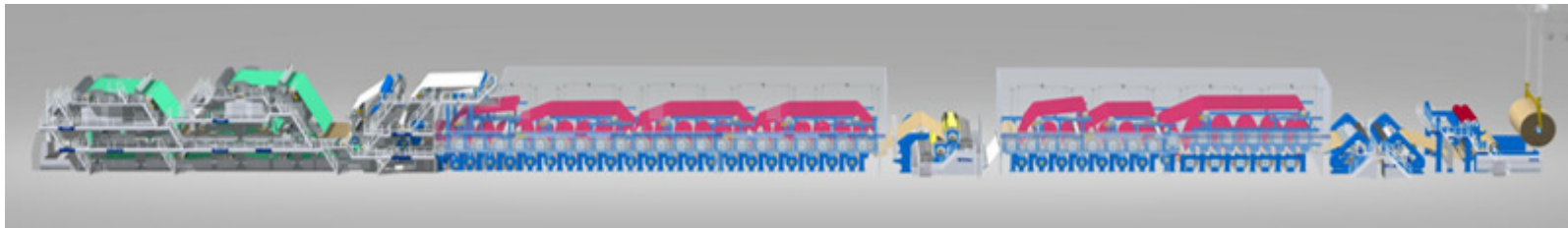


Paper Machine Energy Upgrades

Energy Audits and Savings, Feb. 25th, 2009

Energy & Papermaking



Entire Plant

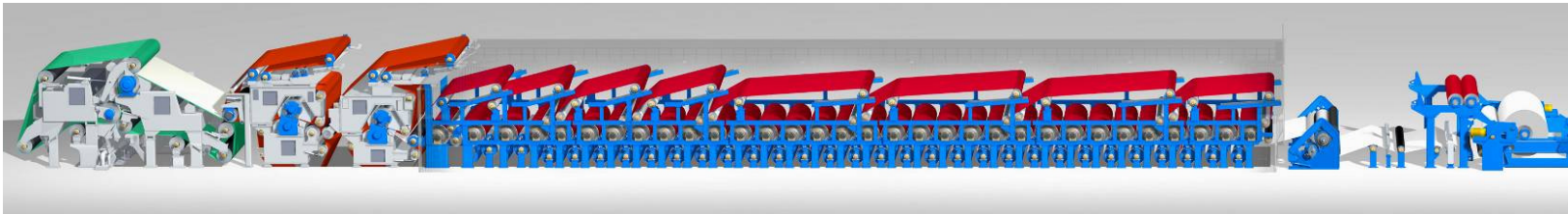
- Total consumption vs. paper output
- Equipment status i.e. leaks
- Process i.e. pulping, refining, screening
- Efficiency i.e. fiber loss, water consumption
- Building heating / cooling

Paper Machine

- Process related
- Equipment
- Operation
- Pressing, drying
- Waste handling

Energy and Overall Efficiency are intertwined

Energy Audits, Paper Machine (examples)



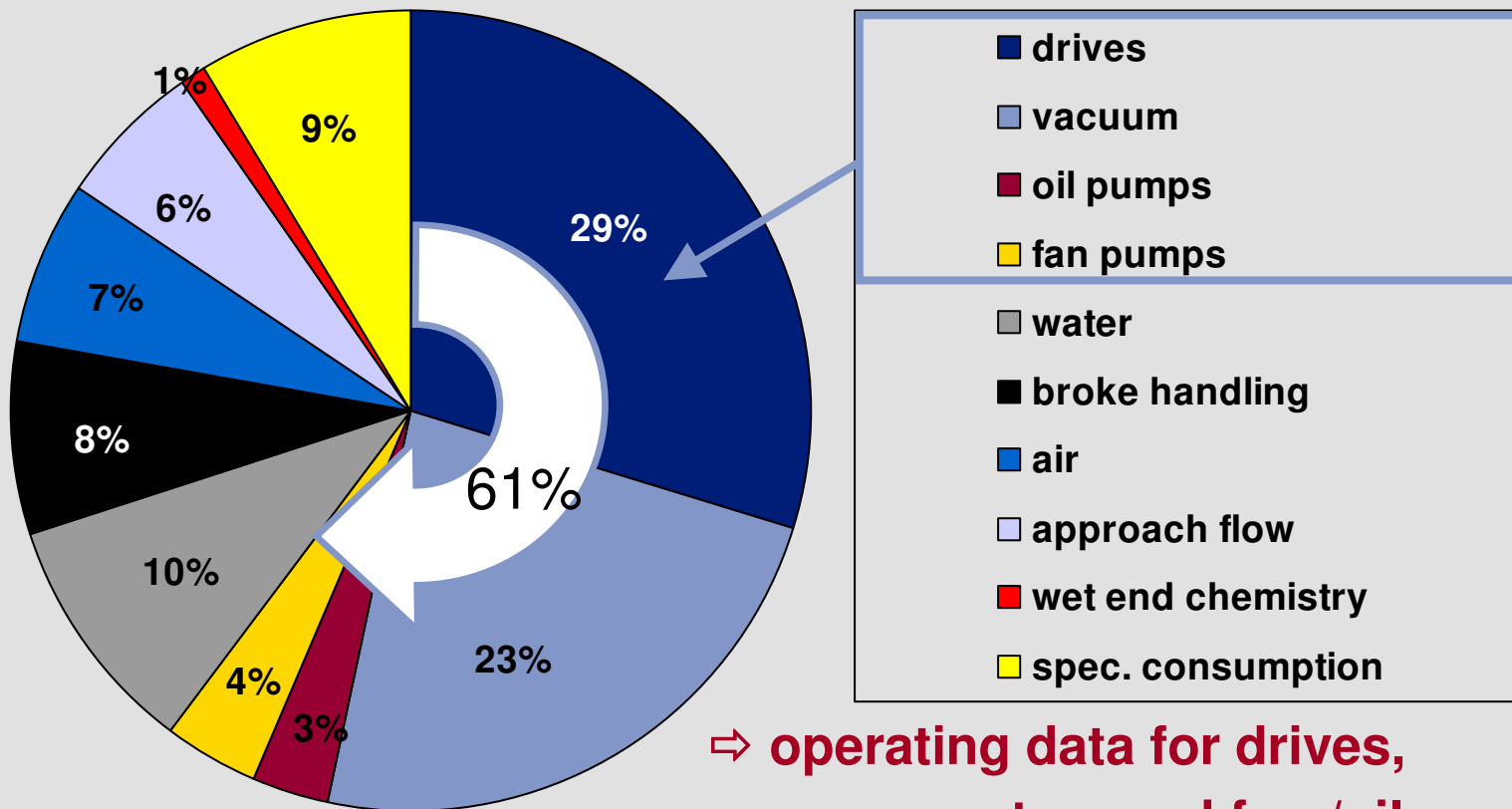
Process

- Headbox flow, water usage
- Dewatering / drying
 - Forming section, Press, Dryer section
- Vacuum management
- Drive concept
- Coating, drying

Equipment

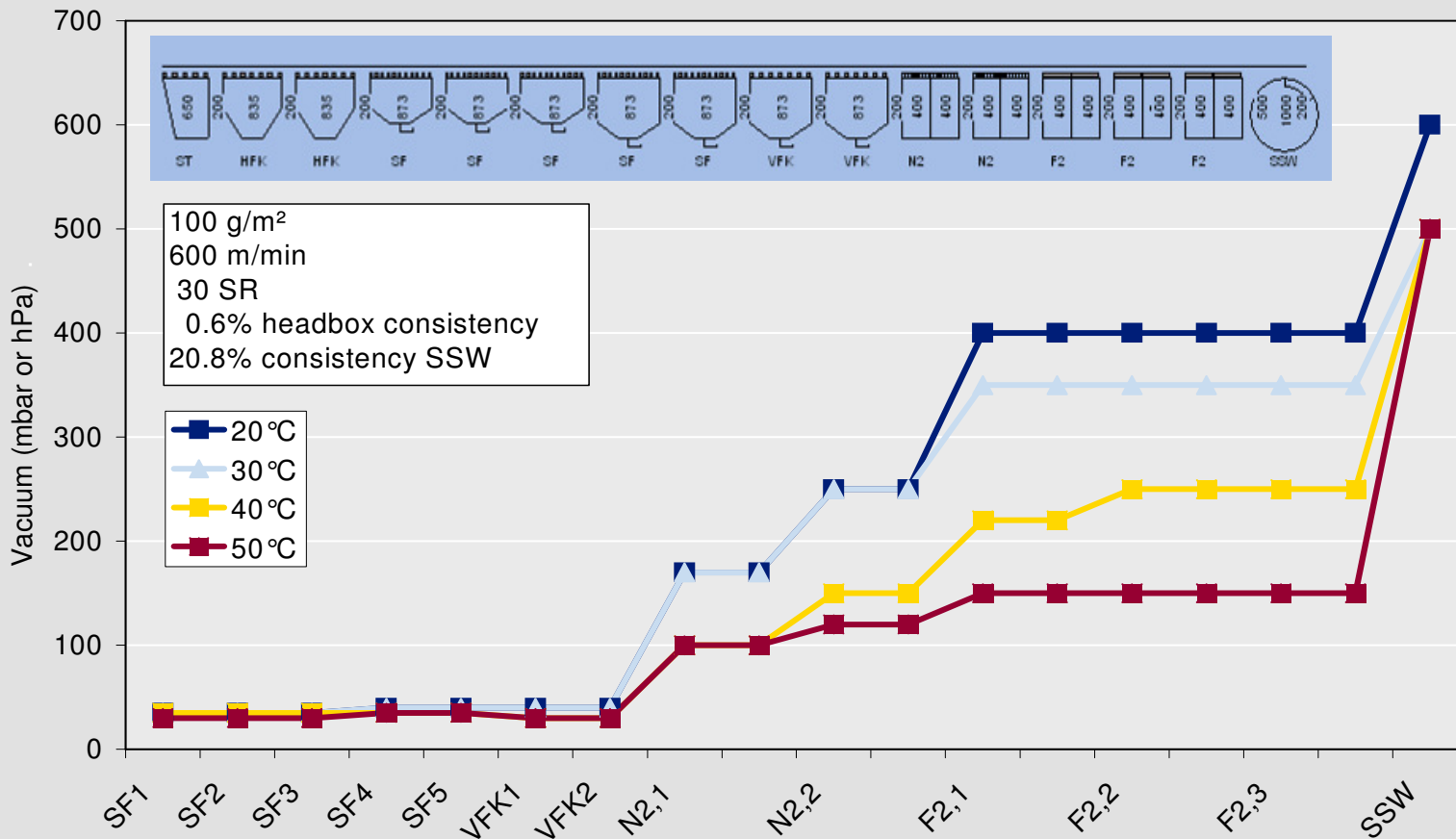
- Hood, air handling, heat recovery
- Steam and condensate system
- Motors, gears
- Rolls, bearings, dryers
- Maintenance
- General equipment condition

Typical Electric Energy Composition of a PM

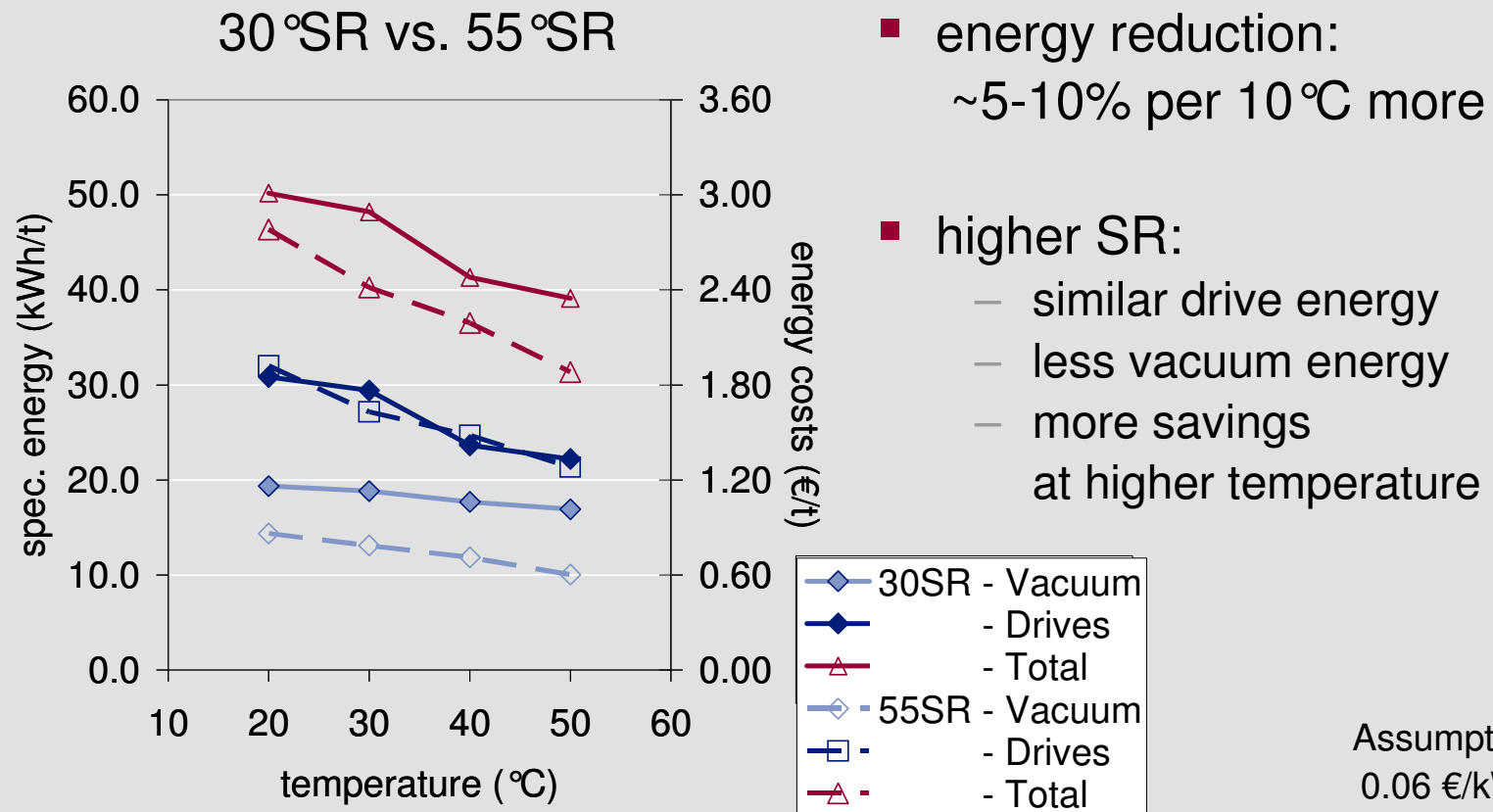


⇒ operating data for drives, vacuum system and fan-/oil pumps

Vacuum for Temperatures 20-50 °C (70-120 °F) and constant Dryness after Couch



Vacuum and Drive Energy vs. Temperature





Energy Audits, Examples of real life results

Energy Audits and Savings, Feb. 25th, 2009

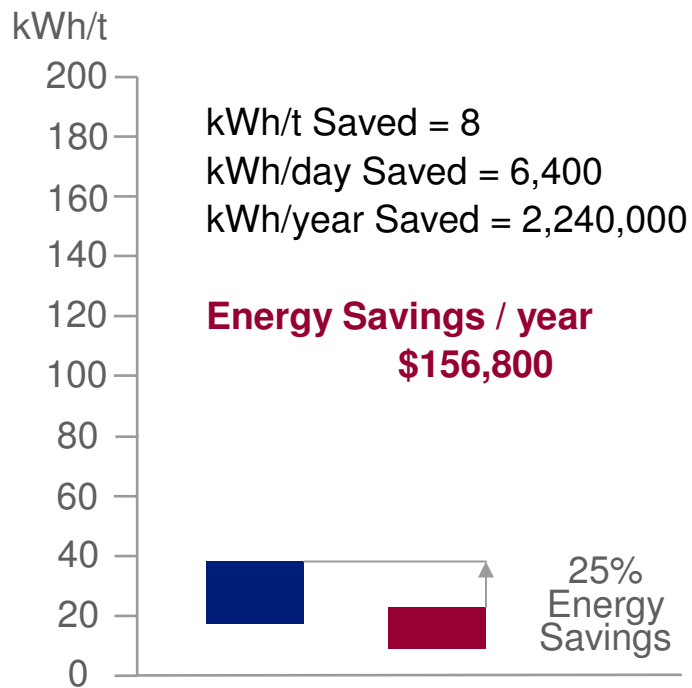


Innovation

HM Rotor Blade – the proven energy saving repulper rotor blade .



Specific Energy Consumption



Innovation

HM Rotor Blade – the proven energy saving repulper rotor blade .

■ Conventional Pulper Rotor

■ Voith HM Pulper Rotor

Production- 800 BDSTPD for 350 days/ year
Purchased electricity @ 7 cents per kWh

Example Process optimization, reduce Headbox flow

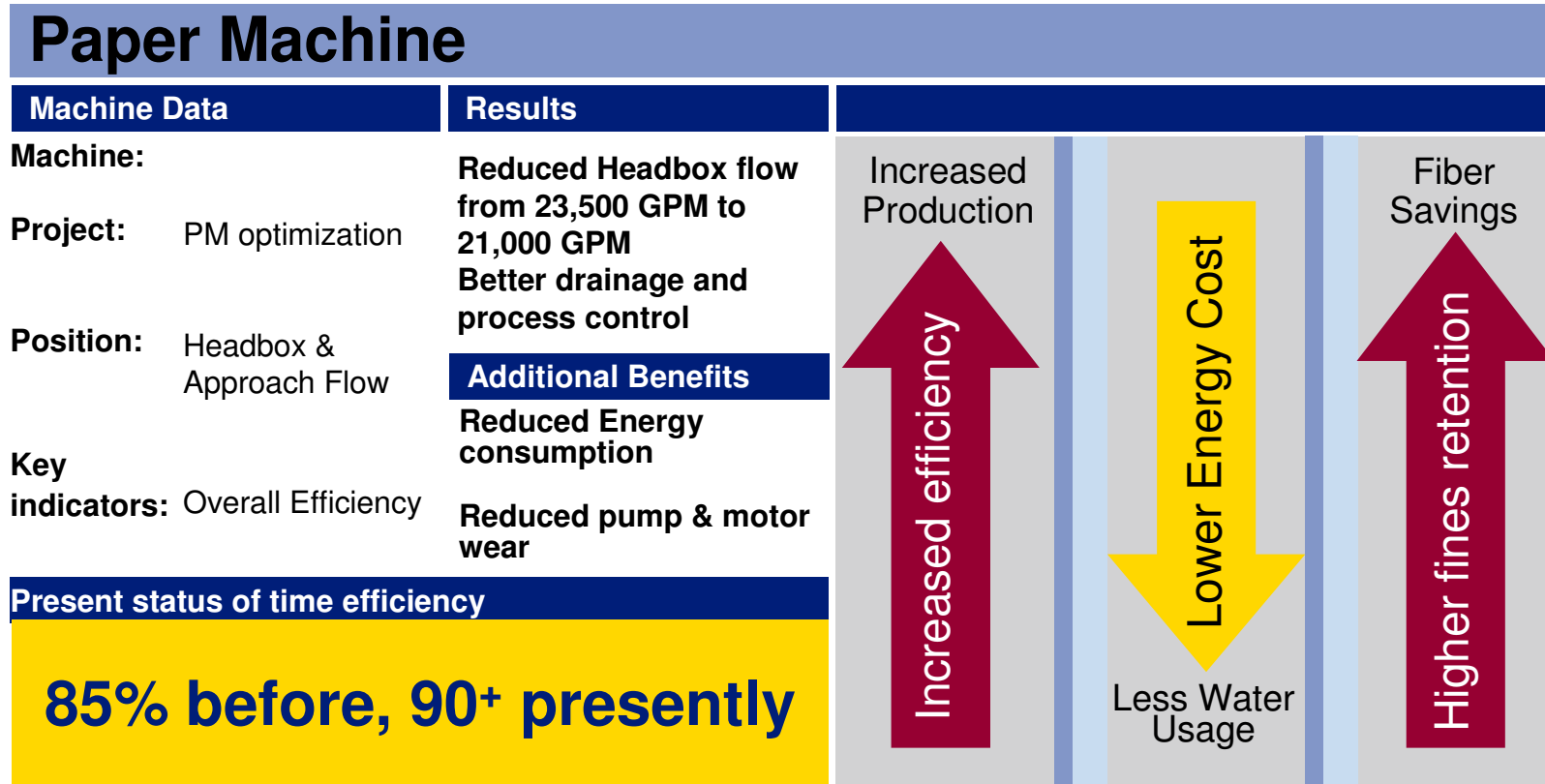


23500gpm

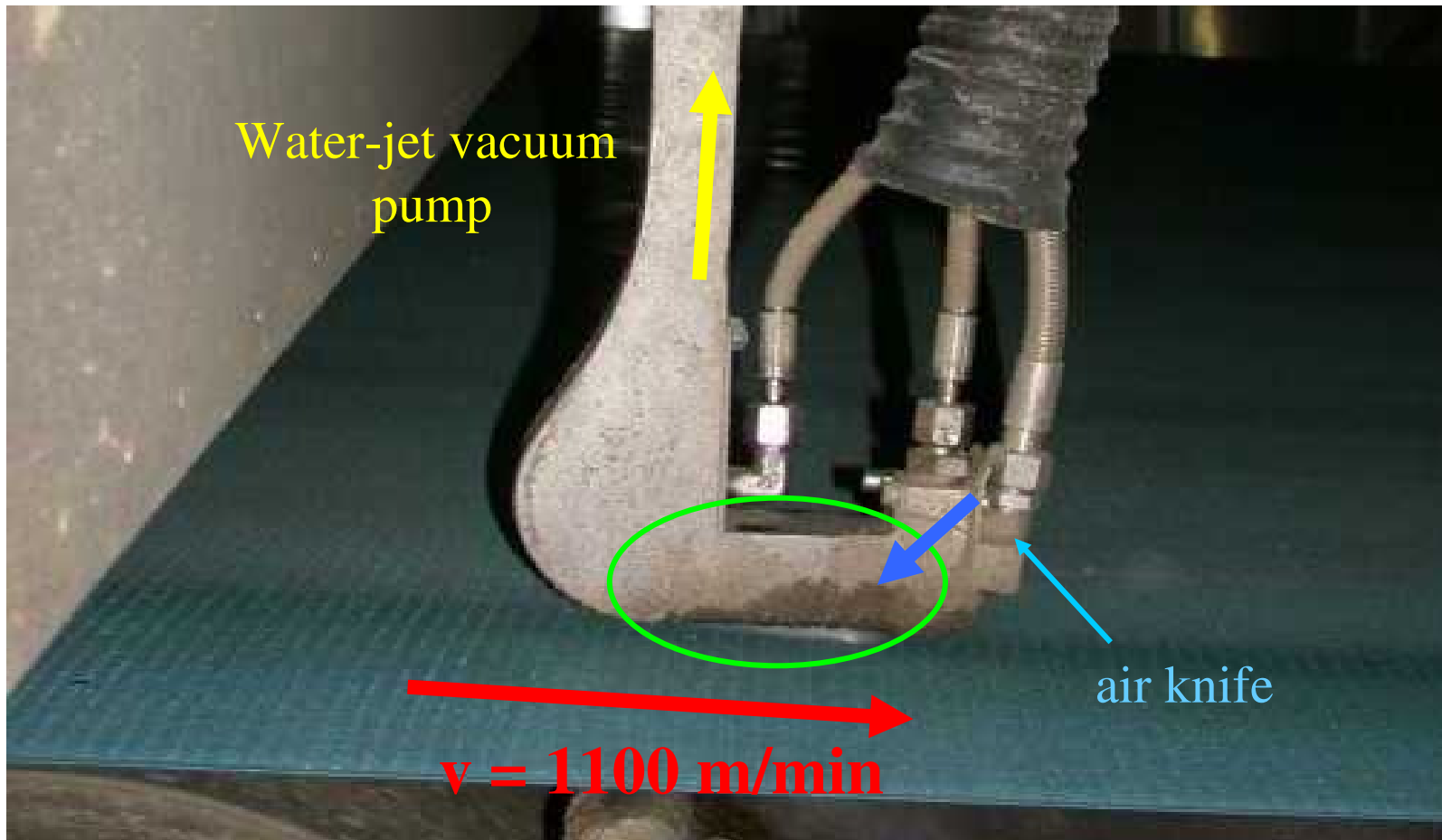


21000gpm

Example Process optimization, reduce Headbox flow



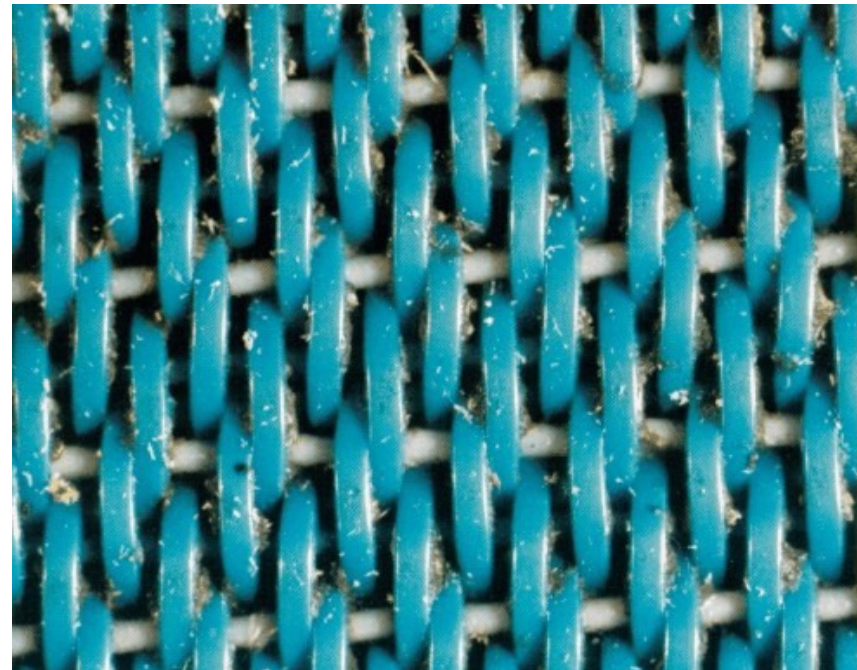
DuoCleaner Express™ - Cleaning Head



Example Equipment optimization, clean dryer felts



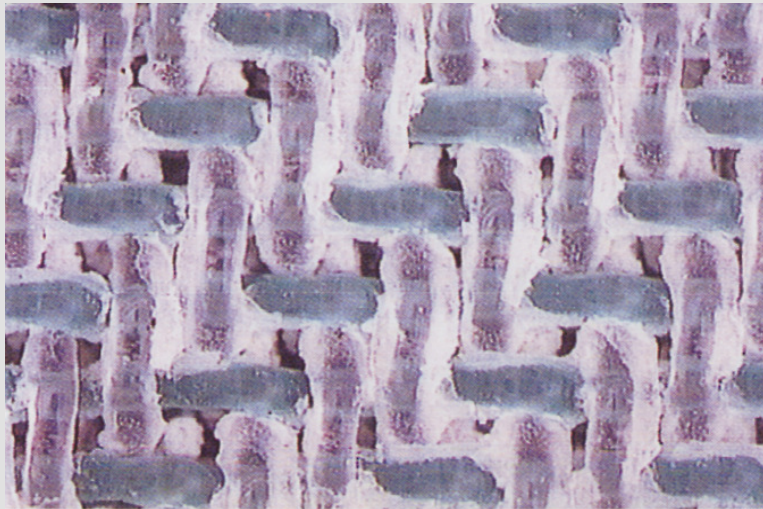
Before cleaning



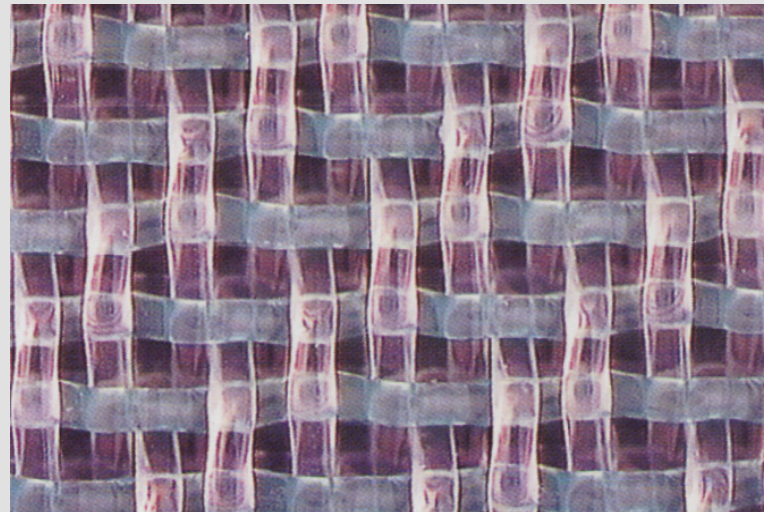
After cleaning

DuoCleaner – Wire section Cleaning results

without DuoCleaner



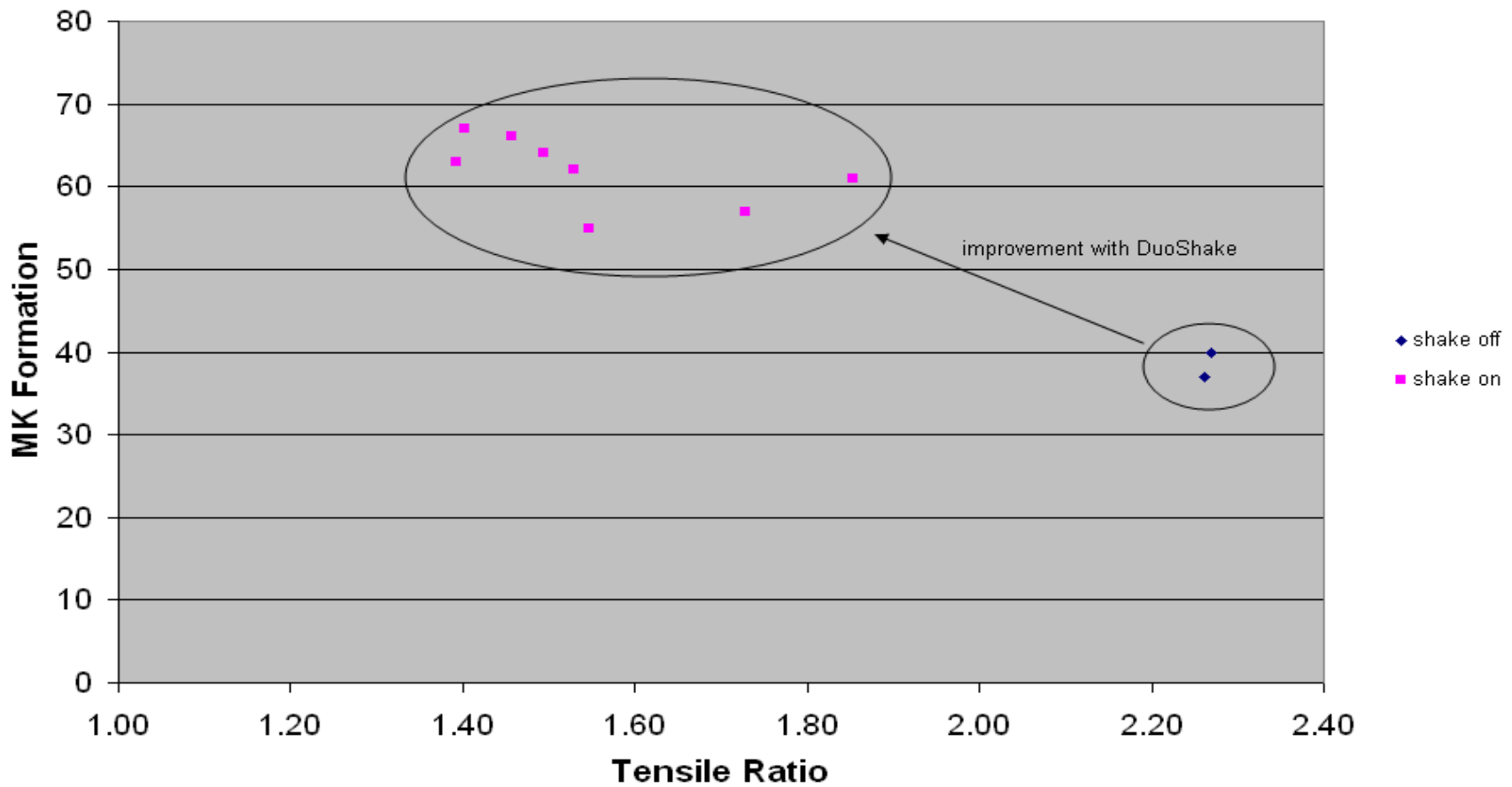
with DuoCleaner



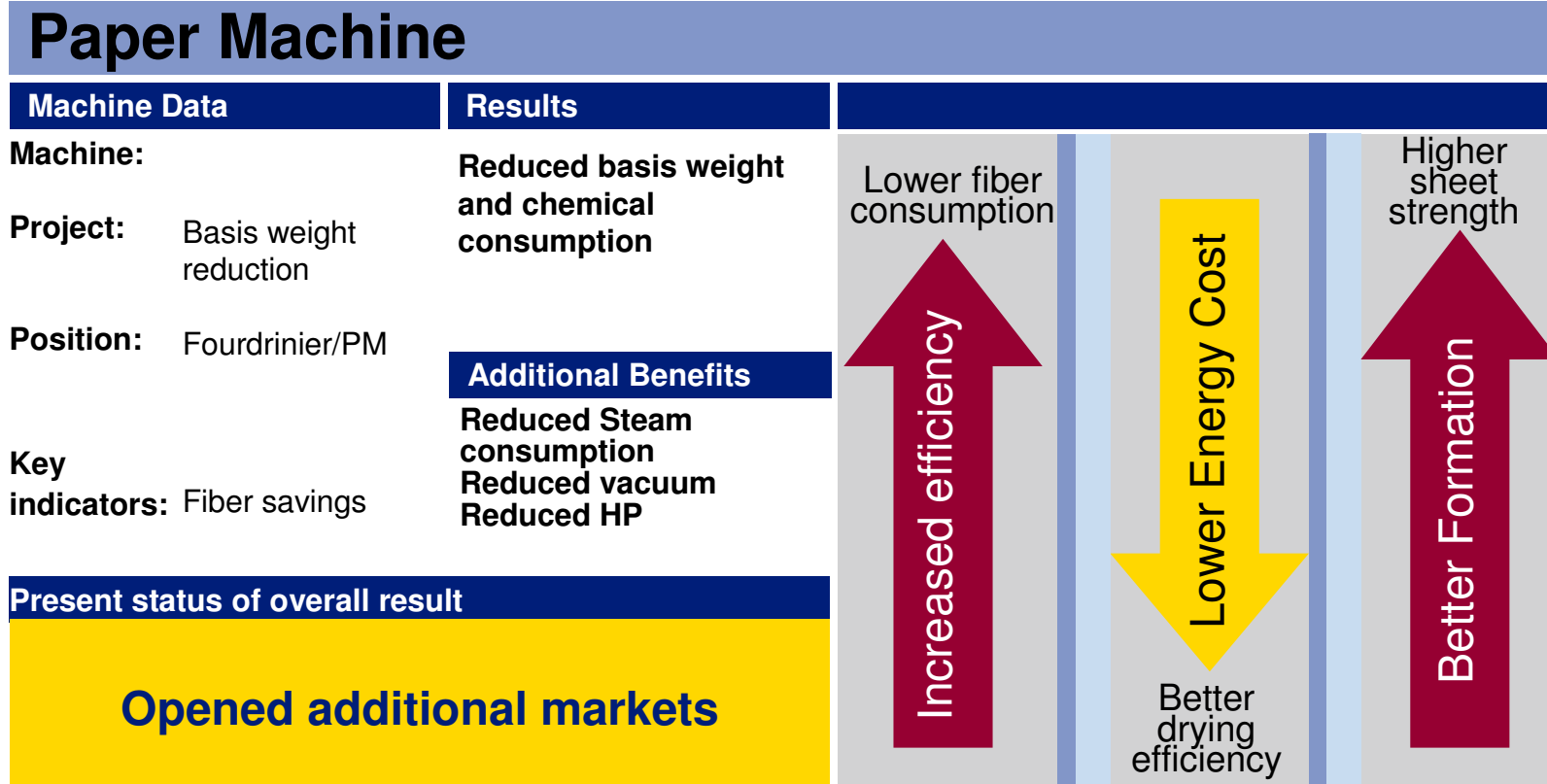
Shake Trial on a Paper Machine in North America



DuoShake – Trial results



Example Shake Trial



Energy-Consumption Audit Basic Package – Paper Machine

- **Focused on major energy consumers**
 - Process review (water handling, forming, pressing & drying)
 - Dryer section, hood, steam & condensate system
 - Vacuum system
 - Drives
 - Dewatering study and Press audit
 - Coating and Calendering (if applicable)
 - Other if desired



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Engineered reliability.

Thank You