Energy Savings in Paper Machine Vacuum Systems

Paperex 2017, Chennai India
Jyrki Uimonen
Sales manager
Runtech Systems Ltd

Paper production Technology Company

• Founded in 1989 (as Ecopump Ltd)
• Composite product factory in Kolho,
  Vacuum turbo assembly/testing factory in Kotka
• Customers in Europe, Asia, Africa and Americas
• Innovative technology on vacuum systems,
  dewatering, doctoring and tail threading
• Subcontracting network for metal working
• Turnover 30M€
• 60+ technical employees
Vacuum system drivers

Stable and high efficient process performance
Low energy consumption
Low/no water consumption
Low installation and maintenance cost
Adapting to various process conditions
Benchmarking: overall performance

FINE PAPER MACHINES
Vacuum System Specific Consumption vs. Production

Reference database, kWh/ton
Optimized by Runtech

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Ecoflow™

Online dewatering measurement tells how the wet end process is performing
EP Turbo™ for PM vacuum system

- Radial turbo blower, 1 or 2 stage
- Robust solid rotor structure
- Impellers directly on motor shaft
  => no gearbox, no couplings
- Frequency converter driven zero to 10 000rpm
- Compact dimensions
- Up to 600kW; 12m³/s; 70kPa
EP Turbo™ for PM vacuum system

- 30..60% energy savings compared with traditional technologies
- No seal water needed
- Easily adaptable to existing building and piping
- Maintenance done onsite, no heavy equipment needed
- Multi-unit design allows backup connections
EP Turbos – 200 Started & 125 on order

- Single turbo supplied
- Multiple turbo supplied
- Single turbo on order
- Multiple turbo on order
EP600 Turbo with water separator
Features

Two efficient filters in series minimum pressure loss

Four sight glasses, level switch connector, quick hatch operation

Filter is divided by several cells which allow easy handling and cleaning (if needed)
System mounted on existing pump bed

Compact machine saves money in installation and piping
Flow curves
Air Blade doctoring

1. Mechanical doctoring to clean the outer surface
2. Sharp air knife to clean the grooves and holes
3. Water collected to specially designed saveall trays

=>

- More void volume on roll
- Higher dewatering
- Higher press dryness
RunPress improves dewatering performance

- Mechanical doctoring cleans the outer surface
- Air jet cleans the grooves and holes

⇒ Efficient dewatering
⇒ Even profile
RunPress: water out of the paper web; - and out of the paper machine

1. Splash wall
   - Splash wall to catch all flying water drops to the save-all.

2. Double doctor for bottom roll
   - Double doctor to remove water from the roll surface.

3. New save-all with doctor
   - New save all with integrated doctor

4. Leading roll re-location
   - Reduce felt wrap angle on top press roll.
System survey as a basis for rebuild

Light survey:
- Mapping the key parameters
- Evaluating the improvement potential

Full survey
- Finding reasons for eventual deficiencies
- Defining the action plan for improvement
- Defining the equipment scope
- Planning the implementation to minimize piping and building cost
- Planning the implementation to minimize the shutdown time
Cases
Kotkamills PM1
VACUUM SYSTEM REBUILD WITH TURBO BLOWERS

• The vacuum system consists of five EP315-500-S Turbos
• Power savings 500 kW (although customer installed new MB-former on this 20 t/h laminating base paper machine) compared with the old Nash pump system
• Water usage reduction about 1 000 000 m³ / year
Stora Enso Kaukopää PM8
SULZER TURBO SYSTEM REBUILT WITH RUNECO VACUUM SYSTEM

RESULTS

- Energy savings **945 kW**
  (46% less than original situation)
- Water savings **140 000 m³/a**

Old vs. New System:

<table>
<thead>
<tr>
<th>Old system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nash 1</td>
<td>317</td>
</tr>
<tr>
<td>Sulzer 1</td>
<td>888</td>
</tr>
<tr>
<td>Sulzer 2</td>
<td>850</td>
</tr>
<tr>
<td>Altogether</td>
<td>2055</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulzer 1</td>
<td></td>
</tr>
<tr>
<td>EP500-700-S</td>
<td></td>
</tr>
<tr>
<td>Altogether</td>
<td>1110</td>
</tr>
</tbody>
</table>

Graph showing Energy Difference:

- **Old system vs. Turbo blower**
- **- 945 kW**

Old system Power kW: 2500
Turbo blower Power kW: 0
Clairefontaine PM6
VACUUM SYSTEM REBUILD WITH TURBO BLOWERS

<table>
<thead>
<tr>
<th>Old system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump 1</td>
<td>90</td>
</tr>
<tr>
<td>Pump 2</td>
<td>400</td>
</tr>
<tr>
<td>Pump 3</td>
<td>400</td>
</tr>
<tr>
<td>Pump 4</td>
<td>400</td>
</tr>
<tr>
<td>Pump 5</td>
<td>0</td>
</tr>
<tr>
<td>Altogether</td>
<td>1290</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP500-700-S</td>
<td>310</td>
</tr>
<tr>
<td>EP500-700-D1</td>
<td>400</td>
</tr>
<tr>
<td>Altogether</td>
<td>710</td>
</tr>
</tbody>
</table>

RESULTS

- Energy savings **580 kW**
  (55% less than original situation)
- Water savings **448 000 m³/a**
Vege PM1, Turkey
VACUUM SYSTEM REBUILD WITH EP TURBO BLOWERS (3-NIP PRESS FINE PAPER, 370-650 M/MIN)

<table>
<thead>
<tr>
<th>Old system</th>
<th>kW</th>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRP x 7</td>
<td></td>
<td>EP500-700-D10</td>
<td></td>
</tr>
<tr>
<td>Altogether</td>
<td>930</td>
<td>Altogether</td>
<td>330</td>
</tr>
</tbody>
</table>

RESULTS
• Energy savings 600 kW
• Specific steam consumption reduced -10%.
• 60 000 m³/a water savings
“New vacuum system allows a more reliable and smoother runnability than the old system. Possibility to install it on existing foundation and the flexibility of the Turbos thanks to variable speed allows the system to adapt in lots of situation and a wide functioning area. Energy saving already made is quite significant and future optimization is still planned. Doctor optimization has been a key to improve press section dewatering and improve dryness after press section for speed development. Being as well a vacuum system expert and a doctoring expert is really a runtech strength. This has allowed to see the project as a whole package and to really optimize the system.”

Sebastien Finel, Production Manager PM3.
### Old system kW
- LRP x 6
- Altogether 700

### New system kW
- EP315-500-D1
- LRP x 1
- Altogether 350

### Results
- **Energy savings**: 420 kW (60% less than the original situation)
- **250 000 m³/a** water savings
Stora Enso Ostroleka PM5
GREENFIELD VOITH LINERBOARD MACHINE IN POLAND

### Ostroleka vacuum system

<table>
<thead>
<tr>
<th></th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed</td>
<td>3000</td>
</tr>
<tr>
<td>Actual</td>
<td>1450</td>
</tr>
<tr>
<td>Vacuum system specific consumption</td>
<td>19 kWh/ton</td>
</tr>
<tr>
<td>Heat recovery - actual</td>
<td>&gt; 1 MW</td>
</tr>
</tbody>
</table>

### KEY TARGETS
- Top energy efficiency
- No water consumption
- Backup process connections
- Savings in building cost
- Savings in piping cost

### RESULTS
- Energy efficiency targets reached
- No seal water, no cooling water
- Compact design: Turbos on top of concrete separators
- Simplified, inexpensive piping
- Backup connections and capacity available
Oyka Paper Caycuma PM1
VACUUM SYSTEM REBUILD (3-NIP PRESS WITH SHOE, SACK AND Kraftliner, 550 M/MIN)

<table>
<thead>
<tr>
<th>Old system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRP x 6</td>
<td></td>
</tr>
<tr>
<td>Altogether</td>
<td>1790</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP400-700-D1</td>
<td></td>
</tr>
<tr>
<td>LRP x 3</td>
<td></td>
</tr>
<tr>
<td>Altogether</td>
<td>1350</td>
</tr>
</tbody>
</table>

RESULTS

- Energy savings **440 kW** (25% less than the original situation)
- **5 000 m³/a** water savings
Sappi Stockstadt PM1
SULZER TURBO SYSTEM REBUILT WITH RUNECO VACUUM SYSTEM

RESULTS

- Power consumption is at the moment 55% of the original situation. Now 18 kWh/ton!
- No seal water and no need for civil work.

<table>
<thead>
<tr>
<th>Old system</th>
<th>kW</th>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC 80</td>
<td></td>
<td>EP Blower</td>
<td>75</td>
</tr>
<tr>
<td>RC 56</td>
<td></td>
<td>EP400-700-D1</td>
<td>240</td>
</tr>
<tr>
<td>Al together</td>
<td>1375</td>
<td>EP400-700-S</td>
<td>310</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Altogether</td>
<td>625</td>
</tr>
</tbody>
</table>

Old system vs. Turbo blowers

[Bar chart showing -55% reduction in power consumption]
ICT Kostrzyn PM14
NEW TISSUE MACHINE VACUUM SYSTEM (Tissue 5,6m)

<table>
<thead>
<tr>
<th>New system</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP500-S</td>
<td></td>
</tr>
<tr>
<td>EP500-D1</td>
<td></td>
</tr>
<tr>
<td>Altogether</td>
<td>320-500</td>
</tr>
</tbody>
</table>

RESULTS

• ÉP500-S is for the uhle box in case higher vacuums are needed.
• EP500-D1 is for suction turning roll.
• Vacuum levels optimized based on Ecoflows
• Possibility to run with one turbo – back-up.
• Energy efficiency targets reached
• Turbo exhaust air heat recovery system
• No seal water, no cooling water
Turbo sales

VACUUM SYSTEM BUSINESS DEVELOPMENT
TURBO INSTALLATIONS

-99 -00 -01 -02 -03 -04 -05 -06 -07 -08 -09 -10 -11 -12 -13 -14 -15 -16 -17

PROJECTS SOLD
THANK YOU!

Runtech Systems

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