DR. VLADIMIR GRIGORIEV
DIRECTOR, APLICATIONS & MARKETING
KEMIRA CHEMICALS, INC.

More with less: Profitable and sustainable solutions for wet-strengthened tissue

kemira

RESPONDING TO FUTURE NEEDS

The growing global population and increasing scarcity of resources mean we need to produce more with less.

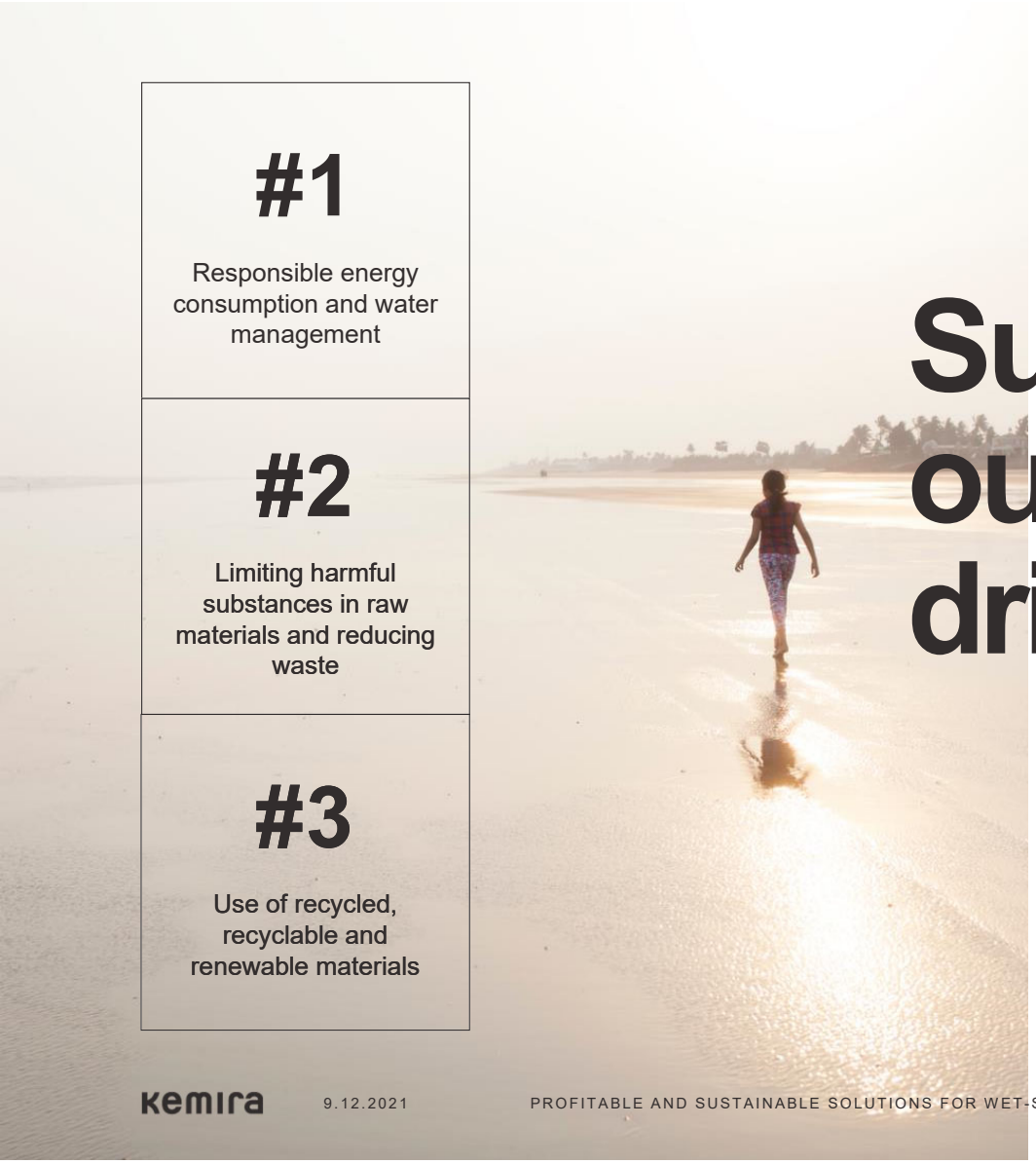
KEMIRA'S STRATEGY

Sustainability is at the heart of our strategy

We have chosen to prioritize five themes to best match our businesses and customer segments

PEOPLE	WATER	CIRCULARITY	CLIMATE
SAFETY			

Sustainability – our customer's drivers



#1

Responsible energy consumption and water management

#2

Limiting harmful substances in raw materials and reducing waste

#3

Use of recycled, recyclable and renewable materials

HELPING CUSTOMERS REACH THEIR TARGETS

Proactive support from Kemira's application experts helps to further improve our customer's energy and water efficiency, minimizing their waste and improve their end-products.

RESPONSIBLE CONSUMPTION AND PRODUCTION

Kemira vision on sustainable chemistry

We want to ensure profitable growth by becoming the leading provider of sustainable chemistry solutions for water-intensive industries.

CURRENT REVENUE	TARGET REVENUE IN 2030
~100 MEUR	>500 MEUR
From biobased products	From biobased products
CURRENT SHARE	**TARGET SHARE IN 2030**
12%	40%
Of renewable carbon of all carbon containing raw materials	Of renewable carbon of all carbon containing raw materials

Wet strength is detrimental to the sustainability of paper

Many paper products require wet strength, which is commonly achieved with the PAE-based wet strength resins.

PAE resins typically contain carcinogenic chloro-organic residuals „OX“ (DCP, CPD) and their quantities in the product, in paper and effluent discharged to the environment are regulated in many countries.

PEOPLE	WATER	CIRCULARITY	CLIMATE
OX transfer from paper to food	OX discharge to the environment with wastewater	Wet strength may restrict recyclability of paper	Overuse of wet strength resin leads to wasted resources and energy

SAFETY

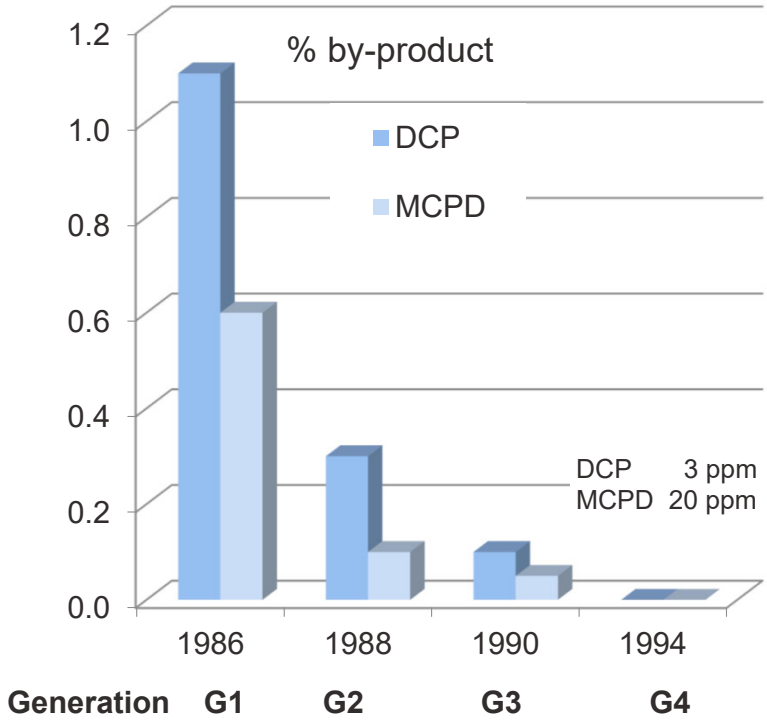
Progress toward cleaner PAE resins

Largely driven by EU market regulations, but other regions are also moving to stricter control of chloro-organic residuals

- EU wastewater legislation (AOX)
- Food contact paper regulations, including BfR (DCP and CPD extractions from paper), FDA, and GB9685-2016
- Ecolabel NGO's (DCP, CPD in product)
- Supermarket chains: Aldi, Lidl, …(OX in paper)

Many Asian producers still use G1 resins even though G2 resins are available in the market

- Kemira's G2 resin FennoStrength PA 21 produced in APAC
- Kemira's G3 and G4 resins imported from EU



LIMITS CALCULATED FOR A TYPICAL MARKET RESIN WITH 20% ACTIVE SOLIDS

Wet strength resin generations

Generation	Epi + DCP + CPD (ppm)	AOX (g/l as Cl)	Dangerous chemical labels	EU Ecolabel	BfR XXXVI	OX in paper	Where used
G1	1,000-15,000	7-10		No	No	No	Still common in Asia and Americas. Not used in EU due to hazardous classification and non-compliance with EU Ecolabel and BfR XXXVI.
G2	<700	3-5	No	Yes	Yes/No*	Yes/No*	Major tissue brands in Asia and USA have switched to G2. In EU, most common in liquid packaging, wallpaper, décor paper, and label paper and less common in tissue and towel.
G2.5	<550	<2.0	No	Yes	Yes	Yes	In EU, most common for tissue and towel
G3	<100	<1.5	No	Yes	Yes	Yes	In particularly challenging cases for tissue and towel to pass BfR extraction test or OX in paper and AOX in effluent targets
G4	<10	<0.1	No	Yes	Yes	Yes	Tea bags, coffee filters, sausage casings

The definition of generation type is based on Kemira's assessment. There is no industry standard.
*Depends on the WSR dosage and water loop closure

How to reduce chloro-organics in wet strength tissue production

Cleaner WSR

Often at the expense of efficiency

Higher cost in use

COST

COST

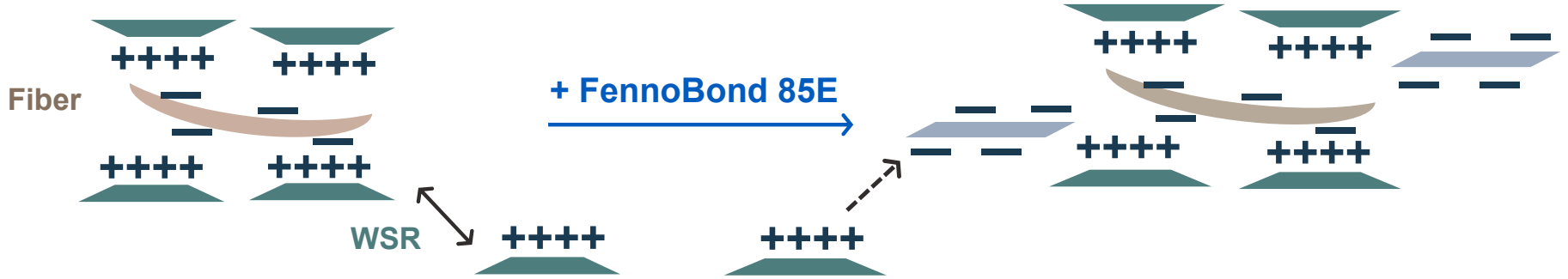
Lower WSR usage

Less DCP/CPD in paper and effluent and without additional cost

WSR promoters

Sustainable solutions for wet strength

Anionic Booster FennoBond 85E



Overcationization of fibers

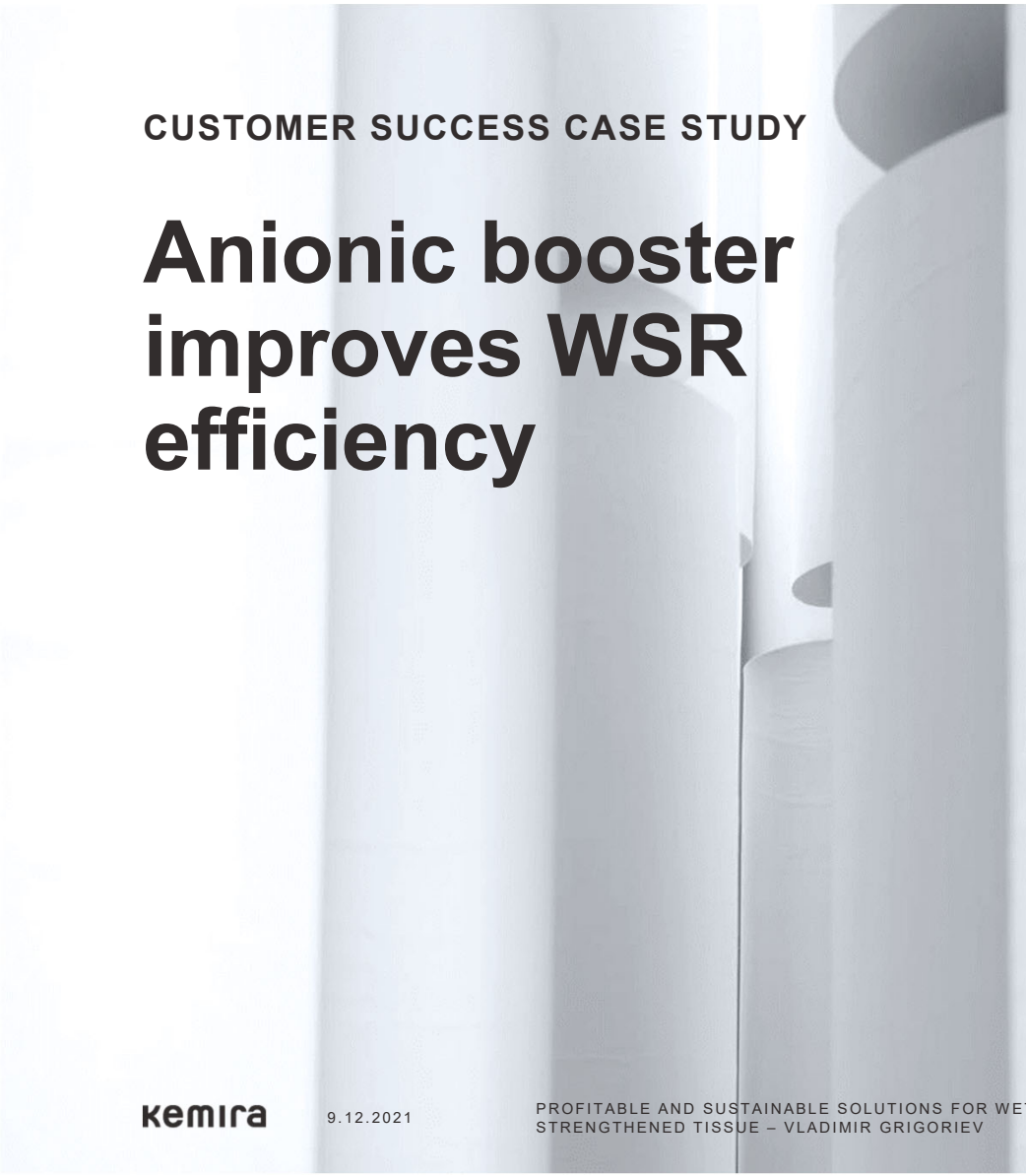
- Poor resin retention leads to high WSR consumption
- Quality problems
- Operational inefficiencies
  - Excessive foaming
  - Felt deposits and slower dewatering
- Excessive load of harmful chloro-organic residuals (DCP+CPD) in the system

Anionic booster balances the charge

- Improved efficiency makes possible WSR savings
- Higher wet tensile targets possible
- Optimized machine runnability
  - Foam under control
  - Cleaner felts and improved dewatering
- Reduced load of harmful chloro-organics in paper (DCP+CPD) and effluent (AOX)

CUSTOMER SUCCESS CASE STUDY

Anionic booster improves WSR efficiency



MACHINE OPERATION

- 18 g/m2 Towel, Bamboo pulp + short fibers
- Crescent, 1300 m/min
- G1 WSR (>10,000 ppm DCP+CPD) @ 35 kg/t

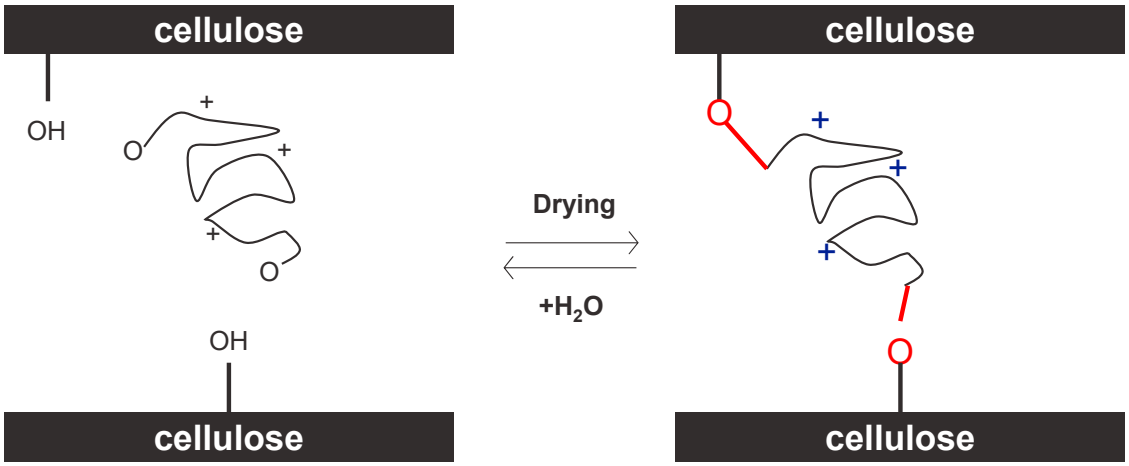
CUSTOMER NEED

- Reduce WSR dosage and improve wet strength performance
- Increase machine operating efficiency
- Reduce ecological impact from DCP+CPD

SOLUTION & RESULTS

- FennoBond 85E at 3 kg/t
- WSR dosage reduced by 32%
- Refining energy reduced by 36%
- Machine speed increased by 40 m/min
- **Sustainability:** Less wasted WSR, less DCP+CPD in the system → less discharge with paper and effluent
- **Profitability:** Net savings ¥ 900k / year

Cationic GPAM FennoBond 3300LS



Benefits

- Initial wet strength
- Temporary wet strength
- Dry strength
- Dewatering

CUSTOMER SUCCESS CASE STUDY

FennoBond 3300LS for temporary wet strength

MACHINE OPERATION

- 21 g/m^2 AFH towel, 100% virgin fibers
- Crescent, 70 t/d, 1500 m/min
- Enzyme and cat starch
- Wet strength resin (G2 PAE) @ 6 kg/t dry

CUSTOMER NEED

- New towel grade with temporary wet strength
- Faster degradation in water vs. PAE resin

SOLUTION & RESULTS

- FennoBond 3300LS @ 1,5 kg/t dry
- WSR dosage reduced (-50%)
- Starch dosage reduced (-25%)
- Degradation in water passed internal test
- **Sustainability:** Less DCP/CPD from PAE and less COD from starch; easier to repulp/recycle aged broke
- **Profitability:** Opportunity for new grade and differentiation in the market

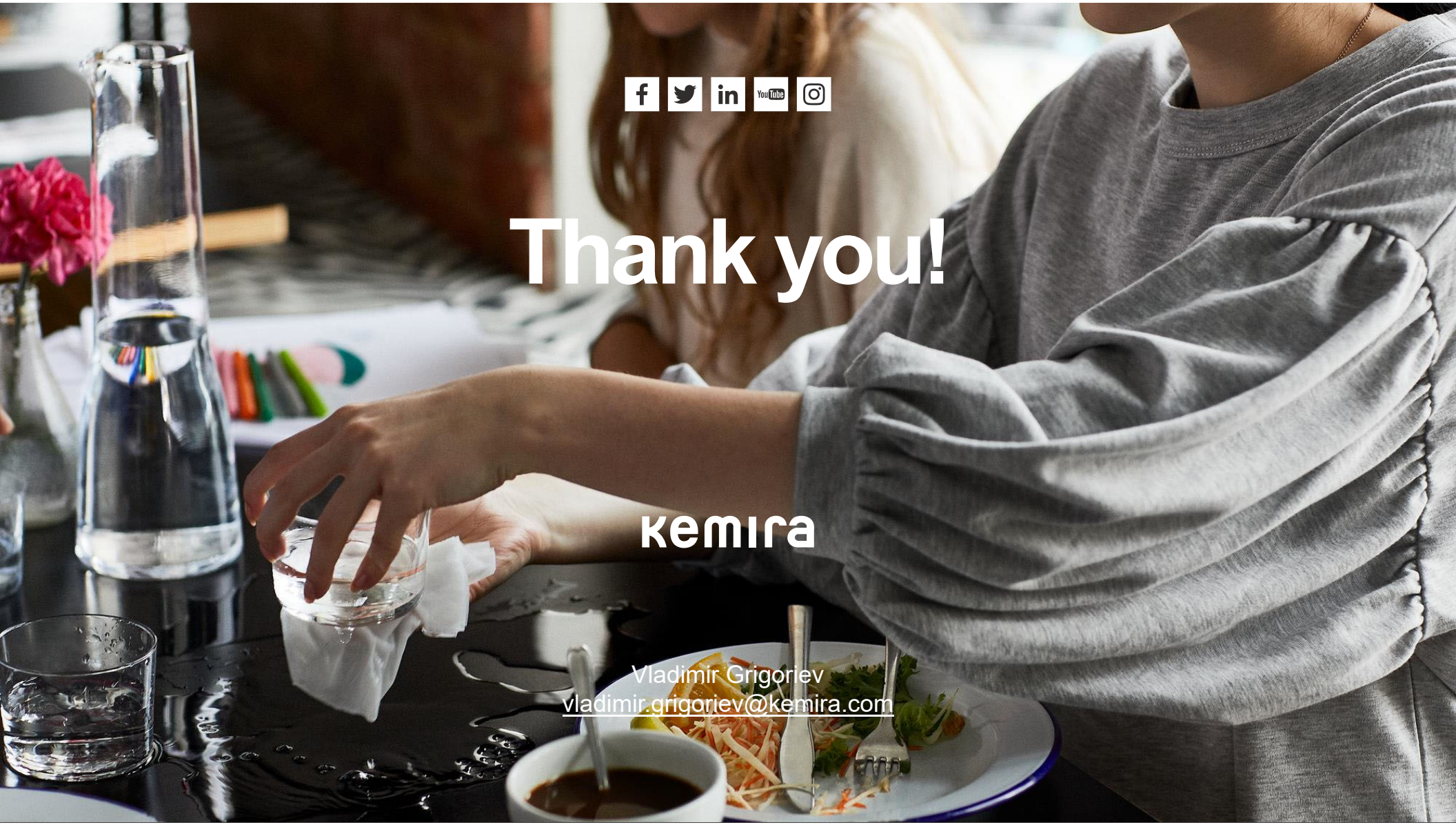
KEMIRA'S APPROACH: MORE WITH LESS

Improved sustainability of wet strength

- Anionic booster FennoBond 85E for improved efficiency of WSR
- Cationic GPAM FennoBond 3300LS for partial or full replacement of PAE resin

			
PEOPLE	**WATER**	**CIRCULARITY**	**CLIMATE**
Less OX to transfer from paper to food	Less OX to discharge into the environment with wastewater	Less restrictions for recyclability of paper	Balanced use of wet strength resin leads to less wasted resources and energy

Sustainable wet strength solutions can also provide economic benefits:
COST SAVINGS AND DIFFERENTIATED PRODUCTS IN THE MARKET



Vladimir Grigoriev
vladimir.grigoriev@kemira.com