MEDNARODNO SREČANJE SLOVENSKEGA PAPIRNIŠTVA

INTERNATIONAL MEETING OF SLOVENE PAPER INDUSTRY

2023

26. DAN SLOVENSKEGA PAPIRNIŠTVA
26TH DAY OF SLOVENE PAPER INDUSTRY

49. MEDNARODNI LETNI SIMPOZIJ DITP
49TH INTERNATIONAL ANNUAL SYMPOSIUM DITP

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BACK(?) TO THE FUTURE

15. - 16. november 2023
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SLOVENIJA

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OBDELAVE ZA PREPREČEVANJE KISLINSKE RAZGRADNJE PAPIRNIH ARTEFAKTOV IZ CELLULOZE

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Informacije o kulturni dediščine naše družbe, ki so zapisane na celuloznih materialih se zaradi kislinskega razpada počasi izgubljajo in s tem tudi naša identiteta. Kulturno dediščino je potrebno iz utemeljenih razlogov kot so nacionalni, politični, pravni, zgodovinski, ekonomski, znanstveni in čustveni nujno ohraniti.[1] Razgradnjo papirja povzročajo fizikalni, kemični in biološki dejavniki. Endogeni dejavniki kot je pH vrednost papirja ključno vplivajo na njegovo razgradnjo in s tem krajšo življenjsko dobo.[1] Zakisanost papirja, ki izhaja iz dodatka aluminijevega sulfata Al2(SO4)3·18H2O (alum), kot sredstva za klejenje v proizvodnji papirja od sredine 19. stoletja do zadnjih desetletij 20. stoletja, je splošno sprejeta kot glavni vzrok za degradacijo papirja. Posledično se v razvoj obdelav za razkislinjenje papirja vlaga ogromno truda in finančnih sredstev. Potencial za tovrstne obdelave je samo v Sloveniji ogromen, saj obstaja kar 230 km knjižnih polic polnih arhivskega gradiva od katerega ja okoli 80 % bilo proizvedenega po letu 1830.
V tem delu bo predstavljena učinkovitost obdelav za razkislinjenje na osnovi alkalnih nanodelcev stabiliziranih s celuloznimi polimeri in vloga slednjih pri ohranjanju mehanske stabilnosti ogroženih papirnih artefaktov. Predstavljene bodo analiza velikosti in stabilnosti alkalnih delcev v disperzijah z DLS in turbidimetrijo, površinska in globinska kemijska analiza obdelanega papirja z FTIR in SEM/EDX, ter analiza barvnih sprememb s pomočjo UV-VIS spektroskopije. Primerjane bodo standardne in nove metode za določanje nevtralizacije papirja in alkalne rezerve, kot sta pH titracija in določevanje pH z mikroelektrodo.
Na kratko bodo predstavljene tudi nove perspektive uporabe funkcionalnih polisaharidov za doseganje multifunkcionalnosti specialnih obdelav artefaktov iz kislega papirja.

1.Strlič, M. & Kolar, J. (National and university library, 2005)

TREATMENTS PREVENTING ACIDIC DEGRADATION OF CELLULOSE-BASED PAPER ARTEFACTS

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Degradation of paper artifacts is a cause for great concern as the information about our cultural heritage needs to be preserved in its original form for a core of valid reasons like national, political, legal, historical, economic, scientific, and emotional.[1] Degradation of paper is caused by physical, chemical and biological factors. Endogenous factors, e.g., pH value of the paper, are crucial determinants for paper degradation and its longevity.[1] Paper acidity arising from the addition of aluminum sulphate Al2(SO4)3·18H2O (alum), as a sizing agent in the final stages of papermaking from the mid-19th century until the final decades of the 20th century, is generally accepted as a main cause of paper degradation. Consequentially, enormous effort and financial resources are put into development of special deacidification treatments to preserve paper artifacts. The potential for such treatments is huge in Slovenia alone, as 230 km of bookshelves full of archival material exist and ≈ 80% of it was produced after 1830. In this work, the role of cellulose in preparation of non-aqueous colloidal dispersions of alkaline particles and their role in preserving the mechanical integrity of compromised paper artefacts is presented. The stability and particle size in the colloidal dispersions of alkaline particles are evaluated by DLS and turbidimetry. Successful application of the dispersions on model paper artefact is evaluated by chemical analysis (FTIR) and penetration depth using SEM/EDX of paper cross-sections. Neutralisation of the paper's acidity and the added alkaline reserve are determined by standard methods and new protocols for pH measurement and alkaline reserve determination. Finally, the visual appearance of the paper artefacts is evaluated by UV-VIS spectroscopy.
New perspectives of using functional polysaccharides to achieve multifunctionality of speciality treatments for acidic paper artefacts will briefly be presented as well.

1.Strlič, M. & Kolar, J. (National and university library, 2005)

TISKANI TEMPERATURNI INDIKATOR ZA RECIKLABILNO PAMETNO EMBALAŽO IN NJEGOV PRISPEVEK ZA IZBOLJŠANJE TRAJNOSTNOSTNE HLADNE VERIGE ZA TEMPERATURNO OBČUTLJIVE IZDELKE

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Pri pakiranju hrane velja posebna pozornost temperaturno občutljivim izdelkom, ki jih varuje hladna veriga. Ta nadzira temperaturo prostorov, kjer lahko nastopijo različne napake, še posebno pri prehodu izdelkov iz enega v drug prostor. Nadzor vsakega izdelka omogoča pametna embalaža, ki temelji na elektronskih senzorjih, komunikacijskih sistemih, pametnih oznakah (RFID, NFC) in podobno, kar pa oteži ali pa celo onemogoči recikliranje embalaže. Tiskani temperaturni indikatorji ne potrebujejo elektronskih komponent in so reciklabilni skupaj z embalažo. Z nepovratnim obarvanjem pri segretju preko dovoljene temperature pokažejo napake hladne verige in vplivajo na njihovo preprečevanje, kar prispeva k daljši obstojnosti ter višji kakovosti hrane, varnosti proizvajalcev in zaupanju potrošnikov. Učinkovit nadzor hladne verige vodi tudi do manj zavržene hrane.

Temperaturni indikator se lahko natisne v poljuben dizajnu direktno na embalažo ali pa na etiketo, ki se jo prilepi na embalažo. Tiskani temperaturni indikatorji se nepovratno obarvajo pri segretju preko nadzorovane temperature, ki jo imenujemo kritična temperatura, zato govorimo o indikatorjih kritične temperature. Obarvanje vidimo s prostimi očmi in ga lahko dokumentiramo s slikanjem. Namen tiskanega temperaturnega indikatorja ni neposredno vplivati na rok trajanja ali kakovost pakiranega živila, temveč opozoriti udeležence v hladni verigi (od pridelave do uporabe), da je bilo živilo pregreto. Na ta način je mogoče ugotoviti, kje v hladni verigi prihaja do temperaturnih motenj in jih z izvajanjem določenih ukrepov preprečiti.

Z metodo analiza življenjskega cikla (LCA) smo ovrednotili okoljske odtise nalepke z natisnjenim temperaturnim indikatorjem in njen doprinos k okoljskim odtisom različnih vrst temperaturno občutljivih živilskih izdelkov pakiranih v inteligentno embalažo. V naslednjem koraku smo ocenili okoljske koristi, povezane z izboljšavami hladne verige in posledično zmanjšanjem količine zavržene hrane. Rezultati so pokazali, da je okoljski odtis nalepke z natisnjenim temperaturnim indikatorjem minimalen, v primerjavi z okoljskim odtisom pakiranih živilskih izdelkov kot so mleko, jogurt, sladoled, meso itd. Doprinos nalepke z natisnjenim temperaturnim indikatorjem na okoljski odtis pakiranega živilskega izdelka znaša manj kot 0,1 %. Po drugi strani tiskani temperaturni indikator posredno prispeva k izboljšavam v nadzoru hladne verige in posledično k manjši količini zavržene hrane. Okoljski vplivi povezani s pridelavo/proizvodnjo pakiranih živilskih izdelkov so povzročeni popolnoma po nepotrebnem, če so ti izdelki zavrženi. Na primer, pri vsakem litru mleka (pakiranem v tetrapak), ki ga zavržemo zaradi napake v hladni verigi, povzročimo za 1,4 kg CO_2 ekvivalentov izpustov. Uporaba tiskanih temperaturnih indikatorjev posredno zmanjšuje nepotrebne izpuste povezane z zavrženo hrano in na ta način prispeva h okoljski trajnostnosti vzdolž hladne verige.

PRINTED TEMPERATURE INDICATOR FOR RECYCLABLE INTELLIGENT PACKAGING AND ITS CONTRIBUTION TO IMPROVING COLD CHAIN SUSTAINABILITY FOR TEMPERATURE SENSITIVE PRODUCTS

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Considering packaging food, special attention is paid to temperature-sensitive products protected by the cold chain. It monitors the temperature of the spaces where temperature mistakes can occur, especially when products move from one space to another. Intelligent packaging, based on electronic sensors, communication systems, smart tags (RFID, NFC), etc., makes it possible to monitor each product, but this makes it difficult or even impossible to recycle the packaging. Printed temperature indicators do not require electronic components and are recyclable together with the packaging. By irreversibly colouring when heated above the permissible temperature, they indicate cold chain defects and have an impact on their prevention, contributing to longer shelf life and higher food quality, producer safety and consumer confidence. Effective cold chain control also leads to less food waste.

The temperature indicator can be printed in any design directly on the packaging or on a label to be stuck on the packaging. Printed temperature indicators irreversibly colour when heated beyond a controlled temperature, called the critical temperature, hence the term critical temperature indicators. The colouring is visible to the naked eye and can be documented by imaging. The purpose of a printed temperature indicator is not to directly affect the shelf-life or quality of the packaged food, but to inform those involved in the cold chain (from production to use) that the food has been overheated. In this way, it is possible to identify where in the cold chain temperature disturbances are occurring and to prevent them by taking certain measures.

A Life Cycle Analysis (LCA) was used to evaluate the environmental footprint of the printed temperature indicator label and its contribution to the environmental footprint of different types of temperature-sensitive food products packaged in intelligent packaging. In the next step, we assessed the environmental benefits associated with cold chain improvements and the resulting reduction in food waste. The results showed that the environmental footprint of a label with a printed temperature indicator is minimal compared to the environmental footprint of packaged food products such as milk, yoghurt, ice cream, meat, etc. The contribution of a label with a printed temperature indicator to the environmental footprint of a packaged food product is less than 0.1%. On the other hand, a printed temperature indicator contributes indirectly to improvements in cold chain control and consequently to a reduction in food waste. The environmental impacts associated with the production/manufacturing of packaged food products are caused completely unnecessarily if these products are discarded. For example, for every litre of milk (packaged in a tetra pack) that is thrown away due to a cold chain failure, 1.4 kg of CO_2 equivalent emissions are generated. The use of printed temperature indicators indirectly reduces unnecessary emissions associated with food waste and thus contributes to environmental sustainability along the cold chain.

RAZVOJ PAPIRJA IZ NARAVNEGA BARVILA TAGETESOVIH CVETOV

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Danes se vse bolj in bolj kot umetni vir svetlobe, uporablja svetloba LED izvora. Ta v svojem spektru vsebuje nesorazmerno veliko modre svetlobe, ki ob prekomerni izpostavljenosti, negativno vpliva na hormonska ravnotežja, kognitivne sposobnosti in ima še nekatere vplive na oči ter celotni organizem. Če za branje ali pisanje uporabljamo klasičen papir z visoko belino, je tako tudi odboj modrega spektra svetlobe visok, če papir vsebuje določen barvni odtenek, pa je lahko ta odboj manjši, kar ugodno vpliva na hormonska ravnovesja ter zmanjša stres vidnega sistema pri občutljivih osebah npr. z očesnimi boleznimi, migrenami, epileptiki. Raziskave in meritve, da barvila rumenkasto-oranžne barve, kakršno je tudi barvilo iz cvetov rastline tagetesa absorbirajo modro svetlobo (v spektralnem območju 390–450 nm), so bile preko našega partnerja iz optometristične stroke že predhodno opravljene. V naši raziskavi, pa smo želeli preveriti, kako izvesti učinkovito ekstrakcijo barvila, potrebne dodatke tega barvila v papir, kompatibilnost z ostalimi papirniškimi dodatki in obstojnost tega barvila. Plan pa je bil tudi izdelava papirja na pilotnem oz. polindustrijskem nivoju.

Kot rečeno smo najprej raziskavo zastavili na laboratorijskem nivoju, kjer smo preko ekstrakcije tagetesovih cvetov pripravili barvilo rumenkasto-oranžne barve. Zasnovali smo recepturo izdelave laboratorijskih listov z beljenimi celuloznimi vlakni, papirniškimi pomožnimi sredstvi in različnimi količinami dodatkov pripravljenega barvila. Preverjali smo kompatibilnost dodajanja barvila v papirniško suspenzijo z ostalimi dodatki. Za primerjavo smo izdelali tudi liste z dodatkom klasičnih komercialnih barv, s ciljem da dobimo isti barvni odtenek. Pri vseh listih smo izračunali porabo barve, izmerili barvne koordinate ter odboj LED svetlobe v modrem spektralnem območju.

Zadnji korak pri laboratorijskih testih je bilo preverjanje obstojnosti barvnih odtenkov na staranje. Izvedeno je bilo umetno staranje z nastavitvami od UVA sevanja z močjo od 2.75 mW/cm^2 ter UVB 0.85 mW/cm^2 v krajšem in daljšem časovnem obdobju. Pokazalo se je da so vzorci z barvilom tagetesa, manj odporni na UV staranje (predvsem b barvna koordinata, ki odraža rumeni odtenek), kot vzorci z dodatkom komercialnih barvil, vendar ob zmernem izpostavljanju UV svetlobi, lahko imajo uporabnost tudi v daljšem časovnem obdobju. To pa v veliki meri ustreza namembnosti razvitega papirja, saj naj bi se uporabljal kot papir za zvezke v šolah, ipd.

Po uspešnih laboratorijskih testih, smo se skupaj s partnerjem odločili še za izdelavo papirja na našem pilotnem stroju, kjer smo želeli zadostno količino papirja v gramaturi 80 g/m^2 za izdelavo cca. 500 A4 zvezkov. Za ta namen smo izvedli posebne preračune laboratorijskih zakonitosti, ekstrakcije in porabe barvila na pilotni nivo. Pilotni test smo uspešno izvedli in izdelali želeno količino papirja, v predpisanih parametrih.

Pričujoč raziskovalni projekt, se je pokazal kot odlično sodelovanje med partnerji, torej našo razvojno-tehnološko stroko, ki je znala prisluhniti potrebam in priporočilom optometristične stroke in z zelo praktičnimi koraki razvila papir, ki je bolj prijazen osebam z določenimi težavami (očesne bolezni, migrene, epileptiki..), obenem pa se je kot barvilo uporabil naravni zavrženi material.

DEVELOPMENT OF PAPER WITH ADDITION OF THE NATURAL DYE FROM TAGETES FLOWERS

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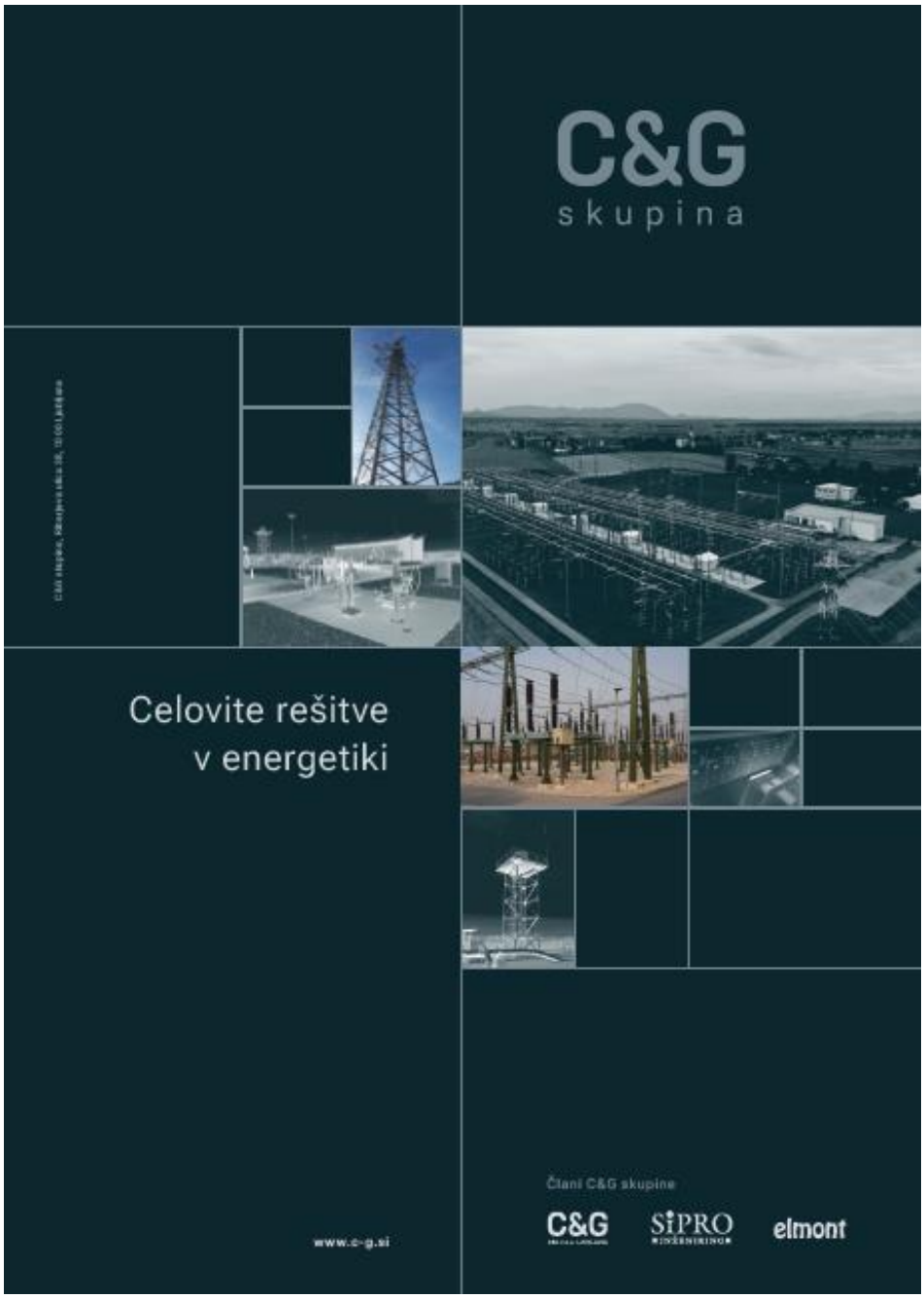
Today, LED light is used more and more as an artificial light source. In its spectrum, this contains a disproportionate amount of blue light, which, in case of excessive exposure, has a negative effect on hormonal balances, cognitive abilities, and has other effects on the eyes and the entire organism. If we use classic paper with high whiteness for reading or writing, the reflection of the blue spectrum of light is also high. But if the paper contains a certain colour shade, this reflection can be lower, which has a beneficial effect on hormonal balances and reduces stress on the visual system in sensitive people, e.g. with eye diseases, migraines, epileptics. Researches and measurements that yellowish-orange dyes, as the dye from the flowers of the tagetes plant, absorb blue light (in the spectral range 390–450 nm), were previously carried out by our partner from the optometric science. In our research, however, we wanted to check how to perform an efficient dye extraction, the necessary additions of this dye to the paper, the compatibility with other paper additives and the durability of this dye. The plan was also to produce paper on a pilot or semi-industrial level.
As mentioned, we first started the research at the lab level, where we prepared a yellowish-orange dye through the extraction of tagetes flower. We designed a recipe for the production of lab sheets with bleached cellulose fibers, paper additives and various amounts of prepared dye additives. We checked the compatibility of adding the dye to the papermaking suspension with other additives. For comparison, we also produced sheets with the addition of classic commercial dyes, with the aim of obtaining the same colour shade. For all sheets, we calculated the dye consumption, measured the colour coordinates and the reflection of LED light in the blue spectral range.
The last stage at the lab tests was checking the durability of the color shade against aging. Artificial aging was performed with settings of UVA radiation with a power of 2.75 mW/cm^2 and UVB 0.85 mW/cm^2 in a shorter and longer period. It has been shown that samples with tagetes dye are less resistant to UV aging (especially the b color coordinate, which reflects a yellow shade) than samples with the addition of commercial dyes, but with moderate exposure to UV light, they can be useful even over a long period of time. This largely corresponds to the purpose of the developed paper, as it is supposed to be used as paper for notebooks in schools, etc.
After successful lab tests, together with our partner, we decided to produce paper on our pilot machine, where we wanted a sufficient amount of paper with a grammage of 80 g/m^2 to produce approx. 500 A4 notebooks. For this purpose, we carried out special calculations of lab findings, extraction and dye consumption for a pilot level. We successfully conducted the pilot test and produced the desired amount of paper, within the prescribed parameters.
The current research project proved to be an excellent collaboration between partners, e.g. our development and technology knowledge and optometrist science. We knew how to listen to the needs and recommendations of the optometrist science and with very practical steps developed a paper that is more friendly to people with certain problems (eye diseases,

migraines, epileptics ...), while at the same time natural discarded material was used as a dye raw material.



KARAKTERIZACIJA MEHANSKIH LASTNOSTI PERFORIRANE VALOVITE LEPENKE S CILJEM IZBOLJŠANJA LOČEVANJA SEKUNDARNE EMBALAŽE

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Prodajna embalaža SRP (Shelf Ready Packaging – embalaža za prodajne police) je vrsta sekundarne embalaže, zasnovana za zmanjšanje stroškov dela v trgovini pri zlaganju izdelkov na police. Vendar pa je večina težav s prodajno embalažo SRP povezanih z odpiranjem in zlaganjem na police. Funkcija enostavnega odpiranja pomeni nezapleteno rokovanje z enostavnim ločevanjem na predvidljiv in zaželen način brez uničenja konstrukcijske trajnosti embalaže. Perforacije na valovitem kartonu so eden od načinov za enostavno odpiranje prodajne embalaže SRP. V prispevku smo analizirali spreminjanje mehanskih lastnosti valovitega kartona zaradi vpliva perforacij. Poudarek je bil na ugotavljanju, katera od razlagalnih spremenljivk najbolj vpliva na lastnosti valovitega kartona. Meritve so bile razdeljene v dve kategoriji: meritve, povezane s transportom in skladiščenjem: preskus trdnosti robov, preskus razpočne trdnosti, 3-točkovni preskus upogibne togosti v vzdolžni in prečni smeri; in meritve v zvezi z ločevanjem valovitega kartona s perforacijo: natezni preskus: v ravnini in izven ravnine, ter preskus trganja. Rezultati študije kažejo, da se učinek kota na spremembo mehanskih lastnosti pri ločevanju valovitega kartona zmanjša s povečanjem velikosti odrezanega dela perforacije. Zato je obstoječe pozitivne lastnosti, povezane s transportom in skladiščenjem, možno ohraniti tako, da izberemo vrsto perforacije z večjim rezom in jo postavimo pod kotom približno 70°, hkrati pa omogočimo ločevanje valovitega kartona z manjšo silo.

CHARACTERIZATION OF MECHANICAL PROPERTIES OF PERFORATED CORRUGATED CARDBOARD IN ORDER TO IMPROVE THE SEPARATION OF SECONDARY PACKAGING

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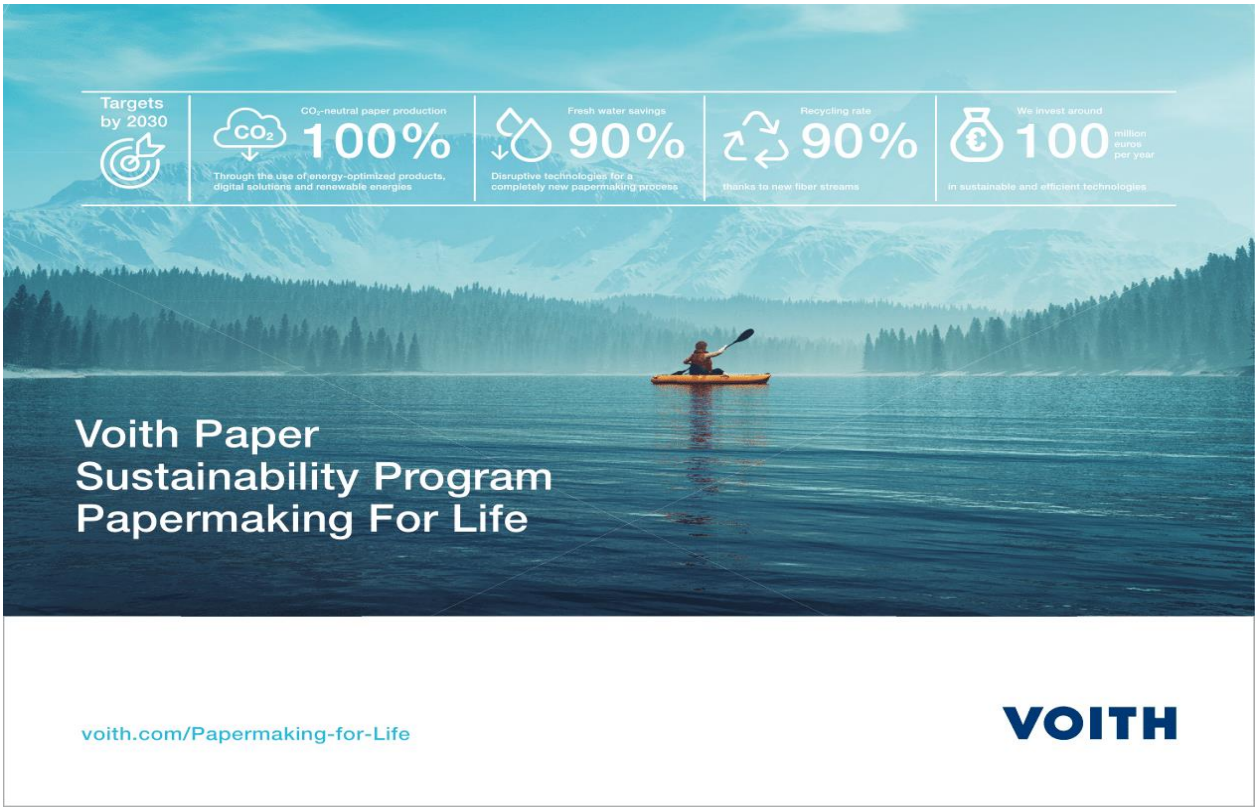
Shelf Ready Packaging (SRP) is a type of secondary packaging designed to reduce in-store labour cost of stacking products on shelves. However, most of the problems with SRP are involved in the area of opening and shelving. An easy opening function implies uncomplicated handling with easy separation in a predictable and desirable manner without destroying the structural integrity of the packaging. Perforations on corrugated cardboard are one of the ways for easy opening of Shelf Ready Packaging. In this paper the change of corrugated cardboard mechanical properties was analysed under the influence of perforations. The focus was on determining which of the explanatory variables affect the corrugated cardboard

properties the most. The measurements were divided into two categories: measurements related to transport and storage: edge crush test, burst strength test, 3-point bending stiffness test in Machine Direction and Cross Direction; and measurements related to the separation of corrugated cardboard by perforation: tensile test: in-plane and out-of-plane, and tear test. The results of this study indicate that the effect of angle on the change of mechanical properties in the separation of corrugated cardboard is reduced by increasing the size of the cut part of the perforation. Therefore, it is possible to maintain the existing positive properties related to transport and storage by selecting a type of perforation with a larger cut portion and positioning it at an angle of about 70°, while enabling the separation of corrugated cardboard with less force.



REŠITVE ZA POLSUHO PROIZVODNJO PAPIRJA

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Voda je ključna komponenta pri proizvodnji papirja, saj opravlja več vlog pri distribuciji in vezanju vlaken ter formiranju papirnega lista. Zaradi energetsko intenzivne narave papirništva pa si prizadevamo zmanjšati porabo vode v tej panogi. Eden od pristopov k minimiziranju porabe vode je suha proizvodnja papirja, ki vključuje oblikovanje papirnega lista iz suhih vlaken. V naših študijah raziskujemo količino vode, ki je potrebna pri proizvodnji papirja, in njen vpliv na natezne lastnosti papirja z uporabo vročega suhega stiskanja .
Suho razpuščanje je že dolgo predmet raziskav delovne skupine za papirno tehnologijo na Tehnični univerzi v Dresdnu. V tej študiji so bila vlakna beljene evkaliptusove kraft celuloze (BEKP) uporabljena za oblikovanje papirnega lista iz suhih vlaken. Pole BEKP so bile podvržene suhi fibrilaciji po postopku, opisanem v nemškem patentu DE 10 2015 223 333 B4. Papir je bil ročno oblikovan in prilagojen na vsebnost vlage (MC) od 20 % do 60 %. Za doseganje želenih ravni vsebnosti vlage je bilo uporabljeno hladno stiskanje. Nato je bilo izvedeno vroče suho stiskanje z različnimi silami in temperaturami stiskanja.
Rezultati so pokazali, da ima temperatura minimalen vpliv na natezne lastnosti listov papirja, in da služi predvsem za sušenje. So pa višje temperature povzročile razbarvanje papirja. Ob bolj ekstremnih nastavitvah stiskanja, torej ob višjih temperaturah, viši vsebnosti vlage in močnejših silah stiskanja se je stopnja beline zmanjšala.
Na zgostitev listov papirja je v glavnem vplivala uporabljena sila stiskanja in ne vsebnost vlage. Povečanje sile stiskanja je povzročilo višje vrednosti gostote in doseglo plato pri približno 45 % vsebnosti vlage. Najvišja dosežena vrednost nateznega indeksa (TI) je bila 14 Nm/g.
Za izboljšanje postopka je bila izvedena optimizirana nastavitev stiskanja, kar je skrajšalo čas stiskanja in znižalo temperaturo sušenja. Rezultat tega je bilo znatno zmanjšanje porabe energije in višje vrednosti nateznega indeksa. S povečano silo stiskanja je največja vrednost nateznega indeksa dosegla skoraj 20 Nm/g. Čeprav je še vedno prišlo do rahlega razbarvanja, se je belina papirja v primerjavi z vročim stiskanjem izboljšala.
Primerjava nateznega indeksa z relativno površino vezljivosti (RBA) je pokazala visoko korelacijo. Natezni indeks in relativna površina vezljivosti sta dosegla plato pri približno 45-50 % vsebnosti vlage, kar je ustrezalo vrednosti retencije vode 0,95 g/g uporabljene BEKP. Voda, ki je prisotna na površinah vlaken, tvori hidrogel in aktivno prispeva k povezovanju vlaknen. Odvečna voda deluje kot nestisljiva faza med vlakni in preprečuje njihov tesnejši stik. Nezadostna vlaga ne prekrije celotne površine vlaken, kar omejuje izkoristek celotnega veznega potenciala hidrogela. To kaže, da vsebnost vlage, ki je potrebna za največji potencial trdnosti pri suhi proizvodnji papirja, ustreza vsebnosti vlage v papirnem traku po skupini stiskalnic v sodobnem papirnem stroju.
Skratka, potrebno količino vode pri proizvodnji papirja je mogoče zmanjšati na minimum s tehnikami suhe proizvodnje papirja. Primarna dejavnika, ki sta vplivala na natezne lastnosti papirnih listov, sta bila sila stiskanja in vsebnost vlage, medtem ko je temperatura imela minimalen vpliv. Rezultat optimizacije nastavitev stiskalnice so bile izboljšane vrednosti nateznega indeksa in nižja poraba energije. Razumevanje medsebojnih vplivov med tlakom, vsebnostjo vlage in zasnovo stiskalnice, prilagojene specifičnemu vlakninskemu materialu, je ključnega pomena za doseganje maksimalnega potenciala trdnosti pri suhi proizvodnji papirja.

APPROACHES ON SEMI-DRY PAPERMAKING

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Water is a crucial component in paper production, playing multiple roles in fiber distribution, bonding, and sheet formation. However, efforts have been made to reduce water usage in papermaking due to its energy-intensive nature. One approach to minimize water consumption is dry papermaking, which involves forming paper from dry fibers. Our studies investigate the amount of water necessary for papermaking and its influence on the tensile properties of paper sheets using hot dry-pressing.

Dry pulping has long been the subject of research by the Paper Technology Working Group at TU Dresden. In this study, bleached eucalyptus kraft pulp (BEKP) fibers were used to form dry fiber webs. BEKP plates underwent dry fibrillation, following the procedure outlined in German patent DE 10 2015 223 333 B4. The webs were manually formed and adjusted to moisture contents (MC) ranging from 20% to 60%. Cold pressing was applied to achieve the desired MC levels. Subsequently, hot drypressing was performed using different pressing forces and temperatures.

The results showed that temperature had a minimal influence on the tensile properties of the paper sheets, primarily serving for drying purposes. However, higher temperatures caused discoloration of the paper. The degree of whiteness decreased with more extreme press settings, including higher temperatures, higher MC, and stronger pressing forces.

The densification of the paper sheets was mainly influenced by the applied pressing force rather than MC. Increasing the pressing force resulted in higher density values, reaching a plateau at approximately 45% MC. The highest tensile index (TI) value obtained was 14 Nm/g. An optimized press setting was implemented to improve the process, reducing pressing time and drying temperature. This led to a significant decrease in energy consumption and higher TI values. With increased pressing force, the maximum TI value reached nearly 20 Nm/g. Although some discoloration still occurred, the whiteness of the paper improved compared to hot pressing.

Comparing the TI with the relative bonded area (RBA), a high correlation was observed. The TI and RBA reached a plateau at approximately 45-50% MC, which corresponded to the water retention value of 0.95 g/g of the used BEKP. The water present at the fiber surfaces forms a hydrogel and actively contributes to fiber-fiber bonding. Excess water acts as an incompressible phase between the fibers, preventing them from coming into closer contact. Insufficient moisture does not cover the entire fiber surface, thus limiting the utilization of the full bonding potential of the hydrogel. This indicated that the MC required for maximum strength potential in dry papermaking corresponded to the MC of a paper web after the press section in a modern paper machine.

In conclusion, the necessary amount of water for papermaking can be minimized through dry papermaking techniques. The primary factors influencing the tensile properties of the paper sheets were the pressing force and MC, while temperature had a minimal effect. Optimization of the press settings resulted in improved TI values and reduced energy consumption. Understanding the interplay between pressure, moisture content, and press design, tailored to the specific fiber material, is crucial in achieving maximum strength potential in dry paper production.

PGA STARCHPERFORMER – NOV INOVACIJA ZA PRIPRAVO ŠKROBA

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Naš novi koncept predelave škroba »PGA starchPERFORMER« je primeren za vse običajne vrste škroba za namene v uporabi v snovni pulpi kakor tudi za premazovanje . Kuhanje poteka po termomehanskem principu, ki nudi največjo fleksibilnost in homogenost kuhanega škroba ter - zlasti pri škrobu v razsutem stanju - znatno povečanje vsebnosti trdnih snovi. Poudarek je na enovitosti proizvoda, maksimalni ponovljivosti, zmanjšanju proizvodnih stroškov, zmanjšanju vnosa škrobnih surovin in posledično izboljšanju ekološkega ravnovesja.
Prednosti uporabe pri masnem škrobu – priprava s starchPERFORMER:
· Prilagodljiva uporaba in enostavno preklapljanje med vsemi običajnimi vrstami kationskega škroba.
· Dosegljiva občutno višja koncentracija kuhanja: 25 % namesto 5–8 % => >70 % prihranek pare.
· Škrob je 100 % prekuhan => zaradi tega znatnega izboljšanja kakovosti je na primer možno preiti s krompirjevega škroba na katerikoli škrob.
· Zaradi višje koncentracije pri kuhanju je prav tako možna do pribl. 8 % koncentracija za shranjevanje => to pomeni, da se čisti filtrat lahko uporabi tudi pred dozirno točko z drugim razredčevanjem, da se doseže končna koncentracija. Redčenje s čistim filtratom vode kemično ne spremeni vodne bilance v mokrem delu.
· Zasnova obrata je veliko manjša.
· Zasnova obrata je veliko bolj gospodarna z viri.
Prednosti uporabe škroba za premazovanje – procesiranje s starchPERFORMER:
· Prilagodljiva uporaba in enostavno preklapljanje med vsemi običajnimi vrstami naravnega škroba.
· Zmanjšanje potreb po škrobu za proizvodnjo papirja za vsaj 5-25 odstotkov.
· (Odvisno od stanja obstoječega obrata)
· Možnost nadzora porazdelitve molske mase - s pomočjo sodobnega, dodatno razvitega postopka doziranja uporabljenih encimov. To omogoča učinkovitejšo uporabo vezne moči škroba in ima tudi regulacijski učinek na porazdelitev molske mase.
· Kakovost škroba je mogoče optimizirati za posamezen papirni proizvod.
· Zasnova obrata je veliko bolj gospodarna z viri

– EMERGING ADDITIVE SOLUTIONS –

PGA STARCHPERFORMER – NEW INNOVATION OF STARCH PREPARATION

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PGA starchPERFORMER

Our new starch processing concept "PGA starchPERFORMER" is suitable for all common starch types in the field of surface starch plants as well as bulk starch plants. Cooking is carried out according to a thermo-mechanical principle, which offers maximum flexibility, homogeneity of the cooked starch and, especially in the case of bulk starch, a considerable increase in the solids content. The focus is on product uniformity, maximum reproducibility, minimisation of production costs, reduction of starch raw material input and the resulting improvement of the ecobalance.

Benefits Mass starch - with starchPERFORMER preparation:

- *Flexible use and easy switching between all common cationic starch types.*
- *Significantly higher cooking concentration achievable, 25% instead of 5-8% => >70% steam saving*
- *The starch is 100% digested=> due to this significant quality improvement, it is possible to switch from potato starch to any starch, for example.*
- *Due to the higher cooking concentration, a storage concentration of up to approx. 8% is also possible=> this means that clear filtrate water can also be used upstream of the dosing point with a second dilution station to achieve the final concentration. The clear filtrate water dilution does not chemically change the water balance in the wet section.*
- *The plant concept is much smaller.*
- *Plant concept is much more resource-efficient.*

Benefits Surface strength - with starchPERFORMER processing:

- *Flexible use and easy switching between all common native starch types.*
- *Reduction of starch requirements for paper production by at least 5-25 per cent.*
- *(Depending on the condition of the original existing plant)*
- *Controllability of the molar mass distribution - through a modern, further developed dosing process of the enzymes used. This makes more efficient use of the starch binding power and also has a regulating effect on the molar mass distribution.*
- *The starch quality can be optimised for the respective paper product.*
- *The plant concept is much more resource-efficient.*

METNIN™ SHIELD ZA TRAJNOSTNE EMBALAŽNE IZDELKE

Sami-Pekka Rantanen
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METNIN™ je edinstvena tržno usmerjena tehnologija za izrabo premalo izkoriščenih tokov lignina iz sodobnih biorafinerij ter tovarn celuloze in papirja. METNIN™ združuje cenovno dostopen inženiring z napredno biotehnologijo za nov val bioloških proizvodov. Ta tehnologija, ki proizvaja tri glavne proizvode, kot so METNIN™ SHIELD za aditive pri embalažnih proizvodih, METNIN™ lignopolyols v proizvodih iz poliuretana, METNIN™ resins za lepila pri proizvodnji vezanih plošč, spreminja obilen industrijski stranski tok v trajnostne in reciklabilne alternative petrokemičnim proizvodom.
Vodilni proizvod te tehnologije je METNIN™ SHIELD, ki pri embalaže iz kartona nadomešča proizvode na osnovi fosilnih goriv za izboljšanje trdnosti kartona in njegove odpornosti na vlago. SHIELD, ki v celoti temelji na biološki osnovi, je mogoče reciklirati ter ponovno razpustiti in je varen za pakiranje hrane, biološko razgradljiv ter močnejši in vzdržljivejši med transportom. Namen proizvoda METNIN™ SHIELD je, da s tehnologijo METNIN™ pretvori lignin, ekstrahiran v fazi razpuščanja, v proizvod za proizvodnjo linerja v ploščah. SHIELD je učinkovita alternativa za zamenjavo plastike in v srži spreminja embalažno industrijo. METNIN™. Ta rešitev temelji na biološki osnovi in lahko v celoti ali delno nadomesti uporabo škroba in sintetičnih klejiv pri proizvodnji embalaže. V podjetju MetGen trenutno poteka postopek prenosa tehnologije METNIN™ od pilotnega na predstavitveni obseg s potencialom zmanjšanja emisij toplogrednih plinov za 85 %.

"METNIN™ SHIELD for sustainable packaging products

Sami-Pekka Rantanen
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METNIN™ is a unique market driven technology to valorize the underutilized lignin streams from modern biorefineries, and pulp and paper mills. METNIN™ combines affordable engineering with advanced biotechnology for new wave of bio-based products. The technology turns an abundant industrial side stream into sustainable and recyclable alternatives for petrochemicals which produces three main products such as METNIN™ SHIELD for additives in packaging applications, METNIN™ lignopolyols in polyurethane application, METNIN™ resins for plywood adhesives.

The spearhead product of this technology is METNIN™ SHIELD for packaging application replacing fossil-based products in cardboard for strength and moisture-resistance at high humid conditions. SHIELD is completely biobased, recyclable, repulpable, safe for food packaging, biodegradable, stronger and more durable while transportation. METNIN™ SHIELD aims to convert lignin extracted at pulping stage using METNIN™ technology into a product for liner board production. SHIELD is an efficient alternative for replacing plastics and a game

changer for the packaging industry. METNIN™. This solution is biobased, potential to replace completely or partially the use of starch and synthetic sizing agents in packaging application. Currently, MetGen is in progress of bringing METNIN™ technology from pilot to demonstration scale with potential to reduce GHG emission by 85%."

NOVA GENERACIJA SREDSTEV ZA SUHO JAKOST PRINAŠA PRIHRANKE ENERGIJE IN NOVE PRILOŽNOSTI

Stefan Franke
Servophil AG, Bösch 73, CH-6331 Hünenberg

Serija S-FLOCS-G25 podjetja SERVOPHIL je nova generacija sredstev za suho jakost, ki temelji na tehnologiji G-PAM. V preteklosti so G-PAM uporabljali predvsem za doseganje določenih ravni kakovosti z nizkocenovnim vlaknenim materialom. Naša serija S-FLOCS-G25 odpira vrata za veliko več možnosti uporabe na številnih področjih kot so - proizvodnja različnih vrst kraftlinerja iz odpadnega papirja - proizvodnja papirjev višje kakovosti brez zapletenih prilagoditev surovin - proizvodnja visokokakovostnih papirjev z zmanjšanim mletjem za prihranke pri energiji - zamenjava ali zmanjšanje količine kationskega ali površinskega škroba zaradi stroškov - zmanjšanje količine površinskega škroba, da zmanjšamo ponovno vlaženje v klejni stiskalnici , kar prihrani energijo in izboljša tek strojev - izboljšanje sprijemljivosti vlaken za boljšo potiskljivost - izboljšanje trdnosti in medsebojne vezi vlaken za večje vnose polnila - izboljšanje teka strojev vodi tudi do nižje specifične porabe energije na tono proizvedenega papirja. Zlasti energetski prihranki oz. izboljšanje CO2 odtisa postajajo vedno pogosteje tema v proizvodni industriji. Poleg tega serija S-FLOCS-G25 doda ekološko noto. Ti proizvodi so brez snovi, ki so razvrščene kot CMR; delamo pa tudi na tem, da trgu ponudimo koncentrirane proizvode za zmanjšanje logistike.

"A NEW GENERATION OF DRY STRENGTH AGENTS FOR ENERGY SAVING AND MUCH MORE OPPORTUNITIES"

Stefan Franke
Servophil AG, Bösch 73, CH-6331 Hünenberg

S-FLOCS-G25-Series of SERVOPHIL is a new Generation of Dry Strength Agents based on G-PAMTechnology. In former times G-PAM were mainly used to reach certain quality levels with low-cost fibre material. Our S-FLOCS-G25-Series open the door for a lot of more applications and can be used for wide area of opportunities, like - Producing Kraft liner-Qualities with wastepaper raw material - Production of higher qualities without complicated raw material adjustments - Production of high qualities with reduced refining for energy saving - Replace or reduce cationic or surface starch for cost reasons - Reduce surface starch to reduce the rewetting in the sizer, this saves energy and improve the runnability - Improving internal bonding for a better printability - Improving Strength levels and internal bonding for higher filler levels - Improving Runnability lead at the end also to a reduced specific energy demand per ton of produced paper Especially energy saving or improving the CO2-Footprint is more and more a theme in the production industry. In addition to this, the S-FLOCS-G25-Series add an ecological bullet point. The products are CMR-free, and we work on concentrated versions to reduce logistic operations.

FENNOPOL ER 9920E – ENOSTAVEN ZA UPORABO, OMOGOČA VISOKO PRODUKTIVNOST

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Proizvajalci papirja se že desetletja soočajo z različnimi izzivi, npr. slabšanjem kakovosti vlaken, zapiranjem sistemov, kar povzroča bolj onesnažene sisteme, in naraščajočimi stroški energije. Zlasti stroški energije in poleg tega težave pri iskanju usposobljenih ljudi so ustvarili potrebo po konceptih, ki jih je enostavno uporabiti, in ki lahko ustvarijo prihranek energije in prispevajo k produktivnosti.
Na novo razvit polimer za hitro inverzijo, FennoPol ER 9920E, lahko zagotovi nekatere od teh prednosti.
V tem predavanju bodo opisane lastnosti polimera FennoPol ER 9920E in rokovanje z njim.
Nato bodo predstavljene tri študije primerov njegove uporabe:
· Pri uporabi FennoPol ER 9920E v sistemu za rekuperacijo vlaken v tovarni recikliranih vlaknin se zmanjša obremenitev KPK in količina naravnega škroba v odpadni vodi.
· Pri drugi aplikaciji, kartonskih strojih za proizvodnjo visoko gramaturnega večslojnega VAT kartona, se polimer uporablja v kombinaciji s FennoSil ES 325, kar proizvajalcu kartona omogoča znatno znižanje proizvodnih stroškov, vendar ne na račun produktivnosti.
· Uporaba polimera FennoPol ER 9920E kot ojačevalca retencije in odvodnjavanja omogoča, da stroj za proizvodnjo linerja poveča proizvodno hitrost za 200 m/min pri proizvodnji nove vrste papirja.
· Zadnji primer opisuje njegovo uporabo kot fiksirnega sredstva pri proizvodnji časopisnih papirjev, ki zmanjšuje količino lepljivih nečistoč, izboljšuje tek stroja in povečuje vsebnost polnila v papirju.

FENNOPOL ER 9920E, EASY TO USE POLYMER ENABLING HIGH PRODUCTIVITY

Štefan Žganec
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Since decades paper makers have been facing various challenges, e.g.: decreasing fiber quality, system closures leading to more contaminated systems and increasing energy costs. Especially energy costs and on top of this difficulties to find skilled people created the need for easy to apply concepts which are able to generate energy savings and contribute to productivity.
The newly developed, quick inversion polymer, FennoPol ER 9920E, is able to provide some of these benefits.
During this lecture the properties of FennoPol ER 9920E and its handling will be described.
Subsequently, three case studies on its application will be presented:

- *When using FennoPol ER 9920E in the fibre recovery system of a recycled fibre mill it decreases the COD load and the amount of native starch in the effluent water.*
- *In the second application, multi-ply VAT board machines producing heavy weight board, the polymer is used in combination with FennoSil ES 325 enabling the board producer to significantly lower production costs without sacrificing productivity.*

- *Applying FennoPol ER 9920E as retention and dewatering booster it enables a liner machine to increase production speed by 200 m/min when producing a new paper grade.*
- *The final case describes its usage as a fixative in newspaper production reducing the amount of sticky contaminants improving machine runnability and increasing filler content in the sheet.*

UPORABA RECIKLIRANIH MINERALOV ZA REGULACIJO PH V PROIZVODNJI PAPIRJA

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Recikliranje mineralov iz papirniških odpadkov je pomemben proces, ki lahko pomaga zmanjšati vpliv papirnic na okolje, naslavlja ekonomske vidike ravnanja z odpadki in ohranja skladnost s spreminjajočimi se pravnimi okviri. Zanimanje za recikliranje mineralov iz papirniških odpadkov temelji na dejstvu, da ti odpadki vsebujejo dragocene minerale, ki jih je mogoče ponovno uporabiti, namesto da jih zavržemo kot trdne in tekoče odpadke. Poznavanje sestave in količine je ključnega pomena za iskanje možnosti uporabe recikliranih mineralov, pa tudi za odločanje o postopkih za nadaljnje izboljšanje tega dragocenega delovanja. Elektrofiltrski pepel iz deinking mulja je eden od takšnih odpadkov, ki ga je mogoče reciklirati zaradi njegovega alkalnega delovanja in ga je mogoče uporabiti za nadzor pH vrednosti v kislih vodnih sistemih . Predstavljena je njegova učinkovitost v primerjavi z referenčnimi izdelki pri prilagajanju pH v procesih proizvodnje papirja.

USE OF RECYCLED MINERALS FOR PH ADJUSTMENT IN PAPER MAKING

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Recycling minerals from paper mill waste is an important process that can help reduce the environmental impact of paper mills, address economic aspects of waste handling and continues compliance with changing legal frameworks. The interest in recycling minerals from paper mill waste arises from the fact that these wastes contain valuable minerals that can be reused instead of being discarded as solid and liquid waste. Knowledge about composition and volumes is key to find potential use of recycled minerals but also to decide on processes to further enhance the valuable performance. Deinking sludge fly ash is one such waste product that can be recycled for its alkaline behaviour that can be used for pH control of acidic water systems. Its performance compared to reference products in pH adjustment in paper making processes are presented.

– NAPREDEK V PROIZVODNIH PROCESIH –

ANDRITZ OCCASION – ZA NAJVIŠJO ZMOGLJIVOST PRIPRAVE SNOVI PRI PROIZVODNJI RECIKLIRANEGA KARTONA

Winfried Wolf
Andritz AG, Stattegger Strasse 18, 8045 Graz, Austria

Ali menite, da bi v današnjem svetu, kjer se srečujemo z različnimi težavami, kot so dramatično naraščajoči stroški energije, slabšanje kakovosti surovin oz. kjer se soočamo z zahtevami po visoki zmogljivosti ob hkratni konkurenčni kakovosti, lahko vaš proces optimizirali in s tem dosegli še boljše rezultate? V tem osrednjem referatu vam bomo razkrili, kako lahko ANDRITZ poveča učinkovitost vaše priprave snovi pri proizvodnji recikliranega kartona s celostnimi rešitvami, ki so vedno usklajene z vašimi poslovnimi cilji.
Predstavili bomo celotno linijo proizvodov in storitev za tovarne celuloze in papirja po vsem svetu, s katerimi lahko ANDRITZ vaš glavni načrt optimizacije pripravi v 12 tednih. S primeri iz resničnega življenja in študijami primerov bo ta osrednji referat podal vpogled v to, kako se optimizacija delovanja izvaja v praksi.

– PROGRESS IN PRODUCTION PROCESSES –

ANDRITZ OCCASION – Maximize the performance of your OCC Stock Preparation

Winfried Wolf
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In today's world, where we are facing various problems, like dramatically increasing energy costs, degrading raw material quality or where we have a demand of high capacity simultaneously with competitive quality, do you feel that your process could be optimized in order to achieve even better results? This keynote speech will inform you how ANDRITZ is prepared to maximize the performance of your OCC Stock Preparation through holistic solutions, which are always aligned with your business goals.
We will discuss and present the full line of products and services for pulp & paper mills worldwide, with which ANDRITZ can prepare your optimization masterplan in 12 weeks. Through real-life examples and case studies this keynote speech will provide insight into how the performance optimization is conducted in practice.

KJER SE SREČATA TRADICIJA IN INOVACIJE – NOVI INFIBRAFINER DG

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InfibraFiner DG (digitalna generacija) je kombinacija odlične mehanske zasnove, ki temelji na desetletnih izkušnjah mletja z dvoploščnim rafinerjem, pametnih funkcij in najnovejše senzorske in krmilne tehnologije na trgu, okronane z odličnim industrijskim dizajnom. Z InfibraFiner-jem je Voith povečal proizvodno kapaciteto in uporabno moč ob istočasnem zmanjšanju moči v prostem teku ter stroška vzdrževanja. Osredotočili smo se tudi na varnost pri delu in predstavili novo patentirano napravo za menjavo rotorja. S tem orodjem je mogoče rotor pritrditi, izvleči iz in potisniti v stroj, ne da bi se rotorja samega sploh dotaknili.
Naš popolnoma nov koncept rafinerja jasno izstopa tako v smislu oblikovanja kot zmogljivosti. Pri razvoju smo sledili najvišjim standardom kakovosti. V skladu z našo oblikovalsko študijo »Papermaking Vision« smo se pri zasnovi osredotočili na privlačen videz, optimizirane uporabniške vmesnike in izvedbo čistega dizajna.

TRADITION MEETS INNOVATION – THE NEW INFIBRAFINER DG

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The InfibraFiner DG (Digital Generation) is a combination of excellent mechanical design based on decades of experience with double disc refining, smart functions and the latest sensor and control technology on the market crowned with a great industrial design. With the InfibraFiner, Voith increased throughput and applicable power while reducing the no load power, maintenance effort and machine footprint. Also, we focused on work safety and introduced a new patented rotor changing device. With this tool, the rotor can be secured, pulled out and pushed in the machine without even touching the rotor itself.
Our completely new refiner concept clearly stands out in terms of both design and performance values. During development, we pursued the highest quality standards. In line with our "Papermaking Vision" design study, the design focused on an appealing appearance, optimized user interfaces and the implementation of a clean design.

PREOBLIKOVANJE FORMIRANJA PAPIRJA – INOVATIVNE REŠITVE ZA OPTIMIZACIJO FORMACIJE

Gunther Feldmann, Masen Mouchantat, Domagoj Cunko, Aleksandar Henc, Balazs Hornyak, Udo Schober
Valmet GmbH, Marienburgstr. 35, 64297 Darmstadt, Germany

Sesalni valj podjetja VAlmet je novo orodje za doseganje višjih suhote v mokrem delu stroja. Ključno vprašanje za Valmet je bilo »ali lahko iztisnete vodo iz papirnatega traku v formirni skupini?«, s čimer prihranimo energijo vakuuma ter pozitivno vplivamo na lastnosti papirja. Izziv je bil najti tehnično možnost, ki bi lahko ustvarila stiskalni impulz na papirnem traku, ne da bi to negativno vplivalo na lastnosti papirja in čas obratovanja formirnega sita.
Valj je nameščen na poziciji proti valja zgornjega in spodnjega sita pri napravah Gapformer ali v območju zgornjega sita pri papirnih strojih z vzdolžnim sitom.
Izkušnje s pilotnimi testi in prvimi namestitvami so zdaj pokazale, da ima ta tako imenovani "sesalni valj" izjemen učinek na odvodnjavanje papirnega traku. Izkazalo se je, da sesalni valj deluje zelo dobro neodvisno od vstopne suhote.
Zaradi dobrega odvajanja vode na valju s sitom je mogoče zmanjšati vakuum v sitovi skupini. Poleg tega je mogoče izboljšati formiranje z večjim pretokom vode skozi natočno omaro.
Pozitivni učinki odvodnjavanja na valju s sitom na vezavo plasti in druge vrednosti trdnosti so še v zgodnjih fazah.
Valmetov nov OptiFlow natok s tehnologijo plastenja Aqua predstavlja korak naprej v tehnologiji plastenja. Uvaja vodno plast (ali "vodni klin") med plasti papirne snovi. Neposredna prednost te tehnologije vodnega plastenja je odlična čistost plasti s trenutnim razponom gramatur plasti in možnost uporabe nižjih gramatur v zgornjih plasteh za izboljšanje stroškovne učinkovitosti končnega proizvoda. Poleg tega se lahko vodna plast uporablja kot nosilec za nanašanje funkcionalnih aditivov, s čimer se poveča trdnost papirja ter izboljša obvladovanje procesa in fleksibilnost proizvodnje. Papirničarjem to odpira nova obzorja za razvoj rešitev, ki ustrezajo točno določenemu namenu, ki si jih je bilo prej mogoče le predstavljati.

TRANSFORMING FORMING - INNOVATIVE SOLUTIONS FOR OPTIMIZATION IN FORMING SECTION

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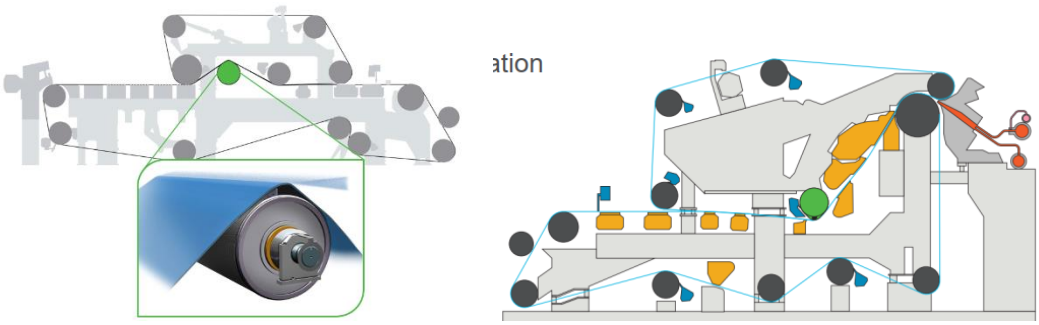
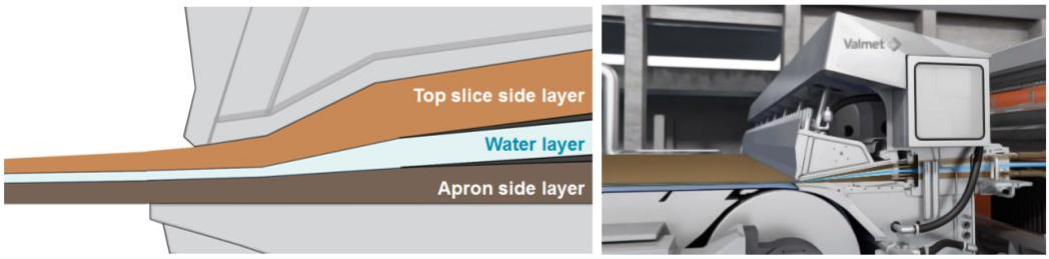
The sleeve roll is a new tool for producing the dry content in the forming section.
The crucial question for Valmet was "can you squeeze the water out of the paper web in the forming section?" and thus save vacuum energy and positively influence paper properties.

The challenge was to find a technical possibility that could generate a press impulse on the paper web without having a negative influence on paper properties and forming fabric running times.
The roll is installed in the position of the deflection roll of the top and bottom wire on Gapformers or in the area of the top wire on Fourdrinier machines.
Experiences from pilot tests and the first installations have now shown that this so-called "sleeve roll" has an outstanding effect on the dewatering of the paper web. It turned out that the sleeve roll works very well independent of the inlet dryness.
Due to the good dewatering of the sleeve roll, it is possible to reduce the vacuum performance in the wire section. In addition, it is possible to improve formation by sending more water through the headbox.
The positive effects of sleeve roll dewatering on plybond and other strength values are still in the early stages.

Valmet's new OptiFlow headbox with Aqua layering technology represents a step forward in layering technology. It introduces a water layer (or "water wedge") between the stock layers. The immediate benefit of this water layering technology is excellent layer purity with the current layer basis weight range and the opportunity to utilize lower basis weights in the top layers to improve the cost-efficiency of the final product. In addition, the water layer can be used as a carrier to apply functional additives, enhancing paper strength as well as improving process handling and production flexibility. For papermakers, this opens new horizons for developing fit-for-purpose solutions that could previously only be imagined.





SMARTTABLE – INTELIGENTNA REŠITEV PODJETJA RÖCHLING INDUSTRIAL OEPPING ZA SITOVO SKUPINO

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SmartTable opredeljuje revolucionarno rešitev podjetja Röchling Industrial Oepping za inteligentne sitove skupine v strojih z vzdolžnim sitom, zlasti za široko paleto različnih proizvodov in hitrosti strojev. Pametna tehnologija prinaša številne prednosti za doseganje učinkovitega procesa proizvodnje za vsako vrsto papirja.
Ključne prednosti SmartTable so:
· znatno izboljša kakovost papirja
· zviša lastnosti trdnosti kot so RCT, SCT, CMT
· izboljša formiranje
· poveča obseg proizvodnje
· zmanjša porabo energije
Modularna družina proizvodov SmartTable vključuje več elementov:
Po kotu ali višini nastavljive Smartfoils
Možnost individualne nastavitve kota in višine letve poveča zmogljivost odstranjevanja vode in optimizira stopnjo aktivnosti v coni oblikovanja na sitovi mizi, kjer se formira list papirja. Posledično se lahko formiranje znatno izboljša.
Boljše formiranje vodi do boljše trdnosti, kar rezultira v boljši kakovosti papirja oz. možnosti zmanjšanja stroškov za drage surovine, kot so les iglavcev ali aditivi za izboljšanje trdnosti. Nastavljiva formirna miza je tudi orodje, ki pomaga izboljšati lastnosti papirja. Točko pristanka curka iz natoka je med proizvodnjo mogoče optimizirati. Za to je na voljo skupno območje nastavitve v dolžini 100 mm.
Pametni vakuumski ventili so elektronsko krmiljeni vakuumski ventili za individualno krmiljenje tako območja z nizkim vakuumom kot območja z visokim vakuumom na sitovi mizi, kar izboljša kakovost papirja in učinkovitost odstranjevanja vode z optimalno uporabljenim vakuumom.
Zaradi integriranih vakuumskih senzorjev imajo operaterji pregled nad obstoječim vakuumom v sesalnih omaricah in ga lahko po potrebi individualno prilagajajo. Krmiljenje vakuuma zagotavlja operaterjem sigurnost, da vedo, kaj se dogaja v omaricah, in možnost, da enostavno zmanjšajo stroške z znižanjem vakuuma.
Senzorji suhote
Nepotrebne visoke ravni vakuuma pogosto ne izboljšajo odvodnjavanja. Ravno nasprotno, povzročajo veliko trenje med elementi odvodnjavanja in formirnim sitom.
S kombinacijo pametnih ventilov za krmiljenje vakuumov in pametnih senzorjev koncentracije je mogoče vakuum zmanjšati brez izgube učinkovitosti odvodnjavanja. Nepotrebne visoke ravni vakuuma so stvar preteklosti in zato je pogonska moč zmanjšana. Zmanjšani vakuumi pomenijo tudi, da je treba zagotoviti manjši pretok zraka.
Röchling Industrial Oepping zagotavlja popolno avtomatizacijo, vključno s programsko opremo in krmiljenjem Röchling.

SMARTTABLE - INTELLIGENT WIRE SECTION SOLUTION FROM RÖCHLING INDUSTRIAL OEPPING

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SmartTable defines the revolutionary intelligent wire section solution from Röchling Industrial Oepping for machines with fourdrinier wire tables especially for a wide range of different products and machine speeds. The smart technology brings numerous benefits to achieve an efficient paper production process for each paper grade.

Key advantages of SmartTable are:
significantly improve paper quality
increase strength properties like RCT, SCT, CMT
improve formation
increase production output
reduce energy consumption
The modular SmartTable product family includes several products:
Angle- or height adjustable Smartfoils:
The possibility to individually adjust the foil angle and height increases the dewatering capacity and optimizes the activity level in the sheet forming zone of the wire table where the fiber mobility takes place. Subsequently the formation can be improved significantly.
A better formation leads to higher strength properties, followed by a better paper quality, or the possibility to reduce costs for expensive raw materials like softwood or strength improvement additives.
The adjustable forming board box is also a tool which helps to improve paper properties. The jet landing point thoughout the headbox can be optimized during production. Therefore, a total adjustment range of 100 mm is available.
Smart vacuum valves are electronically controlled vacuum valves to individually control, both the low-vacuum area and the high-vacuum area of the wire table, and thus increase the paper quality and the dewatering performance through optimally applied vacuums.
Due to integrated vacuum sensors, operators have an overview of the existing vacuum in the suction boxes and are able to adjust it individually, if necessary. The vacuum control gives operators the safety to know what's happening inside the boxes as well as the possibility to easily reduce costs by minimizing the vacuum.
Dryness sensors
Unnecessary high vacuum levels often do not improve the dewatering. Quite the contrary, they lead to a high friction between dewatering elements and forming fabric.
With the combination of SmartValves for controlling the vacuums and the Smart Consistency Sensors, the vacuum can be reduced without losing dewatering efficiency. Unnecessary high vacuum levels are a thing of the past and therefore the driving power is reduced. Reduced vacuums also mean that less air flow needs to be provided.
Röchling Industrial Oepping supplies the complete automation including Röchling software and control.

OPREDELITEV REOLOŠKIH LASTNOSTI PREMAZNIH MEŠANIC NEPOSREDNO PRI UPORABNIKU

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Calcit je eden vodilnih proizvajalcev kalcijevo-karbonatnih pigmentov, funkcionalnih aditivov in granulatov na evropskem trgu. Strankam širom Evrope dobavljamo širok spekter proizvodov za področje papirništva, umetnih mas, barvne industrije, steklarstva, farmacije, kmetijstva, ekologije, gradbeništva in drugih.
Industrija papirja in kartona uporablja naše proizvode predvsem v obliki visoko koncentriranih suspenzij CaCO3 s širokim razponom velikosti in porazdelitve delcev: od zelo strmo porazdeljenih in finih posebnih materialov CoverPlex do položneje porazdeljenih grobejših proizvodov HydroPlex.
Izbiro naših proizvodov določajo končna uporaba in zahteve glede kakovosti papirja. Vendar pa v posebnih primerih, ko stranka zahteva optimizacijo razmerja med stroški in učinkovitostjo proizvodnje s spreminjanjem ali prilagajanjem koncentracije pigmenta v recepturi premazne mešanice, ekipa Calcit R&D nudi celovito podporo strankam v obliki reoloških študij na kraju samem. Naši visokokvalificirani strokovnjaki pridejo na strankino proizvodno lokacijo z rotacijskim reometrom Anton Paar MCR-302 in visokostrižnim viskozimetrom ACA AX 150 ter izvedejo karakterizacijo prvotne in spremenjene recepture premazne mešanice v celotnem razponu strižnih stopenj. Na ta način našim strankam zagotavljamo, da spremembe, ki jih izvedemo, ne bodo vplivale na njihove proizvodne procese.
Med številnimi rezultati reološke študije na kraju samem je bila uspešna zamenjava kaolina z našimi materiali CaCO3 in povečanje vsebnosti suhe snovi v recepturi premazne mešanice s prilagajanjem koncentracije zgoščevalca in veziva. V okviru tega projekta smo preučevali ključen vpliv zgoščevalnega sistema na strukturiranje in pretočnost recepture pri različnih strižnih hitrostih. Spremenjena receptura se še naprej uspešno uporablja v proizvodnem procesu.

ON-SITE RHEOLOGICAL STUDY OF THE COATING COLOURS FORMULATIONS

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Calcit is one of the leading producers of calcium carbonate pigments, functional additives and granules in the European market. Our businesses supply a wide range of products to customers throughout Europe, serving key industries such as paper, plastics, paint, glass, pharmaceuticals, agriculture, ecology, construction and others.
The paper and board industry consumes our products mainly in the form of highly concentrated $CaCO_3$ suspensions with a wide range of particle sizes and distributions: from the very steep and fine specialty CoverPlex to the broad and coarse HydroPlex materials.
The final application and quality requirements of the paper determine the choice of our products. However, in special cases where the customer requires cost/efficiency optimization

of production by changing or adjusting the pigment concentration in the coating colour formulation, the Calcit R&D team offers comprehensive customer support in the form of on-site rheological studies. Our highly qualified experts come to the customer's production site with an Anton Paar MCR-302 rotational rheometer and an ACA AX 150 high shear viscometer and perform characterization of the initial and modified coating colour formulation over the entire range of shear rates. In this way, we assure our customers that the changes we make will not affect their production processes.

Among the many results of the on-site rheology study was the successful replacement of clay with our $CaCO_3$ materials and increasing the solids content of the coating colour formulation by adjusting the concentration of thickener and binder. Within this project we studied the crucial impact of thickening system on the structurization and flowability of the formulation at different shear rates. The modified formulation continues to be successfully used in the production process.

– PAMETNA IN TRAJNOSTNA PROIZVODNJA –

PREMIK OD OPISNE K PREDPISOVALNI ANALITIKI Z UPORABO UMETNE INTELIGENCE: ZGODBE O USPEHU IZ PROIZVODNJE PAPIRJA

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Na voljo je nov pristop k posodobitvi postopkov proizvodnje papirja z uporabo umetne inteligence (UI) in napovedne analitike, ki zagotavljata meritve in povratne informacije v realnem času za optimiziranje kakovosti in učinkovitosti proizvodnje. Za razliko od tradicionalnih postopkov proizvodnje papirja, ki temeljijo na laboratorijskih testih, ki se izvajajo redno ali občasno, ta pristop uporablja algoritme strojnega učenja, ki zagotavljajo takojšnje povratne informacije o ključnih indikatorjih procesa. Takojšnje povratne informacije operaterjem omogočajo sprejemanje informiranih odločitev glede upravljanja stroja ter izvedbo ustreznih in pravočasnih prilagoditev za izboljšanje učinkovitosti in zmanjšanje nekakovostne proizvodnje.
Ta predstavitev govori o tem, kako se lahko UI uporablja v postopkih proizvodnje papirja za sporočanje nadzornih odločitev in kakšne so njene možne koristi. Natančneje, ekipa bo govorila o tem, kako UI omogoča napovedno analitiko z zagotavljanjem razumevanja indikatorjev, kot so spremembe hitrosti, nihanje kappa vrednosti in spremembe v kemičnih procesih, v realnem času. Avtorji raziskujejo tudi potencialno uporabo UI pri uporabi obstoječih podatkov iz laboratorijskih testov za nadaljnje izboljšanje napovedne natančnosti. Ekipa bo predstavila tudi študijo primera iz velike papirnice, kjer so uvedli ta pristop, in dosežene rezultate, vključno z izboljšanjem učinkovitosti in optimizacijo kakovosti.
UI in napovedna analitika lahko prispevata k večji učinkovitost papirnih strojev. Z uporabo preskusov natezne trdnosti v mokrem je mogoče prilagoditi kemijo trdnosti v mokrem za optimizacijo in prilagoditi ciljne vrednosti trdnosti za boljši nadzor. Poleg tega meritve trdnosti, gladkosti in gramature v povezavi z meritvami debeline omogočajo učinkovito optimizacijo gramature. Nazadnje, uporaba napovedne analize za teste spor, ki zahtevajo več kot dva dni za dokončanje, omogoči učinkovitejši mikrobiološki (MB) nadzor. UI in napovedna analitika imata ob uspešni implementaciji velik potencial za optimizacijo papirnih strojev.
Na splošno ponuja ta predstavitev izčrpen pregled, kako je mogoče UI uporabiti za napovedno analitiko v postopkih proizvodnje papirja, in govori o njenih možnih koristih za izboljšanje učinkovitosti strojev in optimizacijo nadzora kakovosti. Namenjena je vsem, ki jih zanima razumevanje vpliva naprednih tehnologij na posodabljanje papirništva.

– SMART AND SUSTAINALBE MANUFACTURING –

MOVING FROM DESCRIPTIVE TO PRESCRIPTIVE ANALYTICS USING AI: SUCCESS STORIES IN PAPERMAKING

Juha Rintala, Matthew Callicott
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A novel approach to modernizing papermaking operations is available using artificial intelligence (AI) and predictive analytics that provide real-time measurements and feedback to optimize production quality and efficiency. Unlike traditional papermaking operations that rely on laboratory tests conducted over time or periodically, this approach uses machine learning algorithms that provide instant feedback on key process indicators. Instantaneous feedback allows operators to make informed control decisions and appropriate and timely adjustments to improve efficiency and reduce off-quality production.

This presentation discusses how AI can be used in papermaking operations to inform control decisions and what its potential benefits are. Specifically, the team will discuss how AI enables predictive analytics by providing real-time understanding of indicators such as speed changes, kappa swings, and chemistry changes. The authors also explore the potential use of AI for utilizing existing data from laboratory tests to further refine predictive accuracy. Finally, the team presents an example case study from a large paper mill that implemented this approach and discuss their results, including efficiency gains and quality optimization.

AI and predictive analytics can bring greater efficiency to paper machines. By using wet tensile tests, it is possible to adjust wet strength chemistry for optimization and to adjust strength targets for better control. Moreover, strength, smoothness and basis weight measurements, in tandem with caliper measurements, enable efficient basis weight optimization. Lastly, using predictive analysis for spore tests, which require more than two days to complete, results in more efficient microbiological (MB) control. AI and predictive analytics, when successfully implemented, have great potential to optimize paper machines.

Overall, this presentation provides a comprehensive overview of how AI can be applied for predictive analytics in papermaking operations and discusses its potential benefits for improving machine efficiency and optimizing quality control. It is intended for those who are interested in understanding the impact of advanced technologies on modernizing papermaking.

ZMANJŠANJE PORABE PARE IN ELEKTRIKE TER ZNIŽANJE STROŠKOV S POMOČJO NOVIH APLIKACIJ ZA AVTOMATIZACIJO (DIGITALNI DVOJČEK)

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Je energija in varčevanje z energijo še vedno vroča tema v energetsko intenzivni proizvodnji papirja?
Nova orodja in koncepti zaprtega nadzora za zmanjšanje stroškov pare in električne energije.
Prihranki energije v papirništvu
Na podlagi predpisov in spodbud odločitve o projektih izboljšav prehajajo s tradicionalne donosnosti naložb na donosnost naložb v energetiko in zmanjšanje emisij ogljikovega dioksida. Dobičke v zvezi z energijo je mogoče doseči z uvedbo in optimizacijo inteligentne tehnologije za upravljanje obstoječih krmilnih procesov in opreme, kar ustvarja prihranke v milijonih evrov.
Pred kratkim sta se AutomationX in GAW techologies združila in namestila inovativno tehnologijo Predictive Controller and Process Optimizer v eni od evropskih tovarn lahkih kartonov za embalažo, kar je omogočilo 6-odstotno zmanjšanje porabe energije.
Povprečni letni strošek energije za papirni stroj standardne do polne velikosti lahko znaša do 65 milijonov USD, preračunano na proizvodnjo približno 700 ton/dan pri 2500 kWh na tono in 10 centov/kwh.
Z uporabo naše vrhunske tehnologije bi lahko 6 % pomenilo prihranek v višini skoraj 4 milijonov EUR letno.
Kako to naredimo?
Z uporabo naprednega industrijskega računalništva in termodinamike se izdela »digitalni dvojček« papirnega stroja in procesa v obratu. Računalniško ustvarjen papirni stroj in obrat lahko zagotovita poostren nadzor s takojšnjim reševanjem povratnih informacij o procesu, namesto da bi čakali na podatke iz dejanskih sušilnih skupin ali procesov v obratu.
V kombinaciji z naprednim procesnim krmiljenjem digitalni dvojček učinkovito napoveduje obnašanje obrata in prinaša prihranke energije zaradi manjšega števila napak pri krmiljenju in hitrejšega odzivnega časa. Digitalna rešitev si nenehno prizadeva za najboljšo zmogljivost obrata in tako dosega oprijemljive rezultate pri varčevanju z energijo.
Povzetek varčevanja z energijo:
Prihranki na papirnem stroju po skupinah;
Mokri del in sušilna skupina 3 %;
Rekuperacija toplote v naknadnem sušilnem valju 2 %;
Kondenzatni sistem 1 %.
Skupno znižanje porabe pare 6 %.
Ocenjeni prihranek električne energije 2–3 %.

COST SAVINGS BY REDUCING STEAM AND ELECTRICITY CONSUMPTION WITH THE HELP OF NEW AUTOMATION APPLICATIONS (DIGITAL TWIN)

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Short description:
Is energy and energy saving still a hot potato in energy-intensive papermaking?
New tools and closed control concepts for cost reduction in steam and electricity.

Papermaking Energy ROI
Driven by regulations and incentives, improvement project decisions are transitioning from traditional ROI to carbon emission and energy returns. Energy-related gains can be achieved by deploying and optimizing intelligent technology to manage existing process controls and equipment creating savings in the millions of euros.
Recently AutomationX and GAW technologies teamed-up to install innovative Predictive Controller and Process Optimizer technology for a European lightweight containerboard paper mill resulting in a 6% energy-use reduction.
The average annual energy costs for a standard to full size paper machine can be as high as $65 million based on approximately 700 tons/day at 2500 kwh per ton and 10 cents/kwh.
Using our leading-edge technology, 6% could mean a savings of nearly €4 million annually.

How is it done?
A "digital twin" of the paper machine and plant process is constructed, using advanced industrial computing and thermodynamics. The computer-based paper machine and plant can provide tighter control by solving process feedback immediately, versus waiting for the actual pm dryer sections and plant processes to come around.
Combined with advanced process controls, the digital twin effectively predicts plant behaviour and yields energy savings due to reduced control error and a faster response time. The digital solution continually chases for best plant performance thereby realizing tangible energy saving results.

Energy saving summary:

Paper Machine Section Savings
Wet End and Dryer Section 3 %
After-dryer Heat Recovery 2 %
Condensate System 1 %

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Total steam use reduction 6 %

Bonus Electrical Energy Estimated 2-3%.

UPRAVLJANJE Z ENERGIJO ZA POVEČANJE PRODUKTIVNOSTI IN ZNIŽANJE STROŠKOV

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Učinkovito upravljanje z energijo pri proizvodnji papirja ali kartona lahko omogoči znatne prihranke pri stroških. V sušilni skupini se porabi precejšnja količina energije, predvsem z uporabo sveže pare v sušilnih cilindrih. Vendar pa se velik del te energije izgubi z odpadnim zrakom , ki odnaša uparjeno vodo. Da bi izboljšali porabo energije in prihranili stroške, je ekonomsko koristno pridobivanje energije iz odpadnega zraka.
Optimizacija sistemov za rekuperacijo toplote in ravnovesje zračnih tokov v sušilni skupini imata ključno vlogo pri doseganju prihrankov energije. Z zajemanjem visoke entalpije vlažnega odpadnega zraka skozi izmenjevalnike toplote in vračanjem nazaj v sistem je mogoče doseči znatne prihranke energije. Ustrezna optimizacija sušilne nape ter razmerje dovodnega in odpadnega zraka sta bistvena za učinkovito sušenje papirja in učinkovito rekuperacijo toplote.
V študiji primera v podjetju DS Smith Croatia sta optimizacija sistema za rekuperacijo toplote in izboljšano ravnovesje pretoka zraka v sušilni skupini omogočila prihranek energije in izboljšano proizvodnjo papirja.
Ko je zračni sistem optimiziran in dobro usklajen s konstrukcijskimi vrednostmi, se lahko poraba pare na stroju PM3 zmanjša za približno 3,7 t/h. To zmanjšanje predstavlja približno 13 % skupne letne porabe pare, potrebne za proizvodnjo papirja in za druge procese na stroju.
Z optimizacijo sistema rekuperacije toplote in doseganjem boljšega ravnovesja zračnih tokov v sušilni skupini stroja PM3 v podjetju DS Smith Croatia so se procesni pogoji za sušenje papirja približali projektiranim vrednostim. Ta optimizacija je omogočila prihranke energije in opazno izboljšanje proizvodnje papirja na stroju PM3.

ENERGY MANAGEMENT FOR ENHANCED PRODUCTIVITY AND COST REDUCTION

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Effective energy management in paper or board production can lead to significant cost savings. A substantial amount of energy is consumed in the dryer section, primarily using live steam in the cylinders. However, a significant portion of this energy is lost through the exhaust air carrying away evaporated water. To maximize energy usage and achieve cost savings, it is economically beneficial to recover energy from the exhaust air.

The optimization of heat recovery systems and the balance of airflows in the dryer section play a crucial role in achieving energy savings. By capturing the high enthalpy of the moist exhaust air through heat exchangers and returning it back into the system, substantial energy savings can be realized. Properly optimizing the drying hood and the ratio of supply and exhaust air are essential for effective paper drying and efficient heat recovery.

In a case study at DS Smith Croatia, the optimization of the heat recovery system and improved airflow balance in the dryer section resulted in energy savings and improved paper production. When the air system is optimized and closely aligned with the design values, the steam consumption at the PM3 machine can be reduced by approximately 3.7 t/h. This reduction accounts for about 13% of the total annual steam consumption required for papermaking and other processes on the machine.

Through the optimization of the heat recovery system and achieving an improved balance of airflows in the dryer section of the PM3 machine at DS Smith Croatia, the process conditions for paper drying were brought closer to the design values. This optimization resulted in energy savings and a notable improvement in paper production at the PM3 machine.

Z USTREZNIM MAZANJEM DO VIŠJE UČINKOVITOSTI

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Mazanje je sestavni del rotacijske opreme in odločilni dejavnik pri vzdrževanju strojev. Prednostna naloga, ki jo ima mazanje, je ključnega pomena za gospodarski uspeh podjetij, ki so odvisna od mehanske proizvodnje.
V SKF ne zagotavljamo samo prilagojenih mazalnih rešitev za celulozno in papirno industrijo, ampak nenehno izboljšujemo svojo ponudbo, da ustvarimo najvišjo možno vrednost za naše stranke. Dobava pravega maziva ob pravem času ni dovolj. Naš cilj je zagotoviti najboljšo kakovost maziv, hkrati pa zmanjšati količine in porabo na minimum v dobro našega skupnega okolja in zanesljivosti vaših sredstev.
Tehnologija mazanja se nenehno razvija, da bi dobre rešitve postale še boljše.

LUBRICATING TO HIGHER PERFORMANCE

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Lubrication has been an integral part of rotating equipment and a determining factor in machine maintenance. The priority given to lubrication is critical for the economic success of companies that depend on mechanical production.
SKF does not only provide tailored lubrication solutions to the pulp & paper industry, but we continuously improve our offerings to generate the highest possible value for our customers. Supplying the right lubricant at the right time is not enough. We aim at providing the best lubricant quality while reducing quantities and consumption to a minimum for the sake of our common environment and the reliability of your assets.
Lubrication technology is constantly evolving to make good solutions even better.

– POSTER SEKCIJA –

ZNIŽANJE PORABE ENERGIJE NA PS Z IZBOLJŠANJEM ODVODNJAVANJA V SKUPINI STISKALNIC

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Eden od pomembnih vidikov odvodnjavanja v skupini stiskalnic je dizajn vprege, saj ima le-ta pomembno vlogo pri učinkovitosti odstranjevanja vode. Ker se je Voith zavedal potenciala polimernih slojev v mokri klobučevini, jih je nenehno razvijal. Velika zakladnica izkušenj je bila pridobljena s predhodnikom vseh modelov s polimerno plastjo, imenovanim »Spectra«. Zaradi svoje zmogljivosti je še vedno aktualen, njegove prednosti in slabosti pa so privedle do dizajnov +Peak.
Med proizvodnjo papirja se na stroju spreminjajo gramatura, vrsta papirja in hitrost ter zaradi starosti vprege se količina vode, ki jo je treba odstraniti v skupini stiskalnic, razlikuje za vsako posamezno klobučevino . Če velikost in prostornina por ustrezata količini vode iz papirnega traku, lahko pričakujemo najboljše vrednosti suhote.
Klobučevine +Peak ohranjajo funkcionalnost daljše obdobje v primerjavi s standardnimi. To predvsem pomeni višjo suhoto. Da voda pravočasno pride do sesalnega valja ali strukturo sita, so potrebne kratke pretočne poti. To pomeni, da lahko ustrezno oblikovane obloge pomagajo pri odvodnjavanju in ga celo izboljšajo.
Zato je Voith opravil študije, s katerimi je preučil površinsko zasnovo sesalnih in stiskalnih valjev ter njihov vpliv na proces odvodnjavanja. Eden od rezultatov te stalne raziskave je program za analizo NipMaster, ki omogoča izračun impulzov pritiska, specifičnih tlakov in časa zadrževanja. NipMaster vizualizira pot vsake posamezne vodne kapljice, jo izračuna in določi dobljeno povprečje. To omogoča vpogled v to, kako učinkovita je trenutna zasnova površine in kako jo je mogoče optimizirati za skrajšanje pretočnih poti.
Zato prava kombinacija primerno zasnovane stiskalne klobučevine in oblog valjev izboljša odvajanje vode v skupini stiskalnic in zmanjša porabo energije papirnega stroja.

– POSTER SESSION –

REDUCING PM ENERGY CONSUMPTION BY IMPROVING THE DEWATERING IN THE PRESS SECTION

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One important aspect of the dewatering in the press section is the design of the clothing as it plays a significant part in dewatering efficiency. Knowing about potential of polymeric layers

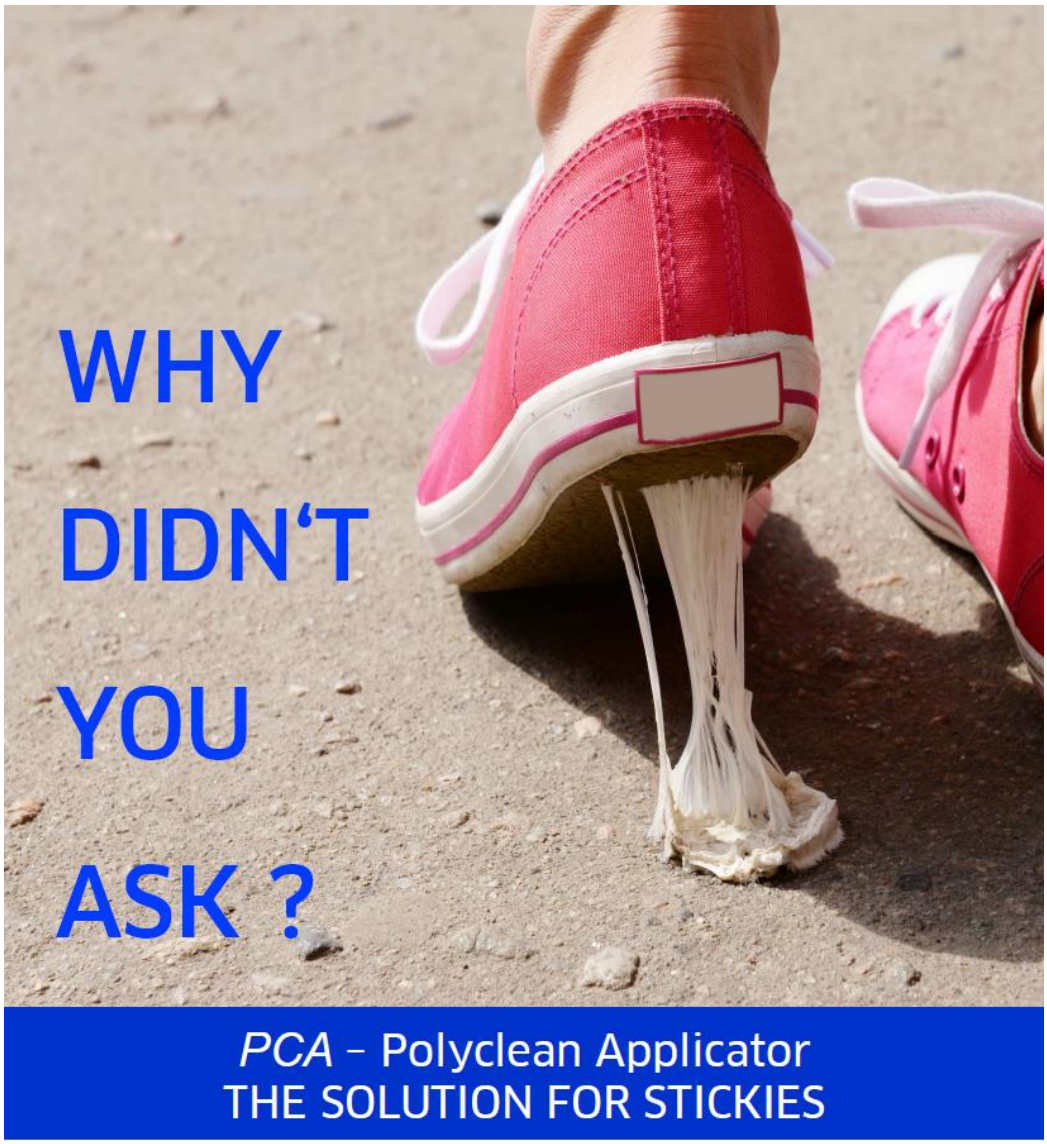
in press cloth, Voith continuously developed it. A big treasure trove of experience was gained with the forebear of all polymeric layer containing designs named "Spectra". Due to its performance it`s still actual and its pros and cons gave birth to +Peak designs.

As a paper machine varies paper weight, grade, speed, and due to clothing age the amount of water to be handled in a press section differences by each single felt itself. If pore size and volume are adequate to the amount of water from the paper web best dryness figures can be expected.

+Peak felts can handle more water for a longer period. This means higher dryness as a first point. But it means as well that more water arrives at a roll cover or shoe press sleeve. To get the plus of water into the apertures of a cover or sleeve structure in time, short flow paths are asked. This means that appropriate designed covers can support dewatering and even improve it.

Therefore, Voith has conducted studies to investigate the surface design of suction and press rolls, and their influence on the dewatering process. One outcome of this ongoing research is the NipMaster analysis program, which allows press impulses, specific pressures, and dwell times to be calculated. NipMaster visualizes the path taken by every single water droplet is calculated and the resulting average determined. This in turn provides insights into how efficient the current surface design is and how it can be optimized to reduce flow paths.

As a result, the right combination of appropriate designed press felt and covers improves the dewatering in press part and reduces the energy consumption of paper machine.



Zbornik povzetkov

49. Mednarodnega letnega simpozija DITP

Oblikovanje platnice
BlueOrange Design, Barbara Tepina, s. p.

Uredile
Petra Prebil Bašin, Sabina Alagić, Tea Kapun

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