimming pools.

At the hefty price of R2,50 per kilolitre (excluding effluent treatment costs), the project is on track to deliver a return on investment in under a year.

TRIED, TESTED AND EFFECTIVE

Mondi placed its order for replacement systems in February with Easy Coat. The order provided for 167 AESSEAL type-SWO2 and SWO3 water management systems that use recycled water to cool, lubricate and flush mechanical seals in the plant. These replaced the existing once-through flushing designs that needed a constant supply of fresh water.

At the time of the order Easy Coat had successfully installed and trialled 152 pump and mixture locations over the last twelve years.

The Easy Coat's proposal was backed by Mondi's environmental department for a number of reasons including the use of a proven mechanical seal, a mean time between failure (MTBF) of over six years, and potential water savings of just under four million kilolitres.

Further, the installation some ten years ago of mechanical seals and water management systems at Mondi's Merebank mill had resulted in multi-million Rand water savings and substantially reduced downtime on rotating equipment

REUSE, RECYCLE, REDUCE

Using an integral vessel to store flushing water for continuous recycling, the SWO2 system is connected directly to the plant water line which becomes the system's fluid and pressure source. The pressure can be adjusted so that the barrier fluid pressure within the system is maintained at one bar above stuffing box pressure, resulting in a pressure differential that keeps contaminants away from mechanical seal faces and increases seal and pump reliability.

The barrier fluid is circulated to and from the mechanical seal by the thermosyphon effect which uses natural convection to effect a passive heat exchange and circulate a fluid without the need for a mechanical pump. The result is a minimisation in water wastage and more efficient cooling than the once-through, quench-to-drain design.

The SWO3 system is supplied with finned tubing as a standard so that it can be used on high heat applications. Mondi has installed a combination of SWO2 and SWO3 systems according to process product temperature.

MORE THAN WATER

Besides lowering water-related costs, the SWO2/SWO3 system is superior to the once-through format in three ways:

1. there is an indicator that shows when any inboard seal failure occurs;
2. the system is kept pressurised by a non-return valve which helps to prevent cross contamination of sealing water in the event of a failure, and;
3. the system is fitted with a regulating valve which maintains water pressure and flow rate without further settings or adjustments after installation.

Sakkie de Villiers, managing director of Easy Coat, emphasised that the AESSEAL mechanical seals at Mondi Richards Bay have always been fitted with the SWO2/SWO3 system. "The 167 new systems are being fitted to non-AESSEAL mechanical seals, where we are replacing the quench-to-drain, double flow meter systems," de Villiers explained.

The installation of the first 64 systems took place during a planned two-week shutdown in March with 97 systems installed July. The remaining six systems are still to be installed.

Environmental performance, particularly with regard to the saving and correct utilisation of water resources, has always been a strong driving force behind AESSEAL's success in South Africa. The company has a mandate to continuously drive down sealing costs and increase the MTBF, in line with Mondi's identification of the need to carefully and aggressively manage water resources as a component of the group's environmental policy. ■



Before: Pump and mechanical seal at Mondri Richards Bay, fitted with quench-to-drain flushing system.



After: Pump and mechanical seal at Mondri Richards Bay, fitted with AESSEAL continuous loop flushing and lubricating system.



Continuous loop flushing and lubricating systems supplied by AESSEAL, fitted to pumps at Mondri Richards Bay.

UPM initiates field tests of wood-based diesel fuel

In October, UPM started field tests of its novel wood-based diesel fuel in urban buses together with Helsinki Region Transport (HSL) and the VTT Technical Research Centre. The field tests are also supported by St1, Volvo and Transdev Finland. The new round of tests with UPM BioVerno fuel will run for a minimum of one year.

UPM BioVerno diesel has previously been studied in several engine and vehicle tests conducted by various research centres as well as in fleet tests, all with excellent results. The studies have shown that UPM BioVerno works exactly like the best quality diesel fuels and reduces exhaust emissions significantly compared to fossil diesel, in some cases up to 80% less emissions during its lifecycle compared to conventional diesel fuels.

The heavy duty vehicle field tests will focus on investigating UPM's renewable diesel in terms of fuel functionality in bus engines, their emissions and fuel consumption compared to fossil diesel. These tests will be operated by Transdev Finland on HSL's regular bus route between the city of Kerava and Helsinki in Finland. The tests will be done with four identical Volvo Euro VI Class buses that have low emissions and efficient engines.

The latest studies show that UPM BioVerno diesel also reduces exhaust emissions significantly. This biofuel is produced from residue of the pulp industry, crude tall oil, with no edible materials being used. UPM started the production of wood-based renewable diesel in the UPM Lappeenranta Biorefinery in January 2015. The annual production capacity of the biorefinery is 120 million litres of renewable diesel. ■



Voith ProTect ensures safe press felt measurement



In the last 24 months, Voith has installed 37 of its ProTect systems that enable press felt measurements to be taken safely while the machine is running. Another 32 such systems have been ordered by various customers around the world.

Measurements of the running press fabrics are essential in efficient paper production as they monitor the condition of the felts. From the data, conclusions are drawn about irregularities so that age-related wear

or variations in the felt can be reliably identified during operation.

Previously, these measurements could only be done manually which presented a number of safety risks. It was for this reason that various paper manufacturers and governments have recently started to prohibit these kinds of manual measurements.

The ProTect solution replaces the manual measuring work with a stand-alone self-propelled carriage on fixed cross beams that can accommodate

conventional manual measuring devices for safe use outside the felt run. ProTect, mountable in very confined spaces, features a battery and integrated water tank, so it does not have to be connected to a power or water supply.

In combination with Voith's OnV Felt-View measuring system, ProTect covers the entire spectrum of felt measurement requirements. OnV FeltView can also be integrated into the OnView information system. ■

Suited for safety

Resolute Forest Products was lauded as a leader in sustainability with a 2015 AF&PA Sustainability Award at the association's annual meeting in mid-November.

The company received the accolade for its Working Towards Zero Incidents objective.

In 2007, Resolute undertook a company-wide initiative to move to a proactive management approach for health and safety issues. Their safety management system comprises three pillars that drive an everyday focus on health and safety across the company's 40 operations, including one-on-one safety discussions, hazard recognition and near-miss reporting.

"Resolute is making great strides towards their goal of zero injuries in their facilities by not only requiring the use of protective gear, but by developing better-performing and more efficient gear," said AF&PA President and CEO Donna Harman.

Personal protective clothing and equipment is essential in any operating environment but even more so when contact with steam or chemicals presents a likely risk. For Resolute, it had always been company policy, but a serious incident in 2012 prompted the company to become more rigorous about the use of personal protective equipment.

The disposable suits being used were hot and uncomfortable so a multi-disciplinary task force took the initiative to design a safer, watertight, more comfortable, breathable chemical protective suit that is appropriate for all mill-related working requirements.



Sylvie Larouche wearing the protective suit at Kénogami paper mill.

In addition, the new suits can be used for at least a year, as opposed to the previous disposable suits, of which employees used and discarded about five per month representing a cost saving too.

"I would like to thank AF&PA for honouring Resolute with the Leadership in Sustainability Award for Safety," said Resolute President and Chief Executive Officer Richard Garneau. "The new protective suits have significantly increased the safety and comfort of our employees, who are always our top priority."

2014 was the company's best year in its history in terms of safety performance with a 22% reduction in total recordable injuries compared to 2013, and a more than 50% reduction compared to 2011.

Mandatory alcohol testing in paper mill environments improves safety and saves lives

RHYS EVANS, DIRECTOR OF ALCO-SAFE

The use and abuse of alcohol in the workplace is no new challenge; it is an ongoing problem across many industry sectors. It is of particular relevance in hazardous working environments such as paper mills, which involve the use of heavy and moving machinery. From wood chippers and pulpers to cranes and forklifts, a paper mill presents numerous hazards. These risks are present even when workers are completely sober and alert, however, it increases many times over when employees are operating under the influence of alcohol.

The effects of alcohol consumption on behaviour and reactions are well understood, and the Occupational Health and Safety (OHS) Act thus specifies a zero tolerance approach toward alcohol in the workplace. Enforcing this approach and mitigating risk requires mandatory daily testing of all employees, with effective policies, procedures and educational programmes put into place to minimise alcohol consumption.

While the OHS Act governs overall safety in workplaces, including industries such as paper mills, the onus lies with organisations to put appropriate safety procedures and practices into place. Intoxicated employees typically experience impaired cognitive ability and poor decision-making as alcohol increases risk-taking behaviour while decreasing inhibitions. When this type of behaviour modification occurs around heavy industrial equipment, the effects can be catastrophic.

Incidents can be fatal or cause severe disability, often resulting in the sole breadwinner of a family unable to work again. This has a negative knock-on economic effect, since more people must rely on government disability grants. In addition, if it can be proven that the operator of the machinery was under the influence and management did not take steps to prevent this, then the company can be held liable for damages. They may even have to pay hefty fines and the operation could possibly be closed down until safety standards are improved. Ensuring the safety and wellbeing of all employees within mill environments should be a top priority.

Alcohol testing needs to form part and parcel of the safety procedures of every paper mill operation. This approach has been proven

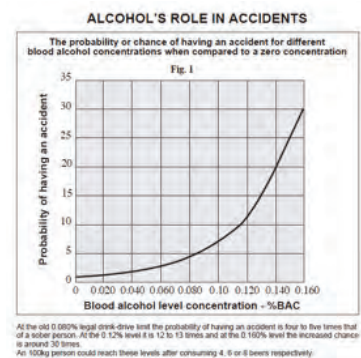
to be successful in significantly reducing the incidence of intoxicated employees in the workplace.

At a large paper mill in KwaZulu-Natal, for example, within six months of introducing random alcohol testing, there was an 80% reduction in intoxicated employees reporting for work. In addition, nine months after the programme was introduced, disabling injuries were down 52%, non-disabling injuries were down 45%, and accidents were reduced by 50%. These improvements were all achieved simply by implementing alcohol testing, without a single additional safety programme being introduced.

Random testing of employees can yield significant benefits, and as a result, many paper mills have implemented alcohol testing policies. However, simply testing a handful of employees at the start of every shift may fail to pick up the majority of employees who may be under the influence, or even dangerously over the limit. This still introduces an unacceptable level of risk and contravenes the OHS Act. In order to provide maximum safety benefits, compulsory testing of each employee at the start of each shift should be introduced.

This is an approach that has proven highly effective in the mining sector, where safety regulators enforce this daily, compulsory practice. In addition to compulsory daily testing, it is also essential to include educational programmes on the dangers of alcohol consumption in the workplace. Such programmes should include real-world examples of the consequences of actions taken under the influence. When combined with compulsory alcohol testing, such practices can act as a significant deterrent to the use and abuse of alcohol in the workplace.

Ultimately it is up to individual paper mill organisations to manage, monitor and control the use of alcohol in the workplace, and to prevent intoxicated employees from entering and working in these often-dangerous environments. Breathalyser technology is a useful tool particularly when combined with compulsory daily testing, as it offers a fast and efficient way of changing the culture of inappropriate drinking. Breathalysers however are just a tool, and must be combined with comprehensive alcohol policies as well as education and assistance programmes for employees. ■



- Alcohol is implicated in or responsible for
 - Fatal accidents 60%
 - Domestic accidents 30%
- At least 20% and up to 40% of accidents in the workplace may be alcohol-related
- Alcohol consumption and operator and driver fatigue can prove to be a deadly combination many hours after consumption of alcohol has ceased.
- At recent South African trials the lateral vision and depth perception of drivers was tested at increasing levels of intoxication.
 - Their depth perception showed up to 44% deterioration after the conclusion of consumption.
 - Five hours after stopping consumption, there was still a 16% deterioration.

Source: ALCO-Safe





MONITRAN'S NEW COMPACT HAND-HELD VIBRATION METER

Instrotech, distributor and manufacturer of a range of process control instrumentation and specialised systems, has announced the launch of UK-based Monitran's MTN/VM220, a compact, handheld meter for measuring vibration levels. Rechargeable and portable, the instrument is designed to operate with a constant current accelerometer to provide accurate vibration measurements.

Conforming to ISO10816-3, the MTN/VM220 is engineered to detect early signs of component wear or failure in pumps, motors, gearboxes and other mechanical assemblies.

Measuring only 130 x 78 x 28mm, the MTN/VM220 has an easy-grip, rubberised case and a long-life rechargeable battery and has the ability to store up to 100 time-stamped readings, including RMS, peak, peak-peak, crest factor and bearing conditions, all on an easy-to-read, colour LCD display.

The unit is shipped in a foam-lined, durable carry case and includes the MTN/2200, a general purpose sensor probe with a default sensitivity of 100mV/g, as well as a magnetic base and spike (for use with the probe), a coiled cable with a four-pin Lumberg connector at each end, and a universal battery charger. ■

Innovative sensors for fibreline applications

BTG's new sensors have been developed to measure lignin in various forms in pulping and bleaching processes. Where traditional process analysers have measured fibre lignin (fibre kappa) alone or the mill relied on time-consuming lab measurement, BTG now provides the full picture in real time. The innovative sensors deliver the measurements that pulp makers require to optimise various pulping and bleaching unit operations.

SINGLE POINT KAPPA ANALYSER (SPK-5500)

Moving away from complicated and expensive multi-point kappa analysers, BTG introduced the new SPK-5500 Single Point Kappa Analyser. The SPK-5500 is mounted directly onto the pulp processing pipeline and frequently measures the fibre lignin content of pulp suspensions. There is no need for the remote pulp samplers, associated water valves and transport lines which are required for traditional kappa analysers. The SPK-5500 provides fast (4-6 minutes), reliable fibre kappa measurement delivering better control of pulping and bleaching operations.



FIGURE 1: Single Point Kappa SPK-5500

BLEACH LOAD TRANSMITTER (BLT-5500)

To overcome the challenge of reducing operator bias in chlorine dioxide (ClO₂) charge control in a D0 or D1 stage in bleaching, the new Bleach Load Transmitter measures total lignin load (fibre lignin plus carryover) coming to the bleach plant. This allows mills to optimise expensive bleaching chemical costs by running the bleach plant in auto-mode and achieving a more stable and predictive bleaching process outcome. The BLT inline sensor has two outputs, providing total lignin (bleach load) and brightness.



FIGURE 2: Bleach Load Transmitter BLT-5500

DISSOLVED LIGNIN TRANSMITTER (DLT-5500)

In the past, pulp mills did not have a direct measurement of dissolved lignin concentration to assess brown stock washing performance. As a result, the fine balance between optimum evaporation costs and optimum bleaching costs due to carryover were seldom achieved.

BTG's new Dissolved Lignin Transmitter now measures the dissolved lignin concentration directly in the pulp stream. It is being used as a powerful brown stock washing optimization tool. The DLT output has a very strong correlation with the chemical oxygen demand (COD), allowing mills to use it as an inline COD sensor for pulp mill applications. With these innovations BTG complements its comprehensive product portfolio enabling a complete offering for enhanced fibre line process control to pulp mill customers. ■



FIGURE 3: Dissolved Lignin Transmitter DLT-5500

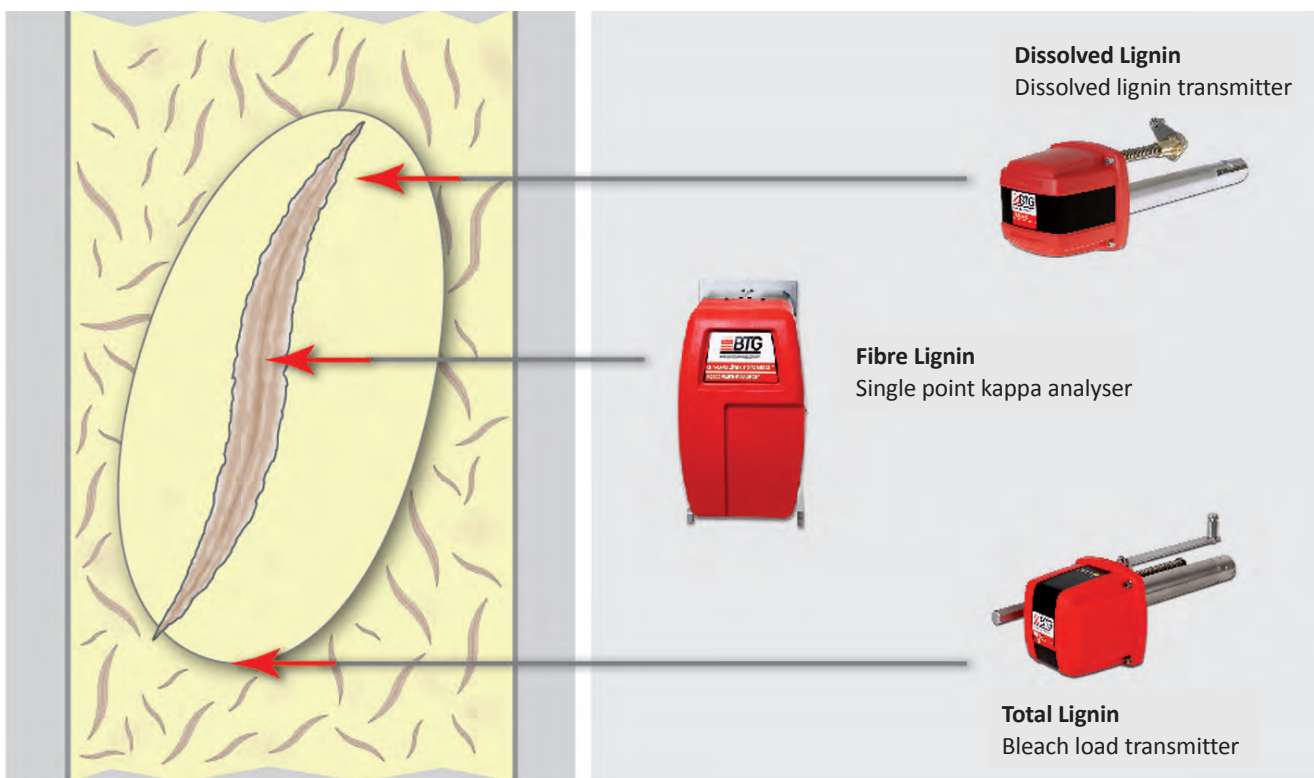


FIGURE 4: Lignin measurements in various forms

Predictive intelligence improves asset reliability

“Studies show that it costs 50% more to repair a machine after it has failed versus predicting the failure and thus planning for the repair costs,” said Thomas Wewers, director of technology for Emerson’s reliability solutions.

With predictive intelligence a key component to increasing availability and improving the reliability of plant assets, Emerson Process Management has introduced the CSI 6500 ATG protection system, a stand-alone machinery protection solution that also allows the economical introduction of prediction monitoring of critical assets from the same system.

The new multi-functional cards can be easily reconfigured for a wide range of measurements, including the impacting or peak-to-peak data used in Emerson’s unique PeakVue™ technology. In addition to monitoring the start-up and coast down of critical turbo machinery for safe operation, users will be able to utilise PeakVue technology to identify the earliest indications of developing faults in gearboxes and bearings.

“For users whose budget doesn’t cover the cost of both a protection and a prediction system, getting prediction data from a protection system is an incremental step towards improving the insight on asset health,” added Wewers.

REDUCING NECESSITY FOR DATA COLLECTION WALKABOUTS

Michael Eksteen, Emerson Process Management, explains some of the challenges in a paper mill environment. “If a roll bearing fails when a paper machine is operating at high speed, extensive machine damage and the loss of substantial amounts of paper can result.” He adds that production comes to a halt until repairs are made and the machine restarted. Typically, mills rely on periodic ‘walkabouts’ by technicians using portable data collectors to measure vibration levels at various points.

“However, if a bearing failed between data collection rounds (and a serious fault can develop in as little as eight hours), the result could be very costly. From a safety perspective, supervisors favour remote monitoring of vibration data so that data collection technicians would not have to approach operating machinery.”

SOLUTION AT HAND

There is a solution, says Eksteen. “Integration with the mill’s process automation system and AMS Suite: Machinery Health Manager predictive maintenance software reduces machinery faults, protects machinery, and empowers maintenance decision-making.”



Alarm parameters are set in AMS Machinery Manager to raise alarms and notify mill personnel when vibration levels go out of range. During operation, the paper machines’ vibration data is transmitted continuously to a maintenance station where mill vibration analysts can watch constantly. “In one case it was observed that there was a serious paper roll vibration, which was diagnosed as an improperly installed roller bearing,” he shares, noting that the timely catch prevented machine downtime and saved the mill nearly \$40,000 (around R562,000).

ONLINE. ANYTIME. ANYWHERE

The vibration analyst can log onto the system from home and so be on alert 24/7. “If there’s an alarm, the analyst can immediately access historical data on that point and analyse the vibration, looking at the trend lines to see exactly what happened and when.

A vibration analyst on a fine paper machine said, “You can’t walk around and continuously monitor. It takes me 30 days to walk all the routes. The beauty of Emerson’s online monitoring solution is that it’s on all the time.”

All the information needed to predict if and when a bearing will fail is available, so maintenance supervisors can determine when to take action to avoid an unwanted machine shutdown. Asset Optimisation Services experts can provide full support, including system design, project management, database development, system configuration and factory acceptance testing.

“Emerson’s machinery health programme has become a very successful application of technology to drive cost-effective predictive maintenance,” concludes Eksteen.

It is no longer necessary to return to the control room or open cabinets in the field to view or analyse data as the new solution can be networked over wired or wireless Ethernet to deliver asset health information to authorised users through a PC or phone application.

To facilitate easy system integration with third party systems, CSI 6500 ATG is the first protection system to include a secure embedded OPC UA server. The CSI ATG system complies with the traditional API 670 certification and is certified for installation in demanding environments where Class 1 Div2/ ATEX Zone 2 approvals are required. ■

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