ZBORNIK PREDAVANJ 2024

BOOK OF ABSTRACTS 2024

Programski in organizacijski odbor za pripravo 27. Dneva slovenskega papirništva

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50 LET SIMPOZIJA DITP

Tjaša Drnovšek
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Kratek pregled petdesetih let organizacije simpozija DITP.
Najprej je treba povedati kdaj, kje in zakaj je prišlo do ideje o ustanovitvi Društva DITP, katerega otrok je vsakoletni simpozij (1974); in poudariti, kdo ima nesporne zasluge za to.
V prvih letih so bili na simpoziju udeleženci papirne stroke iz ožje domovine takratne Jugoslavije, a vedno bolj tudi tuji strokovnjaki. V nadaljevanju so začeli soustvarjati podobo simpozija tudi predstavniki inštitutov in univerz. To je bilo obdobje z najštevilčnejšo udeležbo (okoli 300).
Po razpadu Jugoslavije (1991) se je število udeležencev drastično zmanjšalo; tako domačih, kot tujih. Vzroki so bili finančni in tudi nejasna politična situacija. V teh negotovih časih je leta 1997 k organizaciji pristopilo ZPPPI pri GZS. Od takrat naprej oni organizirajo Dan papirništva, ki je na programu prvi dan srečanja, drugi del je namenjen predavanjem na simpoziju.
Za potek prvega dne poskrbi promocijska skupina Združenja, medtem ko programski svet DITP v mednarodni zasedbi oblikuje vsakoletno obravnavano temo na simpoziju. To naše letno srečanje je bilo več kot 40 let na Bledu, zdaj se že nekaj let odvija v Postojni. Število udeležencev se vrti okoli števila 100.
Simpozij poteka pod vodstvom aktualnega predsednika DITP; v vseh teh letih so se zamenjali le trije in moramo jih omeniti. Kot tudi nekaj posameznikov, ki so vsebinsko oblikovali podobo simpozija.

50 YEARS OF DITP SYMPOSIUM

Tjaša Drnovšek
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A brief overview of fifty years of organizing the DITP symposium.
First of all, it is necessary to say when, where and why the idea of founding the DITP Society, whose child is the annual symposium (1974); and to point out who has the indisputable merits for it.
In the first years, participants in the paper profession from the home country Yugoslavia at the time, but more and more also foreign experts were at the symposium. Subsequently, representatives of institutes and universities also began to co-create the image of the symposium. During this period, the largest participation was recorded (around 300).
After the breakup of Yugoslavia (1991), the number of participants, both domestic and foreign, decreased drastically. The reasons were financial and also the unclear political situation.
During these uncertain times, in 1997, the PPCIA of our Chamber of Commerce joined the organization. Since then, they have been organizing the "International meeting of Slovene paper industry", which is on the program of the first day of the meeting, the second part is dedicated to the lectures at the symposium.
The PPCIA Promotional Team takes care of the course of the first "International meeting of Slovene paper industry", while the DITP Program Council, composed of international members, formulates the theme discussed each year at the symposium. Our annual meeting has been held in Bled for more than 40 years, now it has been taking place in Postojna for several years. The number of participants is around 100.
The symposium is being held under the leadership of the current president of DITP, so far only three have been in this position and all three need to be mentioned. In addition to a few individuals who shaped the image of the symposium in terms of content.

AVTOMATIZACIJA IN UMETNA INTELIGENCA V PAPIRNIŠTVU

PRIHODNOST TOVARNE PAPIRJA: VSTOPAMO V OBDOBJE POPOLNE AVTONOMIJE

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Papirna industrija je na pragu nove dobe – prihodnosti, kjer se inovacije in avtomatizacija združijo in s tem na novo definirajo samo bistvo proizvodnje papirja. Istočasno se soočamo z večjim številom izzivov kot kadarkoli doslej: krčenjem proračunov in virov, naraščajočim pomanjkanjem ustrezno kvalificiranih delavcev in novo, nujno potrebo po trajnostnosti. V predstavitvi poglobljeno predstavljamo transformacijski potencial avtonomne tovarne papirja ter rešitve, ki jih le-ta ponuja za navedene izzive. Verjamemo, da lahko avtomatizacija okrepi spopadanje z današnjimi bolečimi točkami industrije in postane osnova prizadevanj za blažitev podnebnih sprememb za trajnostni jutri.

Nove tehnologije avtonomne tovarne papirja bodo katalizator sprememb, ki bodo sektor celuloze in papirja ter papirno industrijo na splošno pognale v prihodnost, katere značilnost bodo podnebno pozitivne prakse. Avtonomne tovarne papirja nam bodo omogočile, da aktivno zakorakamo proti novim industrijskim standardom, v skladu s katerimi se viri ohranjajo, ponovno uporabljajo in reciklirajo, s čimer bomo zmanjšali ekološki odtis papirne industrije.

Digitalizacija ima potencial, da ne le podpre to industrijo, temveč okrepi njena največja osnovna sredstva: stroje, ki delujejo z izjemno natančnostjo, ki jih poganjajo umetna inteligenca, podatkovna analitika in pametni senzorji – s spajanjem vrhunske tehnologije z načeli krožnosti in trajnostnosti. Avtonomne tovarne papirja bodo opolnomočile kvalificirano delovno silo z naprednimi orodji, ki jim bodo omogočala sprejemanje odločitev na podlagi podatkov ter predvidevanje izzivov, s čimer se bo zmanjšala možnost napak in napačnih izračunov. Napredni sistemi, ki jih poganja UI, in integracija interneta stvari bodo zagotovili natančen nadzor nad porabo virov, zmanjšanje količine odpadkov in povečanje uporabe obnovljivih materialov.

V podjetju Voith verjamemo, da avtonomna tovarna papirja pooseblja odpornost in prilagodljivost na podnebne izzive. Njena agilnost pri odzivanju na zahteve trga, združena s sposobnostjo hitrega inoviranja, lahko sektor celuloze in papirja pozicionira kot dinamično silo v industriji. Upamo, da bomo s to predstavitvijo spodbudili razpravo, sodelovanje in partnerstva v podporo skupni zavezanosti k izkoriščanju tehnologije za trajnostno in krožno prihodnost, ki bo odporna na podnebne spremembe.

HARNESSING AUTOMATION AND AI IN PAPERMAKING

THE PAPER MILL OF THE FUTURE: ENTERING THE AGE OF FULL AUTONOMY

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The paper industry is on the brink of a new era – a future where innovation and automation merge to redefine the very essence of papermaking. At the same time, we're facing more challenges than ever: shrinking budgets and resources, a growing lack of skilled workers, and a new, urgent need for sustainability. This presentation delves into the transformative potential of the autonomous paper mill and the solutions it offers to these challenges. We believe that automation can counter the industry's pain points of today and spearhead climate change mitigation efforts for a sustainable tomorrow.

The new technologies of the autonomous paper mill will be a catalyst for change, propelling the pulp and paper sector as well as the paper industry in general toward a future characterized by climate-positive practices. Autonomous paper mills will allow us to take an active step toward new industry standards where resources are conserved, reused, and recycled, reducing the paper industry's ecological footprint.

Digitalization has the potential to not only support the industry but amplify its biggest assets: machines operating with remarkable precision, powered by artificial intelligence, data analytics, and smart sensors – fusing cutting-edge technology with the principles of circularity and sustainability. Autonomous paper mills will empower the skilled workforce with advanced tools, enabling them to make data-driven decisions and foresee challenges, thus reducing the potential for mistakes and miscalculations. Advanced AI-driven systems and IoT integration will ensure precise control over resource consumption, minimizing waste and maximizing the use of renewable materials.

At Voith, we believe the autonomous paper mill embodies resilience and adaptability in the face of climate challenges. Its agility in responding to market demands, coupled with its ability to innovate rapidly, can position the pulp and paper sector as a dynamic force within the industry. With this presentation, we hope to engender discourse, collaboration, and partnerships, fostering a collective commitment towards leveraging technology for a sustainable, circular, and climate-resilient future.

UMETNA INTELIGENCA KOT DEL GRAFIČNEGA DELOVNEGA PROCESA

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V zadnjem desetletju je umetna inteligenca (UI) postala nepogrešljiv del industrije in zasebnega poslovnega delovanja. V tem pogledu je grafična industrija ena od vodilnih pri vpeljavi UI orodij kot del vsakodnevnega poslovanja. Razvoj in uporaba UI sta v grafično oblikovanje prinesla številne inovacije in spremembe, predvsem v načinu, kako ustvarjamo in interpretiramo vizualne vsebine ter kako UI orodja pripomorejo k poenostavljanju in posledično hitrejšemu tehničnemu napredovanju snovanja, npr. nove embalaže, medtem ko je znatnega pomena v delovnem procesu še vedno ostala stopnja kreativnosti oblikovalca. V ta namen smo raziskali uporabo, vpliv in stopnjo zanesljivosti UI kot orodja/pripomočka za avtomatizacijo določenih delovnih operacij snovanja ali posodabljanja grafičnega izgleda izdelka. Upoštevali smo obseg uporabe UI, stopnjo razvitosti (prepoznavanje čustev, proporcionalnost delov teles, idr.), smernice EU o uporabi UI in se soočili z etično dilemo, ki jo UI sočasno vzbuja pri uporabnikih in naročnikih.

ARTIFICIAL INTELLIGENCE AS PART OF THE GRAPHIC WORK PROCESS

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Over the last decade, artificial intelligence (AI) has become an indispensable part of industry and the private sector. In this regard, the graphic arts industry has been one of the pioneers in introducing AI tools into everyday business. The development and use of AI have brought about many innovations and changes in graphic design, which are mainly expressed in the way we create and interpret visual content and how AI tools help to simplify and consequently accelerate the technical progress of design, e.g. in new packaging, while the designer's level of creativity in the work process remains of considerable importance. To this end, we investigated the use, impact and degree of reliability of AI as a tool/utility to automate certain work processes when designing or updating the graphic appearance of a product. We also investigated the extent of AI usage, the level of development (recognition of emotions, proportionality of body parts, etc.), and EU directives on the use of AI, as well as the ethical dilemma that AI poses for users and customers.

BREZŽIČNI SENZORJI VIBRACIJ IN VGRAJENA UI ZA PREDVIDLJIVO VZDRŽEVANJE

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Uvod: V današnjem industrijskem okolju so strategije predvidljivega vzdrževanja ključne za zmanjšanje zastojev in povečanje učinkovitosti. V naši predstavitvi predstavljamo inovativen hibridni pristop, ki združuje prednosti vgrajene UI za odkrivanje nepravilnosti s klasično analizo signalov. To dosežemo z visoko zmogljivimi senzorji vibracij, ki lahko zajamejo frekvence do 12,8 kHz.

Tehnologija in metodologija: Naš pristop izkorišča prednosti vgrajene UI za odkrivanje anomalij v realnem času. To se dopolnjuje z uporabo zmogljivih senzorjev vibracij, ki omogočajo podrobno analizo signalov. S tem dvostopenjskim pristopom lahko zmanjšamo porabo energije brezžičnih senzorjev na samo nekaj mikroamperov (µA). To ne zagotavlja samo življenjske dobe več kot pet let, temveč omogoča tudi uporabo tehnologij pridobivanja energije iz okolja, zaradi česar so senzorji energijsko avtonomni.

Študija primera iz papirne industrije: Na osnovi resničnega primera iz papirne industrije dokazujemo uspešno izvedbo tega pristopa. Kombinacija napredne senzorske tehnologije in vgrajene UI ni le drastično zmanjšala potreb po energiji, ampak je tudi znatno izboljšala zanesljivost in učinkovitost vzdrževalnih procesov.

Prijaznost do uporabnika in preglednost: Drugi poudarek naše predstavitve je na prijaznosti do uporabnika in preglednosti rezultatov meritev. Razvita rešitev je intuitivna za uporabo in zagotavlja jasne, razumljive podatke, ki so dragoceni za nadaljnje ekspertne sisteme. To uporabnikom olajša interakcijo s tehnologijo in zviša raven sprejetosti vzdrževalnih strategij, ki temeljijo na UI.

Premagovanje zadržkov glede UI: Z našo predstavitvijo želimo tudi omiliti strahove glede modelov UI in tako imenovanih pristopov "črne skrinjice". Občinstvo želimo spodbuditi, da sprejme podporo orodij, ki temeljijo na UI, in izkoristi njihove prednosti. S pregledno predstavitvijo in praktičnimi primeri jasno pokažemo, da UI ni samo zanesljiva, temveč tudi uporabniku prijazna in učinkovita.

Zaključek: Predstavljen hibridni pristop k predvidljivemu vzdrževanju združuje najnovejše tehnologije zaznavanja in UI za energetsko učinkovito, uporabniku prijazno in pregledno rešitev. Veselimo se podrobne razprave o teh razvojnih dosežkih in njihovih prednostih med našo predstavitvijo, ki podaja praktičen vpogled v uporabo teh inovativnih tehnologij.

WIRELESS VIBRATION SENSORS AND EMBEDDED AI FOR PREDICTIVE MAINTENANCE

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Introduction: In today's industrial environment, predictive maintenance strategies are crucial for minimizing downtime and maximizing efficiency. In our presentation, we introduce an innovative hybrid approach that combines the benefits of embedded AI for anomaly detection with classical signal analysis. This is achieved using high-performance vibration sensors capable of capturing frequencies up to 12.8 kHz.

Technology and Methodology: Our approach leverages the strengths of embedded AI to detect anomalies in real-time. This is complemented by integrating powerful vibration sensors that enable detailed signal analysis. Through this two-tiered approach, we can reduce the energy consumption of wireless sensors to just a few microamperes (µA). This not only allows for a lifespan of over five years but also enables the use of energy harvesting technologies, making the sensors energy-autonomous.

Case Study from the Paper Industry: Using a real-world example from the paper industry, we demonstrate how this approach has been successfully implemented. In this context, the combination of advanced sensor technology and embedded AI has not only drastically reduced energy requirements but also significantly improved the reliability and efficiency of maintenance processes.

User-Friendliness and Transparency: Another focus of our presentation is on the user friendliness and transparency of the measurement results. The developed solution is intuitive to use and provides clear, comprehensible data that are valuable for downstream expert systems. This makes it easier for users to interact with the technology and increases the acceptance of AI-based maintenance strategies.

Overcoming Reservations about AI: Our presentation also aims to alleviate fears about AI models and so-called "black-box" approaches. We want to encourage the audience to embrace the support of AI-based tools and take advantage of their benefits. By presenting transparently and providing practical examples, we show that AI is not only reliable but also user-friendly and effective.

Conclusion: The presented hybrid approach to predictive maintenance combines the latest technologies in sensing and AI to offer an energy-efficient, user-friendly, and transparent solution. We look forward to discussing these developments and their benefits in detail during our presentation, providing practical insights into the application of these innovative technologies.

TRAJNOSTNOST V PAPIRNI INDUSTRIJI

KROŽNO GOSPODARSTVO V PAPIRNIŠTVU: IZKUŠNJA PODJETJA FAVINI

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Ko razmišljamo o krožnem gospodarstvu v papirništvu, takoj pomislimo na recikliranje celuloznih vlaken.

Italijanska papirna industrija je zaradi pomanjkanja primarnih surovin (95 % celuloze je uvožene) močno odvisna od recikliranja, zato razvija specializirano industrijo, ki je pri predelavi papirja postala ena najučinkovitejših na svetovni ravni. Vendar pa obstaja veliko več materialov iz drugih industrijskih področij, ki bi jih bilo mogoče reciklirati v proizvodnji papirja, pa jim običajno ne dajemo takega pomena.

Favini, italijansko podjetje z dolgoletno tradicijo proizvodnje specialnih in barvanih papirjev, je našlo način za recikliranje teh neobičajnih materialov, s čimer je odprlo nove možnosti za različne sektorje.

Izhajajoč iz izkušenj z Alga Carta v letu 1992, ko je podjetje Favini izdelalo papir z uporabo razraslih morskih alg v Beneški laguni, je v naslednjih letih postalo jasno, kako bi lahko pri proizvodnji specialnih papirjev svežo celulozo nadomestili s stranskimi proizvodi kmetijsko-industrijskega sektorja. To se je zaključilo leta 2014 z uvedbo serije papirjev Crush, kjer različni kmetijsko-industrijski ostanki nadomeščajo do 15 % svežih vlaknin v proizvodnji različnih barvnih papirjev. Nekaj let kasneje, leta 2017, je podjetje Favini izumilo metodo za predelavo kolagenskih vlaken, ostankov industrije strojenja in usnjarstva, v proizvodnji papirja in tako ustvaril serijo papirja Remake, specialnega papirja s 25 %-no vsebnostjo ostankov usnja. Leta 2019 pa se je podjetje tovarna vrnilo k samemu izvoru papirja in preučilo novo metodo za vključitev tekstilnih ostankov v papir ter lansiralo serijo papirja Refit s 25 % recikliranih tekstilnih ostankov.

Skozi leta so izkušnje podjetja Favini s preko 400 različnimi testiranimi materiali omogočile razvoj koncepta krožnega gospodarstva in vzpostavitev omrežja, ki lahko različne ostanke pretvori v sekundarne surovine, primerne za proizvodnjo papirja.

Predstavljamo izkušnjo podjetja Favini na tem potovanju v krožno gospodarstvo in pojasnjujemo, kako dati materialu drugo priložnost, ki je prej ni imel.

SUSTAINABILITY IN THE PAPER INDUSTRY

CIRCULAR ECONOMY IN PAPERMAKING: FAVINI'S EXPERIENCE

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When thinking about circular economy in papermaking, recycling of the cellulosic fibres is what comes to mind immediately.

The Italian paper industry, due to the lack of virgin raw materials (95% of the cellulose is imported), relies heavily on recycling, developing a specialised industry which became one of the most efficient at global level in paper recovery. Though, there are many more materials, coming from other industrial areas, that could be recycled in paper production and are not considered usually.

Favini, Italian papermill with a long tradition in special and dyed papers, found a way to recycle such unusual materials, opening to new possibilities for different sectors.

Starting from the experience of Alga Carta in 1992, when Favini produced a paper using the overgrown seaweeds in the Lagoon of Venice, in the following years it became clear how by-products of the agro-industrial sector could be used to replace virgin cellulose in special papers. This ended up with the launch of Crush paper series in 2014, where different agro-industrial residues are used to replace up to 15% of virgin fibres in the production of different colourful papers. After few years, in 2017 Favini invented a method to recover the collagen fibres, residues of the tanning and leather industry, in papermaking, thus creating the Remake paper series, special paper with 25% of leather residues inside. Finally, in 2019 the papermill came back to the very origins of paper and studied a new method to include the textile residues in paper, launching the Refit paper series, with the 25% of recycled textile residues.

In the years, Favini's experience over the 400 different materials tested allowed to develop the concept of circular economy and create a network able to convert different residues in secondary raw materials, suitable for papermaking.

We hereby report Favini's experience in this journey into circular economy, explaining how to give a second chance to material which had none before.

TRAJNOSTNOST Z DONOSNOSTJO SREDSTEV (ROI)

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Ali lahko proizvajalci kartona, papirja, celuloze in tissue papirja prihranijo vire in obvarujejo okolje, hkrati pa zmanjšajo proizvodne stroške?

Na podlagi projektov, ki so bili izvedeni na terenu, IBS dokazuje, da je na to vprašanje mogoče odgovoriti z jasnim da - in vse to ob ohranjanju ali celo izboljšanju kakovosti papirja. Vsi predstavljeni projekti vodijo k zmanjšani ali optimizirani uporabi virov, kot so vlakninski material, energija, kemikalije ali voda. Hkrati se pri vseh projektih naložba povrne prej kot v enem letu. Projekti ponazarjajo, da je zagotovo mogoče uspešno združiti ekologijo in ekonomičnost. Doseženi rezultati se ne splačajo le v smislu trajnostnosti, ampak jih je mogoče tudi tržiti različnim deležnikom, kot so stranke, zaposleni ali regionalna politika.

Predstavitev rezultatov, doseženih s posameznimi sistemskimi rešitvami na terenu, je razvrščena po tako imenovanih področjih ukrepanja. Področja ukrepanja in njihova prednostna razvrstitev so bila izpeljana iz tipične strukture proizvodnih stroškov pri proizvodnji kartona v srednji Evropi. Poudarjena so naslednja področja ukrepanja:

- **Optimizacija porabe vlaknin:** Delež stroškov vlaknin v proizvodnji papirja, ne glede na to, ali gre za sveža vlakna ali reciklirana vlakna, je precejšen in znaša skoraj 50 %. Ukrepi, ki zmanjšajo potrebo po vlakninah ob ohranjanju enake kakovosti izdelka oz. omogočajo povečanje deleža recikliranega papirja z nižjimi stroški, so zelo donosni.
- **Zmanjšanje porabe toplotne energije:** Poraba pare za sušenje papirja je ogromna in predstavlja okoli 20 % celotnih proizvodnih stroškov.
- **Zmanjšanje porabe električne energije:** Poraba električne energije za motorje, pogone in sisteme za zagotavljanje vakuuma predstavlja približno 10 % celotnih proizvodnih stroškov.
- **Zmanjšanje porabe kemikalij:** Tu so glavni povzročitelji stroškov škrob za uporabo v masi in škrob za površinsko klejenje, sledijo pa dodatki za izboljšanje mehanskih lastnosti in druge procesne kemikalije.
- **Zmanjšanje porabe vode:** Poraba vode, ne glede na to, ali gre za svežo ali odpadno vodo, je zelo kompleksna in pogosto lokalna problematika. Ukrepi na tem področju so usmerjeni v zmanjšanje porabe sveže vode in s tem količine odpadne vode.
- **Zmanjšanje količine odpadnega papirja in pretrgov papirja:** Vsak pretrg papirja pomeni izgubo proizvodnih virov, moti kontinuirano proizvodnjo in obremeni osebje ter posamezne dele strojev. Poleg neposredne izgube produktivnosti ima pretrg papirja vedno za posledico tudi določeno fazo manj kakovostne proizvodnje, dokler ni doseženo stabilno obratovanje stroja. Zmanjšanje količine izmeta in nenačrtovanih zastojev ne le prihrani vire, čas in denar, ampak vodi tudi do večje proizvodnje papirja.

Skratka, predstavljeni projekti jasno kažejo, da je mogoče tudi z majhnimi, netveganimi ukrepi in projekti, med katerimi so nekateri hitro izvedljivi, doseči velike trajnostne prihranke na zgoraj navedenih področjih ukrepanja.

SUSTAINABILITY WITH ROI

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Is it possible for producers of cardboard, paper, pulp and tissue to save resources and the environment while reducing production cost?

Based on projects that have been implemented in the field, IBS demonstrates that this question can be answered with a clear yes - and all while maintaining or even improving paper quality. All the projects presented lead to a reduced or optimized use of resources such as furnish, energy, chemicals or water. At the same time, all projects have a return on investment of less than 1 year. They illustrate that it is absolutely possible to successfully combine ecology and economy. The results achieved not only pay off in terms of sustainability but can also be marketed to various stakeholders such as customers, employees or regional politics.

The presentation of the results achieved with the respective system solutions in the field is clustered according to so-called fields of action. The fields of action and their prioritization were derived from a typical production cost structure of containerboard production in Central Europe. The following fields of action are highlighted:

- ***Optimization of fiber usage**: The proportion of fiber costs in paper production, whether virgin fiber or based on recovered paper, is considerable and amounts to almost 50%. Measures that reduce the fiber requirement while maintaining the same product quality or allow the proportion of recovered paper to be increased at lower cost are highly profitable.*
- ***Reduction of thermal energy consumption**: The steam consumption for drying paper is enormous and accounts for around 20 % of the total production costs.*
- ***Reduction in electricity consumption**: Electricity consumption for motors, drives and vacuum supply systems accounts for around 10 % of total production costs.*
- ***Reduction of chemicals consumption**: The main cost drivers here are mass starch and surface starch, followed by strengthening additives and other process chemicals.*
- ***Reduction of water consumption**: Water consumption, regardless of whether it is fresh water or wastewater, is very complex and often a local issue. Measures in this field are aimed at reducing freshwater consumption and thus wastewater volumes.*
- ***Reduction of wastepaper and paper breaks**: Every paper break wastes resources, disrupts continuous production and puts a strain on personnel and machine components. In addition to the direct loss of production, a paper break also always results in a quality-restricted ramp-up phase until stable operation is achieved. Reducing waste and unplanned downtime not only saves resources, time and money, but also leads to an increase in the amount of paper produced.*

All in all, the projects presented clearly show that even small, risk-free measures and projects, some of which can be implemented quickly, can achieve major sustainable savings in the areas of action listed above.

KONCEPT ZA UČINKOVITO RECIKLAŽO VLAKNIN IZ REJEKTOV PO RAZPUŠČANJU IN GROBEM PREBIRANJU

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Danes je recikliranje primarnih surovin kot sekundarnih surovin bistvenega pomena za zagotavljanje oskrbe v prihodnosti, zmanjšanje onesnaževanja okolja in ohranjanje surovin za naslednje generacije.

Potencial recikliranja papirja in vlaknin je ogromen.

Nekaj dejstev:
- letna svetovna proizvodnja znaša 420 milijonov ton papirja,
- vsako leto zavržemo 85 milijonov ton papirja,
- 40 % odlagališč odpadkov nastane zaradi papirja,
- za proizvodnjo papirja porabimo 13–15 % svetovne proizvodnje lesa,
- 25–30 % vseh odpadkov predstavlja papirna embalaža,
- svetovno povpraševanje po papirju naj bi se do leta 2032 povečalo za 10–15 %, z današnjih 420 na 480 milijonov ton.

Če recikliramo 1 tono papirja, prihranimo približno:
- 1.440 litrov surove nafte,
- 26.500 litrov vode,
- 2,3 m^3 prostornine odlagališča odpadkov,
- 4.000 kW energije,
- približno 17 dreves.

S povečanim recikliranjem in višjo stopnjo recikliranja se količina neželenega materiala povečuje, povpraševanje po opremi, s katero lahko predelamo povečano število nečistoč in dosegamo učinkovito čiščenje, pa postaja vse večje.

Pri predelavi odpadnega kartona je količina rejektov največja v postopku razpuščanja.

Rejekti so nečistoče, sestavljene predvsem iz grudic vlaken, nerazpuščenega papirja, sponk, kovine, peska, stekla, plastike in lepil. V največji možni meri jih je treba odstraniti že v najzgodnejši fazi postopka priprave.

Sestava rejektov iz razpuščevalnika:
- 70 % različnih vrst ostankov (mešana plastika, kovine, les, agregati, mokromočni papirji, itd.),
- 30 % recikliranih vlaken.

Tecnofer je razvil učinkovito tehnologijo za predelavo preostalih vlaken v rejektih razpuščevalnika.

Običajni rezultati:

- predelava do 98 % vlaken pridobljenih iz rejektov razpuščevalnika,
- zmanjšanje stroškov za odstranjevanje odpadkov za 70 %,
- stiskanje plastične frakcije, da dosežemo 80–90 %-no vsebnost suhe snovi iz vijačne stiskalnice,
- plastična frakcija, ki postane gorivo z visoko kalorično vrednostjo.

EFFICIENT FIBER-RECOVERY CONCEPT FOR PULPER AND COARSE SCREENING REJECTS

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Nowadays the recycling of primary raw materials as secondary raw materials is essential to ensure the future supply, to reduce the environmental pollution and to preserve them for next generations.

The potential in Paper and Fiber recycling is enormous.

Some facts:
- *420 million tons of paper is produced globally each year,*
- *85 million tons of paper is dumped each year,*
- *40 % of landfills is generated by paper,*
- *13–15 % of the global wood production is used to produce paper,*
- *Paper packaging is 25–30 % of all trash,*
- *The global paper demand is expected raise by 10–15 % from today 420–480 Mio. until 2032.*

If 1 ton of paper is recycled it saves around:
- *1.440 liters of crude oil,*
- *26.500 liters of water,*
- *2,3 m^3 of landfill volume,*
- *4.000 kW of energy,*
- *About 17 trees.*

With increased recycling and recycling ratio the amount of unwanted material is raising up and the demand on equipment which can handle the increased number of impurities and efficient cleaning is getting higher.

In the OCC process the amount of produced rejects is the highest out of the Pulping process.
The rejects are impurities consist mainly of fiber lumps, undissolved papers, staples, metals, sand, glass, plastics, and adhesives. Rejects should be removed in the largest possible size and in the earliest stage possible in the preparation process.

The Pulper reject composition is
- *70 % residues of various kinds (mixed plastic's, metals, wood, aggregates, wet strength papers, etc.),*

- *30 % recycled fibers.*

Tecnofer has developed an effective technology for the recovery of the remaining fibers in the pulper rejects.

Typical results are:
- *Recovery up to 98 % of the fibers in the pulper rejects,*
- *Reduction of the disposal costs up to 70 %,*
- *Plastic fraction squeezing to reach a dry content of 80–90 % out of the screw press,*
- *Plastic fraction which is becoming a fuel resource with high calorific value.*

OBDELAVA PROCESNE VODE PO "VZORU IZ NARAVE"

Stefan Franke, Lionel Pomade
Servophil AG, Bösch 73, 6331 Hünenberg, Švica

Razvoj okolju prijaznih rešitev za obdelavo vodnih krogotokov je zapisan v DNK podjetja Servophil.

Namesto biocidov že več kot pet let uspešno uporabljamo naša inovativna funkcionalna čistila na osnovi bakterij (S-BACPRO) v vedno večjem številu aplikacij v papirni industriji.

Možnih je veliko načinov uporabe:
- obvladovanje vonjav
- nadzor organskih oblog
- preprečevanje zakisanosti
- posredna podpora za preprečevanje legionele v sistemih za hladilno vodo; in še veliko več jih bomo odkrili.

Prednosti so nedvomne: optimizacija procesa brez kemikalij, trajnostnost, zmanjšanje tveganja za operaterje in okolje.

Z odločitvijo, da posnemamo naravo z bio-osnovanimi izdelki in zmanjšamo uporabo običajnih kemikalij na minimum, smo v Servophilu jasno zavezani bolj trajnostni prihodnosti.

WATER TREATMENT "INSPIRED BY NATURE"

Stefan Franke, Lionel Pomade
Servophil AG, Bösch 73, 6331 Hünenberg, Switzerland

It is in Servophil's DNA to develop environmentally friendly solutions for the treatment of water cycles.

For more than 5 years now, we have been successfully using our innovative functional bacteria-based cleaners (S-BACPRO) instead of biocides in an ever-growing number of applications in the paper industry.

There are many applications possible:
- odour control
- organic deposits control
- acidification prevention
- indirect support for Legionella prevention in cooling water systems and still many more to be discovered.

The benefits are undeniable: process optimization without chemicals, sustainability, risk reduction for the operators and for the environment.

By choosing to mimic nature with bio-based products and reduce the use of conventional chemicals to the minimum, Servophil is clearly committed to a more sustainable future.

TRAJNOSTNI PRISTOP PODJETJA KEMIRA

Herbert Anzenberger, Štefan Žganec
Kemira OYJ, Energiakatu 4, 00101 Helsinki, Finska

Trajnostnost je večplasten koncept, ki zajema odgovorno ravnanje z viri za zagotavljanje blaginje sedanjih in prihodnjih generacij. Združuje okoljske, ekonomske in družbene dimenzije, s ciljem uravnotežiti človeške potrebe z zmožnostjo planeta, da zagotavlja življenje.

Korporativna trajnostnost je sestavni del načina sprejemanja odločitev v Kemiri. Naš pristop pomeni zaupanja vredno naložbo za naše delničarje. Našim strankam pa prinaša boljšo učinkovitost rabe virov, zanesljivost in prepričanje, da so kemikalije, ki jih uporabljajo, izdelane in dobavljene na etičen, trajnosten način. V skupnostih po vsem svetu nam pomaga, da smo upoštevani kot zaupanja vreden partner, delodajalec in vodilni v poslu.

Trajnostnost je ključno gonilo naše strategije in nedvoumen pogoj za naš dolgoročni uspeh. K trajnostnosti pristopamo celostno, pri čemer naše aktivnosti temeljijo na robustnih, odgovornih poslovnih praksah. Upoštevamo vse vidike trajnostnosti: okoljske, družbene in ekonomske. Pri našem pristopu k trajnostnemu delu izberemo najpomembnejše teme in ustvarimo notranja fokusna področja ter programe okoli njih.

Ta predstavitev ponuja vpogled v naše delo za dosego naših ciljev do leta 2045.
O strategiji, načelih, zavezah in bonitetnih ocenah.
Način certificiranja izdelkov: PCF / LCA / OC / EPD / HP.
Certificiranje ISCC s primeri.
Status quo našega procesa.

Kemija z namenom.
Vsak dan boljši.

KEMIRA'A SUSTAINABILITY APPROACH

Herbert Anzenberger, Štefan Žganec
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Sustainability is a multifaceted concept that encompasses the responsible management of resources to ensure the well-being of current and future generations. It integrates environmental, economic, and social dimensions, aiming to balance human needs with the planet's capacity to support life.

Corporate sustainability is an integral part of the way we take decisions at Kemira. Our approach means a more trustworthy investment for our shareholders. For our customers, it brings better resource efficiency, reliability, and confidence that the chemicals they are using are made and supplied in an ethical, sustainable manner. And in communities around the world, it helps us to be a trusted partner, employer, and business leader.

Sustainability is the key driver of our strategy and a clear requirement for our long-term success. We approach sustainability holistically and our fundament in this work is based on robust, responsible business practices. We take into consideration all aspects of sustainability; environmental, social and economic. In our approach to sustainability work we choose our most material topics and create internal focus areas and programs around those.

This presentation gives you insights into our work to achieve our goals by 2045.
About Strategy, Principles, Commitments and Ratings.
The way of product certification: PCF / LCA / OC /EPD / HP.
ISCC certification with examples.
Status quo of our process.

Chemistry with a purpose.
Better every day.

INOVATIVNI IZDELKI IN PREMAZI

KATIONSKI SILIKONSKI PREMAZI ZA ZAŠČITO ARHIVSKIH PAPIRJEV

Doris Bračič[a], Janez Kosel[b], Lea Legan[b], Polonca Ropret[b], Matej Bračič[a]*
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Večnamenski postopki obdelave zgodovinskih papirjev so izjemno zanimivi, saj so papirji dovzetni za razgradnjo, ki jo povzročajo različni dejavniki, ki jih lahko grobo razdelimo na endogene (kislost, kovinski ioni, lignin ali razgradni produkti) in eksogene (toplota, vlaga, UV svetloba, kisik, onesnaževala ali biodeteriogeni). [1] Blažitev njihovih negativnih učinkov predstavlja velik izziv, saj zahteva multidisciplinaren pristop. V tej raziskavi so kationski silikoni (CatSil) uporabljeni na zgodovinskem papirju za obravnavo težav z rastjo gliv, kislostjo papirja in zmanjšano mehansko trdnostjo. Prikazan je postopek premazovanja papirja, vključno z učinkovitostjo penetracije, določeno z meritvami SEM/EDX prečnih prerezov papirja in njihovo površinsko morfologijo s 3D topografijo. Pokazalo se je, da premazi ne spremenijo površinskih lastnosti papirja. Sposobnost papirjev, prevlečenih s CatSil, za nevtralizacijo kislin in ustvarjanje alkalne rezerve je bila dokazana s potenciometričnimi titracijami in je primerljiva s standardnimi nevtralizacijskimi sredstvi, npr. alkalnimi delci različnih oksidov. Vpliv CatSil-a na ohranitev mehanskih lastnosti papirja je bil preučevan z meritvami pretržne sile, raztezanja in elastičnega modula z uporabo standardnih metod mehanskega testiranja. Pokazalo se je, da premazi ne poslabšajo mehanske celovitosti zgodovinskih papirjev. Sposobnost papirjev, prevlečenih s CatSil, za zaviranje ali celo preprečevanje rasti gliv so bili preučevani na štirih glivnih sevih, aktivnih na celulazo, ki so bili prvotno izolirani iz zgodovinskih knjig. Ocena rasti gliv z mikroinvazivno fluorescenčno mikroskopijo in neinvazivno FTIR spektroskopijo je razkrila, da je zaviranje rasti možno že pri nizkih koncentracijah 1-5 ut. %, rast pa je mogoče popolnoma preprečiti pri višjih koncentracijah 10-30 ut.%.

1.Strlič, M. & Kolar, J. (Narodna in univerzitetna knjižnica, 2005)

INNOVATING PRODUCTS AND COATINGS

CATIONIC SILICONE COATINGS PROTECT HISTORICAL PAPER

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Multifunctional treatments of historic paper are of great interest as the papers are prone to degradation caused by various factors which can roughly be divided into endogenous (acidity, metal ions, lignin or degradation products) and exogeneous (heat, humidity, UV light, oxygen, pollutants or biodeteriogens). [1] Mitigating their negative effects of these factors is a great challenge as it requires a multidisciplinary approach. In this work, cationic silicones (CatSil) were applied to historic paper to address the issue of fungal growth, paper acidity, and decreased mechanical strength. Insights in the dip-coating process of the papers were revealed including the penetration efficiency determined by SEM/EDX measurements of the papers cross-sections and their surface morphology by 3D topography. It was shown that the coatings to not alter the papers surface properties. The ability of the CatSil coated papers to neutralise acids and impart an alkaline reserve were shown by potentiometric titrations and were comparable with standard neutralising agents, e.g., alkaline particles of various oxides. The effect of the CatSil on preserving the mechanical properties of the paper were examined by measuring the papers force at tear, elongation, elastic modulus using standard mechanical testing methods. It was shown that the coatings to not impair the mechanical integrity of the historical papers. The ability of the CatSil coated papers to inhibit or even prevent fungal growth was examined on four cellulase-active fungal strains, originally isolated from historical books. Fungal growth evaluation by micro-invasive fluorescence microscopy and non-invasive FTIR spectroscopy revealed that inhibition of growth is possible at low concentrations of 1–5 wt% already and that growth can be completely prevented at higher concentrations of 10–30 wt.%.

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

NAČRTOVANI PIGMENTNI KONCEPTI ZA NAJBOLJŠO ZMOGLJIVOST PAPIRJA IN KARTONA

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Calcit je eden vodilnih proizvajalcev kalcijevega karbonata, pigmentov, funkcionalnih dodatkov in granulatov na evropskem trgu. Naše podjetje zagotavlja široko paleto izdelkov strankam po vsej Evropi in oskrbuje ključne panoge, kot so industrija papirja, plastike, barv, stekla, farmacije, kmetijstva, ekološke industrije, gradbeništva in druge.

Calcit ponuja široko paleto mokro mletih izdelkov iz naravnega kalcijevega karbonata (HydroPlex in CoverPlex), ki jih odlikujeta izjemno visoka kemijska čistost in dobre optične lastnosti. Tem izdelkom sledi širok razpon velikosti delcev in porazdelitev velikosti delcev, zato se ti izdelki uporabljajo kot polnila in premazni pigmenti v industriji papirja in kartona.

Calcit zelo uspešno izpolnjuje visoke zahteve strank glede končnih lastnosti izdelkov iz papirja in kartona. Stalni razvoj in razumevanje različnih mineralov in njihovih kombinacij nam omogočata, da smo konkurenčni na tem zahtevnem trgu. Medtem ko se proizvajalci grafičnega papirja bolj osredotočajo na doseganje gladke in sijajne površine papirja, se industrija papirne embalaže osredotoča na izboljšanje prekrivnosti in povečanje svetlosti končnega izdelka v kombinaciji s posebnimi zahtevami glede možnosti tiskanja (lasersko, ink-jet itd.), občasno pa tudi na vse vrste barier.

Calcit kot eden vodilnih proizvajalcev nenehno spremlja nove tržne trende in tako podpira priložnosti za izboljšave. Znano je, da optične lastnosti, oblika, velikost in porazdelitev pigmentnih delcev močno vplivajo na premazno plast na papirju in kartonu ter nadalje na končne lastnosti. Zato smo iskali nove rešitve za izpolnjevanje zahtev glede kakovosti končnega papirja in kartona.

Poleg stalnih tehnoloških izboljšav naših osnovnih pigmentov iz kalcijevega karbonata smo razvili koncept mešanja različnih mineralov. Z razumevanjem lastnosti večmineralnih premaznih mešanic za papir in karton lahko izboljšamo kakovost in učinkovitost končnih aplikacij.

DESIGNED PIGMENT CONCEPTS FOR BEST PAPER AND BOARD PERFORMANCE

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Calcit is one of the leading producers of calcium carbonate pigments, functional additives and granulates in the European market. Our businesses deliver a broad range of products to customers across Europe, serving key industries such as paper, plastics, paints, glassmaking, pharmacy, agriculture, ecology, construction, and others.

Calcit provides a wide range of wet grinded natural calcium carbonate products (HydroPlex and CoverPlex) which stands out with their exceptionally high chemical purity and optical properties. Followed by a wide range of particle sizes and particle size distributions, these products used as fillers and coating pigments in the paper and board industry.

Calcit is very successful in meeting customers' high demands for the final properties of paper and board products. Continuous development and understanding of industrial minerals and their combinations enables us to be competitive in this demanding market.

While graphic paper producers are more focused on achieving a smooth and glossy-surface of the paper, the paper-based packaging industry is focusing on improving the opacity, coverage and increasing the brightness of final product in combination with special demand in printability (laser, inkjet etc.) and from time to time as well in all kinds of barriers.

As one of the leading GCC producer, Calcit is constantly following new market trends and is able to support opportunities for improvement. It is well known that the optical properties, shape, size and distribution of pigment particles have a major impact on the coating layer on paper and board and further on the final properties. Therefore, we have been looking for new solutions to meet the quality requirements of the final paper and board.

In addition to the continuous technological improvement of our core calcium carbonate pigment, the concept of blending different minerals has been developed. By understanding the multi-mineral performance of coating colors for paper and board, we are able to improve the quality and performance of end applications.

RAZVOJ BATERIJSKIH SEPARATORJEV IZ MATERIALOV NA OSNOVI PAPIRJA

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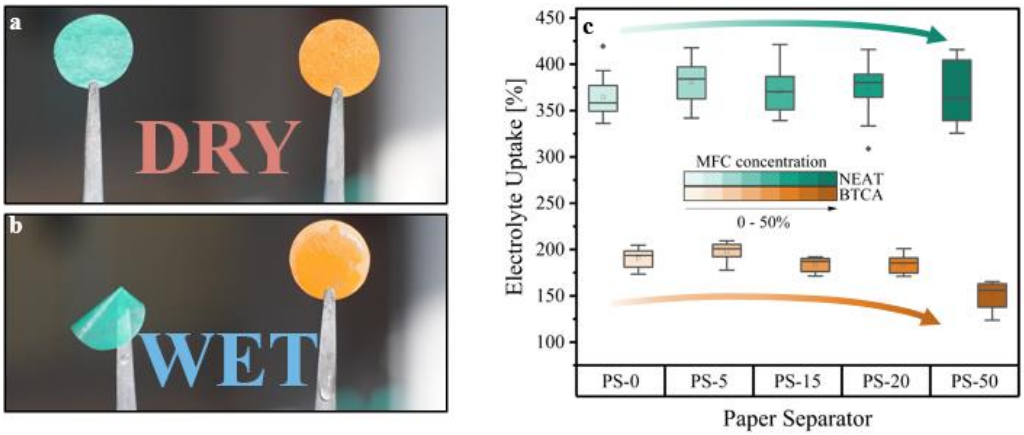
Pri iskanju izboljšav na področju okolju prijaznega shranjevanja energije je uporaba trajnostnih materialov nujna. Separatorji na osnovi celuloze se pojavljajo kot ključne komponente za ekološke sisteme za shranjevanje energije. Med običajnimi težavami s temi separatorji sta neustrezna poroznost in mehanska trdnost v mokrem stanju. Naša raziskava predstavlja učinkovito metodo za izboljšanje strukturnih parametrov teh separatorjev s spajanjem do 50 masnih % mikrofibrilirane celuloze (MFC) s tradicionalnim papirjem, s čimer obvladujemo debelino (okoli 40 mikronov), prepustnost zraka (0,1–200 cm³/s) in trdnost. Vključitev MFC pospeši oblikovanje gosto tkane mreže. Kljub temu so imeli separatorji na začetku pomanjkljivo dimenzijsko stabilnost in nizko natezno trdnost v vlažnih okoljih, ki sta bistvenega pomena za praktično uporabo pri montaži in delovanju. Da bi se spopadli s tem, smo uporabili zamreženje z 1,2,3,4-butantetrakarboksilno kislino (BTCA), ki je izjemno povečala trdnost v mokrem do 6700 %, hkrati pa ohranila prvotne dimenzije separatorja. Elektrokemične ocene, kot sta impedančna spektroskopija in razširjeno galvanostatično polnjenje/praznjenje (cikliranje), z več kot 7500 cikli, so pokazale, da so naši izboljšani separatorji konkurenčni običajnim steklenim in polipropilenskim separatorjem glede difuzije ionov, hitrosti polnjenja in praznjenja, odpornosti na ohmske izgube in ohranjanja kapacitivnosti. Naša študija potrjuje, da lahko separatorji na osnovi papirja, če so izdelani z novimi tehnikami zamreževanja, uspešno rešijo trenutne težave s stabilnostjo in trdnostjo, kar omogoča izdelavo robustnejših naprav za shranjevanje zelene energije.



Slika 1. barvni separatorji PS-15 (zeleni: NEAT, oranžni: BTCA, ⌀ = 15 mm), ki dokazujejo svojo dimenzijsko stabilnost pred (a) in po namočenju (b); Absorpcija/prehajanje elektrolita vzorcev NEAT in BTCA

Reference:
[1] Julian Selinger et al.: Form-stable, crosslinked cellulose-based paper separators for charge storage applications, Carbohydrate Polymers, 2024, in press.

PAPER-BASED MATERIALS IN THE DESIGN OF BATTERY SEPARATORS

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In the search for eco-friendly energy storage advancements, the use of sustainable materials is imperative. Cellulose-based separators are emerging as pivotal components for eco-conscious energy storage systems. Common issues with these separators include inadequate porosity and mechanical strength in wet state. Our research introduces an effective method to enhance the structural parameters of these separators, by fusing up to 50 wt. % microfibrillated cellulose (MFC) with traditional paper, thus controlling thickness (around 40 microns), air permeability (0.1–200 cm³/s), and strength. Thereby, the inclusion of MFC fosters a densely woven network formation. Despite this, the separators initially showed suboptimal dimensional stability and low tensile strength in moist environments, which are vital for practical application in assembly and operation. To tackle this, we applied crosslinking with 1,2,3,4-butanetetracarboxylic acid (BTCA), which dramatically reinforced the wet strength by up to 6700 % whilst maintaining the separator's original dimensions. Electrochemical assessments such as impedance spectroscopy and extended galvanostatic cycling, with over 7500 cycles, revealed that our improved separators rival conventional glass and polypropylene separators in terms of ion diffusion, charge and discharge rates, resistance to Ohmic loss, and capacitance retention. Our study confirms that paper-based separators, when engineered with novel crosslinking techniques, can successfully resolve existing stability and strength issues, which allows to produce more robust green energy storage devices.

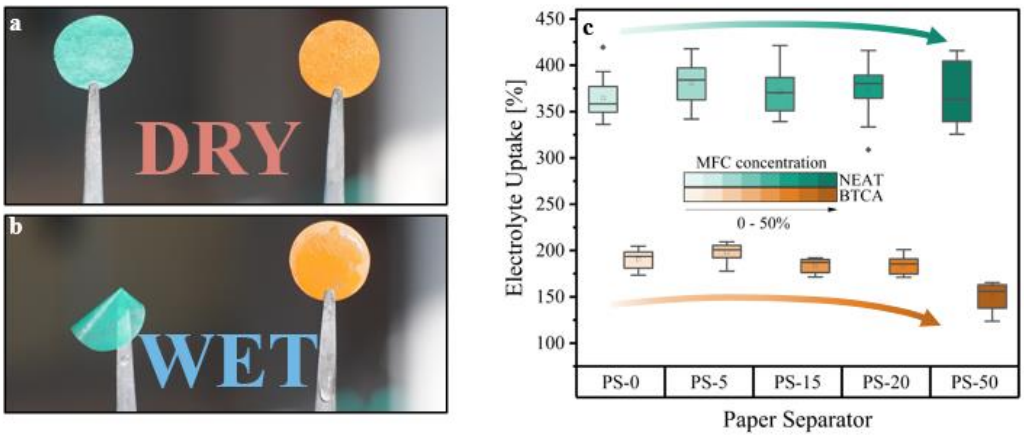

Figure 1. *colored PS-15 (green: NEAT, orange: BTCA, ⌀ = 15 mm) separators demonstrating their dimensional stability before (a) and after being wettened (b); Electrolyte Uptake of NEAT and BTCA samples*

References:
[1] Julian Selinger et al.: Form-stable, crosslinked cellulose-based paper separators for charge storage applications, Carbohydrate Polymers, 2024, in press.

TRAJNOSTNI MATERIALI ZA SAMOLEPILNE ETIKETE OBČUTLJIVE NA PRITISK

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Etikete igrajo ključno vlogo pri identifikaciji izdelkov in podajajo pomembne informacije o lastnostih izdelka. Uporabljati so se začele v zgodnjem 18. stoletju, etiketiranje izdelkov, kot ga sedaj poznamo, pa se je razvilo ob koncu 19. stoletja, ko so bile izdelane prve cenejše večbarvne papirnate etikete, natisnjene z litografijo.

Samolepilne etikete, izumljene sredi 30ih let 20. stoletja, so začele vplivati na trg etiketiranja izdelkov v poznih 60ih letih 20. stoletja in od takrat njihova uporaba konstantno narašča. Danes samolepilne etikete občutljive na pritisk (oznake PSA) zavzemajo več kot 50 % delež na trgu etiket. Ker so tanke, lahke in fleksibilne se lahko PSA etikete nanesejo na različne površine in oblike, zato se veliko uporabljajo za označevanje raznolikih izdelkov, med drugim tudi za majhne gospodinjske aparate. Sestavljene so iz temeljne vrhnje plasti, lepila in podloge, pri čemer se predvsem za vrhnjo plast uporabljajo različni materiali, prevladujejo pa sintetični polimeri.

V okviru naše raziskave smo pregledali več vrst PSA etiket s ciljem poiskati možne alternativne materiale, ki so bolj ekološki od obstoječih sintetičnih. V današnjem času je namreč zelo pomembno, da so izdelki izdelani tako, da čim manj obremenjujejo okolje, kar velja tudi za etikete, ki so pritrjene na izdelek ali embalažo. Raziskava trga je pokazala, da na tržišču obstajajo alternativni materiali, ki so v celoti biorazgradljivi, reciklabilni ali izdelani iz recikliranih materialov. Pomembno pa je, da imajo alternativni materiali primerne lastnosti za določen namen uporabe. Na podlagi njihovih osnovnih in uporabnih lastnosti ter lepljivosti so bili izbrani najprimernejši alternativni materiali za testiranje obstojnosti na drgnjenje in na različne klimatske pogoje. Zahteve glede trdnosti lepljenja, izgleda materiala in kakovosti odtisa po izpostavitvi različnim dejavnikom je prestalo le manjše število PSA etiket iz alternativnih materialov. Za uvedbo v proizvodnjo so se kot najprimernejše izkazale PSA etikete izdelane iz brezlesnega enostransko premazanega sijajnega papirja ali sijajnega etiketnega papirja in podloge iz strojno glajenega papirja ali enostransko premazanega silikoniziranega papirja. Raziskava je pokazala, da reciklabilne, biorazgradljive papirne PSA etikete lahko nadomestijo PSA etikete iz sintetičnih polimerov pri etiketiranju majhnih gospodinjskih aparatov.

SUSTAINABLE MATERIALS FOR PRESSURE-SENSITIVE SELF-ADHESIVE LABELS

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Labels play a key role in product identification and provide important information about the characteristics of the product. The use of labels can be traced back to the early 1700s, though the product labelling, as we know it, evolved at the end of the 19th century, when cost-effective colorful paper labels printed with lithography were produced.

Self-adhesive labels, invented in the mid-1930s, started to make an impact on the product labelling market in the late 1960s, and since then have been gaining widespread acceptance and usage. Today, pressure-sensitive adhesive labels (PSA labels), also called self-adhesive labels make up over 50% of all label usage. Because they are lightweight, thin and flexible, PSA labels can be applied to various surfaces and shapes, so they are widely used to label a variety of products, including small household appliances. They are composed from facestock, adhesive and liner. A variety of materials are utilized for facestock, with synthetic polymers being the most commonly used.

In our research, we examined several types of PSA labels with the aim of finding possible alternative materials that are more ecological than the existing ones. Nowadays, it is very important that products are manufactured in such a way that they have as little impact on the environment as possible, which also applies to labels that are attached to the product or packaging. Market research has shown that there are alternative materials on the market that are fully biodegradable, recyclable or made from recycled materials. It is also important that these alternative materials have suitable properties for the specific usage. Based on their basic and performance properties and adhesive tack the most suitable alternative materials were selected for testing resistance to rubbing and to different climatic conditions and packaging during transport. Only a small number of PSA labels made from alternative materials passed the requirements regarding adhesive strength, material appearance and print quality after exposure to various factors. PSA labels made of wood-free one side coated glossy paper or one side coated label paper and a liner made of glassine paper or one side coated siliconized paper, proved to be the most suitable for introduction into production. Research has shown that recyclable, biodegradable paper-based PSA labels can replace PSA labels made of synthetic polymers for labeling small household appliances.

IZBOLJŠANJE UČINKOVITOSTI V PROIZVODNJI PAPIRJA

DOBAVITELJ MODERNE OCC LINIJE

David Dostál
Bellmer Czech s.r.o., Uničovska 132, 78401 Litovel, Češka

Predstaviti želimo glavna pričakovanja kupca od dobavitelja OCC linij ter rešitve in način, kako to dosega podjetje Bellmer. Govorili bomo o najnovejši Bellmerjevi inovaciji na področju razpuščanja, grobega prebiranja in čiščenja pri nizki gostoti (LD). Bellmer upravlja lasten Inovacijski center za razvoj izdelkov in procesov, ki je na voljo strankam za testiranje. Predstavljena bo najnovejša referenca v Avstriji, predstavitev pa bomo zaključili z razmišljanjem o prihodnjem razvoju linij za pripravo snovi.

OPTIMIZING PERFORMANCE IN PAPER MANUFACTURING

MODERN OCC LINE AND SUPPLIER

David Dostál
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The target of the presentation is introducing main buyer´s expectation from supplier of OCC lines and present solutions how Bellmer achieving it. You will listen about latest innovation by Bellmer in pulping and coarse screening and LD cleaning. Bellmer operates its own Innovation centre for product and process development. The centre is open for customer testing. The latest reference in Austria will be introduced. Presentation ends with reflecting on future development of stock preparation line.

ZNIŽANJE POTREBNE POGONSKE MOČI Z UPORABO EDINSTVENEGA KERAMIČNEGA MATERIALA

Roland Eckerstorfer
Röchling Industrial Oepping GmbH & Co. KG, Röchlingstraße 1, 4151 Oepping, Avstrija

ROBACERAM PX je izjemen vrhunski keramični material za elemente za odvodnjavanje podjetja Röchling Industrial Oepping za stroje z najvišjimi zahtevami glede trenja in največjimi obratovalnimi hitrostmi. Zahvaljujoč edinstveni sestavi materiala in posebnemu proizvodnemu procesu ta vrsta materiala prinaša številne prednosti za doseganje učinkovitega procesa v proizvodnje papirja.

Ključne prednosti ROBACERAM PX so:

- Prihranki energije z znižanjem pogonske moči
  Zaradi manjšega trenja med sitom in keramiko lahko stroj deluje z bistveno nižjo pogonsko močjo.
- Daljša življenjska doba sita
- Zahvaljujoč znatno manjši hrapavosti površine je mogoče doseči daljšo življenjsko dobo vgrajenih delov
- Maksimalna odpornost na toplotni šok 700°C zagotavlja maksimalno zanesljivost procesa

Vodilni ponudnik celuloze in papirja, valovitega kartona in embalažnih materialov s sedežem na severovzhodu Poljske je pred kratkim stopil v stik z Röchling Industrial Oepping, da bi razvili rešitev za znižanje pogonske moči njegovega »gap former-ja«.

Papirni stroj s širino sita 8600 mm proizvede okoli 455.000 t testlinerja in flutinga na leto, v razponu gramatur od 65 do 140 g/m². Obratovalna hitrost je do 1600 m/min, kar povzroči pogonsko obremenitev več kot 3600 kW za sitovo skupino in skupino stiskalnic.

V Röchling Industrial Oepping smo razvili naslednjo rešitev za znižanje pogonske moči:

- Zamenjava vseh 9 obstoječih elementov odvodnjavanja iz silicijevega nitrida z ROBACERAM PX elementi za sitovo skupino.
- Predelava običajne zasnove »uhle box strip design« v ROBACERAM SL200B PressSaver obloge sesalne omarice s perforirano polno keramično površino.

Po predelavi je bilo mogoče energetsko porabo pogonov znižati s 3664 kW na 3201 kW, kar predstavlja zmanjšanje za 13 %.

Stroj obratuje z enako hitrostjo, vendar s 463 kW nižjo pogonsko močjo. Pri proizvodnji 330 dni na leto in strošku energije v višini le 0,1 € na kW znaša letni prihranek do 367.000 €. Če upoštevamo samo razliko v ceni med ROBACERAM PX in drugimi neoksidnimi keramičnimi materiali, je bil ROI te predelave samo 5 mesecev.

Vendar Röchling Industrial Oepping ni le dobavil elementov za odvodnjavanje in poskrbel za vgradnjo. Zagotovljena je tudi popolna podpora na mestu vgradnje, saj je naš strokovnjak za papirno tehnologijo prisoten tako med zagonom kot v procesu optimizacije.

REDUCTION OF DRIVING POWER BY USING A UNIQUE CERAMIC MATERIAL

Roland Eckerstorfer
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ROBACERAM PX is a unique premium ceramic material for dewatering elements from Röchling Industrial Oepping for machines with the highest demand in regards to friction and the highest machine speeds. Thanks to its unique material composition and the special production process, this material grade brings numerous benefits to achieve an efficient paper production process.

Key advantages of ROBACERAM PX are:

- *Energy saving by the reduction of driving power*
  Due to the reduced friction between fabric and ceramic, the machine can be operated with significantly less driving power.
- *Longer fabric lifetime*
- *Thanks to the significantly lower surface roughness, a longer lifetime of the installed parts can be achieved*
- *Maximum thermal shock resistance of 700°C ensures maximum process reliability*

A leading provider for cellulose and paper, corrugated board, and packaging materials, located in northeastern of Poland recently contacted Röchling Industrial Oepping to develop a solution to reduce the driving power of its gap former machine.

With a screen width of 8600 mm, this paper machine produces around 455000 t of testliner and fluting per year in the basis weight range of 65 to 140 g/m². The operating speed is up to 1600 m/min, which is causing a drive load of more than 3600 kW for wire- and press section.

Röchling Industrial Oepping developed following solution to reduce the driving power:

- *Replacement of all 9 existing dewatering elements of silicon nitride with ROBACERAM PX dewatering elements for the wire section*
- *Rebuild of the conventional uhle box strip design to ROBACERAM SL200B PressSaver suction box covers with perforated full ceramic surface*

After the rebuild, the energy consumption of the drives could be reduced from 3664 kW to 3201 kW which is a reduction of 13 %.

Customer operates the machine at the same machine speed but with a reduction of driving power of 463 kW. Considering this with a production of 330 day per year and energy costs of only 0,1 € per kW, the annual saving is up to 367.000€. Considering only the price difference from ROBACERAM PX to other non-oxide ceramic materials, the ROI of this rebuild was only 5 months.

But Röchling Industrial Oepping not only supplied the dewatering elements and take care about the installation on site. Also, the full support on site is granted. Our paper technology specialist is supporting the start-up and optimization process.

DIGITALNI POTNI LIST ZA VAŠE VALJE: SCHÄFERROLLS AND COUNTROLL® USTVARJATA STRATEŠKO ZAVEZNIŠTVO

Frank Kretschmer, Gašper Klančnik
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Septembra 2023 sta countroll® in SchäferRolls GmbH & Co. KG uradno sklenila dolgoročno partnerstvo za uporabo, prodajo, trženje in nadaljnji razvoj countroll® platforme za menedžment valjev. V okviru tega sodelovanja je SchäferRolls vključil SchäferRolls Management Service (SRMS) v svoj storitveni portfelj in svojim strankam nudi celovito podporo pri implementaciji countroll® menedžment platforme.

Countroll® platforma za menedžment valjev ponuja inovativno rešitev za upravljanje digitalne identitete industrijskih valjev. Uporabniki lahko dostopajo do platforme prek svojih pametnih telefonov (iOS & Android) ali osebnih računalnikov, kar jim omogoča dostop do zgodovine valjev, tehnične dokumentacije in pregled nad lokacijo v realnem času, ter nemoteno izmenjavo podatkov o valjih.

SchäferRolls Management Service vključuje vrsto podpornih storitev, vključno s pomočjo pri implementaciji countroll-a®, pri usmerjanju na začetku uporabe aplikacije, usposabljanju na lokaciji ali prek spleta, navodili za uporabo countroll® BT senzorjev, analizo rezultatov, podporo pri izdelavi nadzornih plošč po meri ter telefonsko podporo za stranke, ki je na voljo v običajnem delovnem času.

Uporabniško usmerjena nadzorna plošča za upravljanje valjev zagotavlja celovit pregled nad stanjem stroja na podlagi digitalne dokumentacije o valjih. Uporablja individualno shemo strankinega stroja za pravočasno informiranje oddelka za vzdrževanje, kdaj bo potrebno zamenjati določene valje. Programska oprema countroll® tako omogoča strankam učinkovito načrtovanje zastojev in preprečuje nepričakovane prekinitve.

Poleg tega platforma integrira podatke iz senzorja vrtenja countroll®. Patentiran countroll® senzor zbira ključne podatke, vključno z rotacijami, pospeški, zaviranji, nihanjem hitrosti in vibracijami. Podatki se prenašajo na platformo countroll® z uporabo Bluetooth tehnologije (BT) dolgega dosega, kar omogoča pridobivanje informacij v realnem času.

Predstavitev funkcionalnosti te digitalne platforme bo glavni del te prezentacije. Poleg tega bodo predstavljene tudi študije primerov uporabe senzorja countroll®.

THE DIGITAL PASSPORT FOR YOUR ROLLERS – SCHÄFERROLLS AND COUNTROLL® CREATE A STRATEGIC ALLIANCE

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In September 2023, countroll® and SchäferRolls GmbH & Co. KG officially agreed a long-term partnership for the use, sales, marketing and further development of the countroll® Roller Management Platform. As part of this collaboration, SchäferRolls has incorporated the SchäferRolls Management Service (SRMS) into its service portfolio and provides its customers with comprehensive support to implement the countroll® Management Platform.

The countroll® Roller Management Platform offers an innovative solution for managing the digital identities of industrial rollers. Users can access the platform via their smartphones (iOS & Android) or PCs, giving them real-time access to their roller histories, technical documents and location management, as well as the seamless exchange of roller information.

The SchäferRolls Management Service includes a range of support services, including assistance with the commissioning of countroll®, guidance for getting started with the application, on-site or online training, instruction on the use of countroll® BT sensors, weak point analysis, support with customised dashboard creation and a professional customer hotline, which is available during normal business hours.

The user-oriented roller management dashboard provides a comprehensive overview of the condition of the machine rollers based on digital roller documentation. It uses the customer's individual machine layout to inform the maintenance team in good time if and when certain rollers need replacing. The countroll® software therefore enables customers to plan downtime efficiently and avoid unexpected interruptions to operations.

In addition, the roller management platform integrates the data from the countroll® rotation sensor. The patented countroll® rotation sensor collects key data, including rotations, acceleration, deceleration, speed fluctuations and vibrations. Data is transmitted to the countroll® platform using long-range Bluetooth technology (BT), providing information in real time.

The explanation of the functionality of this digital roller management platform will be the main part of this presentation. In addition, initial case studies on the use of the countroll® rotation sensor will be discussed.

Z USTREZNIM MAZANJEM DO VIŠJE UČINKOVITOSTI

Andre Eichler-Kremer, Hans-Georg Weber
SKF Lubrication Systems Germany GmbH, Heinrich-Hertz-Strasse 2–8, 69190 Walldorf, Nemčija

Mazanje je sestavni del rotacijske opreme in odločilni dejavnik pri vzdrževanju strojev. Pomen, ki ga dajemo mazanju, je odločilen 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

Andre Eichler-Kremer, Hans-Georg Weber
SKF Lubrication Systems Germany GmbH

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.

VALMET DNAE – NASLEDNJA GENERACIJA VAMLETOVIH PORAZDELJENIH KONTROLNIH SISTEMOV

Arnold Präsent, Harri Mustonen, Jaakko Oksanen
Valmet GesmbH, Lassallestraße 7a, 1020 Vienna, Austria

Novi Valmetov sistem DNAe DCS (Distributed Control System) je naslednja generacija sistema DCS – popolna prenova dobro preverjenega DNA DCS. Z nadaljnjim razvojem sistema DCS Valmet naslavlja številne megatrende v industriji, kot so učinkovitost virov in čist svet, rast na osnovi novih tehnologij, sprememba človeškega vedenja in avtonomno delovanje.

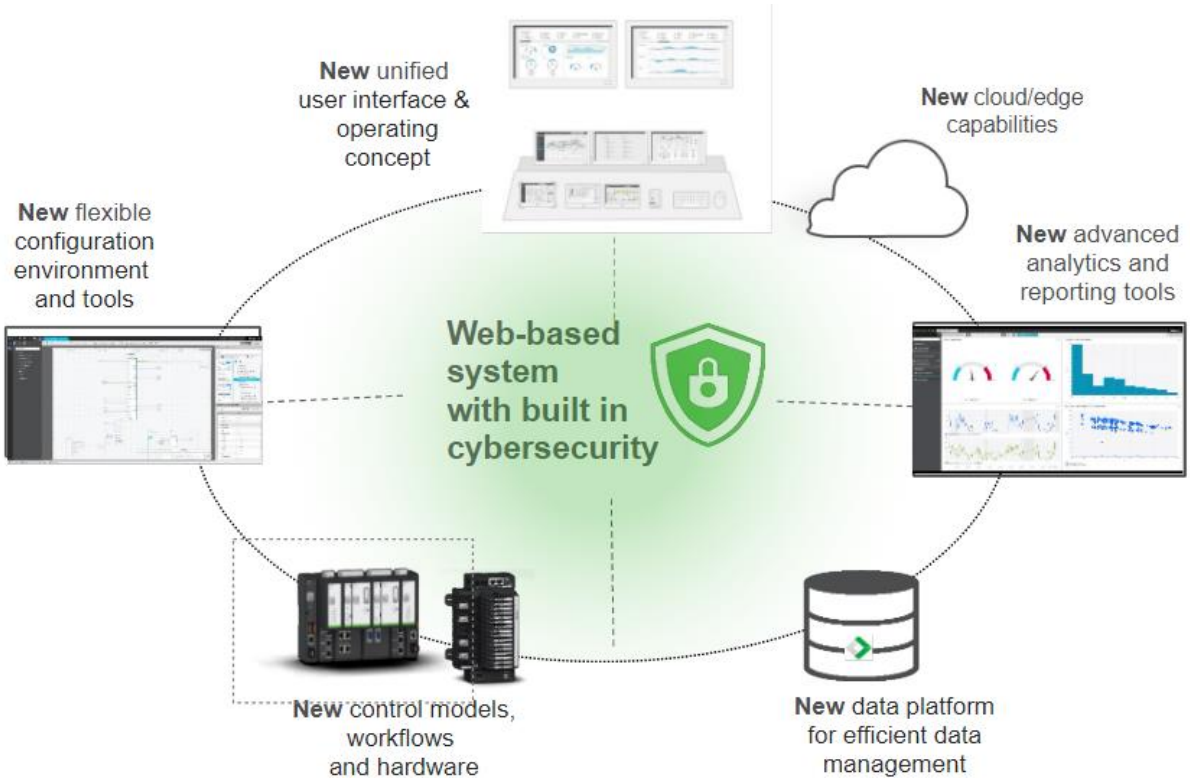
S tem sistemom DCS postane temelj/osnova pri avtonomnem delovanju proizvodnje. Platforma Valmet DNAe zagotavlja brezhibno integracijo tako procesnih naprav kot napredne optimizacije in integracije podatkov v sistema MES in ERP. Podatki bodo postali še bolj pomembni za vizualizacijo, analitiko in optimizacijo delovanja industrijskih sredstev, linij in celotne proizvodnje.

Z odpiranjem dostopa do podatkov v sistemu operativne tehnologije (OT) za uporabo v informacijski tehnologiji (IT) postajajo funkcije, kot so upravljanje podatkov, standardni vmesniki in vgrajena kibernetska varnost, obvezne za stabilno, zanesljivo in varno delovanje. Ključna je varna povezljivost od senzorjev do aplikacij v oblaku. Konvergenca IT/OT se dogaja prav zdaj in sodobni sistemi DCS, kot je Valmet DNAe, imajo vgrajene vse potrebne certifikate in funkcionalnost za pokrivanje zahtev OT, pa tudi zahtev, povezanih z IT.

Zagotovljena združljivost z nadgradnjami skozi celoten življenjski cikel je prav tako bistvenega pomena za DCS v obstoječih in prenovljenih obratih. Nadgradnje zagotavljajo strankam tudi pridobitev najnovejših tehnologij in funkcionalnosti za podporo digitalizaciji in podatkovno usmerjenim rešitvam.

V skladu z idejami industrije 5.0 postajajo ljudje ključen kapital. Sodobni DCS so sistemi, ki podpirajo delovanje v različnih funkcijah od operaterja do vzdrževanja in upravljanja proizvodnje. Valmet DNAe sledi konceptom ISO 9241-210 in ISO 101 za proces načrtovanja, osredotočen na uporabnika, da nudi najboljšo podporo tako zahtevam uporabnika kot organizacijskim zahtevam. Učinkovit uporabniški vmesnik UX je osrednji element, ki ljudem omogoča, da delujejo po svojih najboljših močeh.

Valmet DNAe odpira povsem nove možnosti za delovanje v smeri podatkovno vodenega odločanja, optimizacije in opolnomočenja ljudi, da tlakujejo pot avtonomnemu obratovanju.


New unified user interface & operating concept
New cloud/edge capabilities
New flexible configuration environment and tools
New advanced analytics and reporting tools
Web-based system with built in cybersecurity
New control models, workflows and hardware
New data platform for efficient data management

VALMET DNAE – VALMET'S NEXT GENERATION DISTRIBUTED CONTROL SYSTEM

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Valmet GesmbH, Lassallestraße 7a, 1020 Vienna, Austria

Valmet's new Valmet DNAe DCS (Distributed Control System) is the next generation DCS - a total redesign of the well proven DNA DCS. With the evolution of the DCS, Valmet is addressing many megatrends in the industry like resource efficiency and clean world, growth from new technologies, the change in human behaviour and autonomous operation.

With this system, DCS becomes the base layer in the autonomous operation of production. The Valmet DNAe platform provides a seamless integration from field devices to advanced optimization and data integration into MES and ERP systems. Data will become even more important for visualization, analytics and optimization of the operation of industrial assets, lines and whole production.

By opening the access to data in OT system to be utilized in IT, features like data management, standard interfaces and built-in cybersecurity are becoming mandatory for a stable, reliable and safe operation. Secured connectivity from the sensors all the way through cloud applications is key. The IT/OT convergence is happening right now and modern DCS like Valmet DNAe have all the needed certificates and functionality on board to cover OT but also IT related requirements.

A secured lifecycle and upgrade compatibility is also essential for DCS in brown field and existing installations. Upgrades also provide latest technologies and functionalities to customers to support digitalization and data driven solutions.

Following the ideas of Industry 5.0, people becomes and essential asset. Modern DCS's are systems that support operation in a variety of roles from operator through maintenance and management of production. Valmet DNAe is following the concept of ISO 9241-210 and ISO 101 for a user-centred design process to support the user and organizational requirements best. Efficient UI UX is a central element to empower people to perform at their best.

Valmet DNAe opens whole new possibilities for operation towards data driven decision making, optimization and empowering people to paving the way towards autonomous operation.

POSTER SEKCIJA

RAZVOJ EMBALAŽE BUREK2GO

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Ulična prehrana je priljubljena zaradi svoje priročnosti in dostopnosti, saj omogoča hitro in enostavno uživanje obroka na poti ter raznolikost okusov in jedi, ki so sveže pripravljene in cenovno ugodne. Problem ulične prehrane je embalaža, ki je pogosto okolju neprijazna in obremenjujoča za okolje. Zaradi slednjega smo se odločili, da razvijemo trajnostno rešitev za eno od jedi ulične prehrane. Odločili smo se za priljubljeno jed na Balkanu – burek. Burek je običajno zapakiran v tanek papir ter nato vložen v plastično vrečko.

Na podlagi raziskave smo opredelili glavne probleme obstoječe embalaže: tanek papir pogosto prepušča maščobo, tako kot vrečka ni trajnosten ter ni dovolj praktičen za prenašanje in uživanje hrane na poti. Tako smo prepoznali potrebo po bolj praktični in trajnostni embalaži, ki bi izboljšala izkušnjo uporabnikov in bi bila okolju prijaznejša.

Razvili smo koncept embalaže Burek2Go, ki je sestavljena iz dveh delov: pladnja in škatle. Je bolj funkcionalna, omogoča enostavno prenašanje in uživanje bureka kjerkoli in kadarkoli. Izdelana je iz ustreznega materiala, obdelanega s premazi iz naravnih voskov, ki so primerni za stik s hrano in onemogočajo prepuščanje maščobe.

Izdelali smo več prototipov embalaže, kjer smo preizkušali različne zasnove in materiale, da bi našli optimalno rešitev. Preverjali smo funkcionalnost, vzdržljivost in uporabnost embalaže. Na podlagi povratnih informacij smo prototipe izboljševali.

Skozi proces oblikovalskega snovanje smo ustvarili embalažo, ki združuje praktičnost in trajnostnost. Verjamemo, da lahko Burek2Go postavi nove standarde na področju ulične hrane in postane nepogrešljiv del vsakdanje izkušnje ljubiteljev bureka.

POSTER SESSION

BUREK2GO PACKAGING CREATION

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Street food is popular due to its convenience and accessibility, allowing for quick and easy consumption on the go, offering a variety of flavours and dishes that are freshly prepared and affordable. However, a major problem of street food is its packaging, which is often environmentally unfriendly and has a negative impact on the environment. Therefore, we decided to develop a sustainable solution for one of the street food dishes. We chose a popular dish from the Balkans, i.e. burek. Burek is usually wrapped in thin paper and then put in a plastic bag.
Based on the research, we identified the main problems with the existing packaging, i.e. the thin paper often let's grease through, the plastic bag is not sustainable and the packaging is not practical for carrying and eating food on the go. Consequently, we recognised the need for a more practical and sustainable packaging that would improve the user experience and be more environmentally friendly.

The Burek2Go packaging concept which was developed consists of two parts: a tray and a box. It is more functional and allows easier transport and more enjoyable consumption of burek anywhere and anytime. It is made of a suitable material with a natural wax coating that is suitable for food contact and prevents grease from leaking.

We created several prototypes of the packaging and tested different designs and materials to find the optimal solution. We evaluated the functionality, durability and usability of the packaging. Based on the feedback, we improved the prototypes.
Through the design thinking process, we created packaging that combines practicality and sustainability. We are convinced that Burek2Go can set new standards in the street food sector and can become an indispensable part of everyday experience for burek lovers.