APPLICATION SOLUTIONS

TYPICAL YANKEE DRYING PERFORMANCE ANALYSIS

After successfully installing a heat recovery system to preheat combustion and make-up air, our client requested we conduct a Drying Performance audit of his Yankee Hood.  (Continued on p.2)

SYNERVAC-E SYSTEM ADDRESSES RUNNABILITY ISSUES

The SynerVac system is a specially adapted module for down-run and up-run control. It provides optimum sheet stability on wide and high speed machines. The following story demonstrates how the SynerVac-E system addresses runnability issues.  (Continued on p.3)

PROPER DESIGN AND OPERATION OF YANKEE HOODS REDUCE ROUTINE MAINTENANCE

The Yankee hood is an important tool in the drying of tissue, towel and specialty paper grades. The physical condition of its components has an important bearing on the machine’s overall productivity. One of the main causes of equipment failure is improper design, or the failure to design future maintenance out of the equipment.  (Continued on p.3)

PRESIDENT’S MESSAGE

The paper industry is facing monumental challenges, and never has it been so critical to partner with the expertise guaranteed to position your business for success. At Enerquin, my personal commitment, first and foremost, is to help you meet and overcome these challenges.

Keeping in line with this commitment, we are launching the first in a series of newsletters designed to provide you with invaluable information based on findings of our 700+ professional industry audits and analysis. You will benefit from this in-depth information based on examinations conducted at numerous pulp and paper mills.

With three decades of solid expertise and experience, Enerquin truly is the best partner in your company’s success. So join us to read all about the ways we can help you get there!

Jean Desharnais, P. Eng
President
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TYPICAL YANKEE DRYING PERFORMANCE ANALYSIS

(Continued from cover)

The objective of the survey was as follows:

1) Determine the actual performance values of the hood and Yankee cylinder and compare these values to the industry standard.
2) Adjust the balancing of air systems to optimize hood performance while minimizing gas consumption.
3) Make short and long term recommendations to obtain additional drying capacity and/or reduce energy consumption.

Some major findings derived from our Yankee cylinder/hood drying performance analysis:

<table>
<thead>
<tr>
<th>Survey indications</th>
<th>Recommendation</th>
<th>Benefits</th>
</tr>
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<tbody>
<tr>
<td>Hood Optimization</td>
<td>• Reduce hood exhaust fan speed.</td>
<td>Estimated gas savings which would represent typically 10-15% in gas flow reduction.</td>
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<tr>
<td></td>
<td>• Slight cut back of the hood make-up dampers.</td>
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<td></td>
<td>• Operate hood with higher air balance.</td>
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<tr>
<td>Hood Drying Performance Reduction</td>
<td>• Internal hood supply air short-circuiting within the hood body.</td>
<td>Inspect and correct internal leaks.</td>
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<td></td>
<td>• Hood cylinder gap greater than manufacturer spec.</td>
<td>Re-instate hood drying performance.</td>
</tr>
<tr>
<td></td>
<td>• Profiling dampers for the WE hood.</td>
<td>Improve hood drying rate (RW).</td>
</tr>
<tr>
<td></td>
<td>• Profiling dampers at 100% open if sheet correction from the hood is not required.</td>
<td>Use the full drying potential from the hood impingement drying.</td>
</tr>
<tr>
<td>Hood Air Balance</td>
<td>The hood air balance is to be kept at an optimal level</td>
<td>• Control hood blow-outs and risk of fire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Avoid risks of clogging the supply hole orifice</td>
</tr>
<tr>
<td>Hood Thermal Efficiency (TE Hood)</td>
<td>The high TE value is explained by:</td>
<td>A good TE value for a hood operated with preheated make-up and combustion air should be in the 1800-2000 Btu/lb H2O range.</td>
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<tr>
<td></td>
<td>• Excess exhaust capacity.</td>
<td></td>
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<tr>
<td></td>
<td>• Purge (by-pass) leaks.</td>
<td></td>
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<tr>
<td></td>
<td>• Hood lower drying efficiency.</td>
<td></td>
</tr>
<tr>
<td>Cascading Mode</td>
<td>Conversion to the “cascading mode” for the air systems.</td>
<td>Substantial gas savings up to 10-15%.</td>
</tr>
<tr>
<td>General Maintenance</td>
<td>Identify potential short-circuiting in the hoods.</td>
<td>Reduce electrical output.</td>
</tr>
<tr>
<td></td>
<td>May require internal inspection.</td>
<td>Increase drying.</td>
</tr>
<tr>
<td></td>
<td>Repair all make-up and balancing exhaust dampers to achieve proper control.</td>
<td>Improve hood control operation and achieve improved hood efficiency.</td>
</tr>
</tbody>
</table>

Yankee air systems are energy intensive and should routinely be checked to ensure that they run at an optimal level. A proper hood balance ensures maximum thermal efficiency (i.e. BTU (fuel) per ton of paper). A simple survey allows the papermaker to verify hood performance and balance the air systems. These surveys or audit can often result in significant savings in burner fuel and fan horsepower consumption, while providing you with recommendations for future improvements.

Contact our technical service department for a full optimization survey.
SYNERVAC-E SYSTEM ADDRESSES (Continued from cover) RUNNABILITY ISSUES

Problem
The mill had runnability issues in their Bel-Champ section (i.e. Beloit single-tier dryer section): paper edge flipping that would result in edge cracking and wrinkles.

Production Data
3200 fpm to 3500 fpm producing copy and printing grades paper (38#/3300 sq. ft.).

Solution proposed
Enerquin was consulted to formulate possible solutions at affordable costs; Enerquin came up with an innovative alternative to avenues proposed by other companies.

The key idea was to install on top of the Bel-Champ roll a special vacubox named the SynerVac-E:
- The SynerVac-E has internal compartments to control edge flutter problems & improve sheet threading;
- The vacubox keeps the sheet in contact with the felt across the machine width for optimum machine runnability during normal and threading operating mode;
- The vacuum source comes from the existing Bel-Champ exhaust system; since each box is interconnected to the Bel-Champ ducts on the Tending and Drive Sides, no additional exhaust system is required;
- The SynerVac-E can be supplied and installed at a fraction of the cost required for conventional blow boxes and other Machine Builder’s approach requiring larger vacuum-roll diameter.
- Finally Enerquin guaranteed that the boxes would stabilize the sheet edges without affecting operation of the machine negatively during threading and normal production.

SYNERVAC-E SYSTEM ADDRESSES RUNNABILITY ISSUES

PROPER DESIGN AND OPERATION OF YANKEE HOODS REDUCE ROUTINE MAINTENANCE (Continued from cover)

With respect to Yankee hoods, a great deal of future maintenance can be reduced by:
- Making the drying system easier to understand and instructing the operating personnel on its proper use.
- Incorporating design features that require little or no maintenance.
- Designing the system for maximum accessibility.

Similarly, day-to-day operating of the Yankee hood is critical in determining the level of routine maintenance required and the system’s life expectancy.

Our purpose here is to propose a minimum maintenance Yankee hood system. This system is comprised of three material groups: the Yankee hood, the ductwork, and the process control system.

THE YANKEE HOOD

Figure 1 outlines the general arrangement for half of a Yankee hood. Supply air is fed through a hood supply duct, down through a series of duct feeds, and out to a system of nozzle plenums. All components of this internal hood supply system should have quick-release access doors, to allow for routine inspection during shutdowns.

The outside of the hood has tongue and groove panels (Figure 2), with access doors to make it more convenient to service the inside of the hood (exhaust) plenum. All tissue operations experience some degree of dust accumulation. If the hoods are run at less than 500°F for an extended period, these fibers are not incinerated within the hood. Instead they can plug the drying nozzles, which causes a gradual loss of production. Therefore, the hoods must be vacuumed or blown out periodically during the major shutdowns, following a thorough visual inspection. Dust collection is particularly prevalent in steam-heated systems. (Gas-fired air systems are not as prone to dust problems, since they are usually operated at temperature above 650°F for fiber incineration in the supply and return ducting systems.)

Yearly physical inspections of the hood are required to ensure that the supply air does not short-circuit into the exhaust plenum (e.g. access doors not tightly closed, cracks in supply feeds or impingement boxes, etc).

The lower quarter of the wet-end hood should be made completely of stainless steel, because this area must withstand wet environments.

Finally, a checkered plate on top of each hood will help to prevent damage to top panel seals. Damage of this kind can leave gaps in the panel joints, which allows the exhaust plenum air to short circuit.

Hood profiling used to be an important tool on improving paper quality and uniformity in the cross-machine direction.

Results
The first SynerVac-E boxes were installed to solve Sheet Edge lifting which had been identified as one of the main culprits for edge cracks and sheet breaks. The mill was extremely satisfied with the results and on the fact that Enerquin’s “efficient / low cost” approach represented a small fraction of the several million dollars solution proposed by Machine manufacturers!

The SynerVac-E can be easily retrofitted on any single-tier dryer section with vacuum rolls.

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PROPER DESIGN AND OPERATION OF YANKEE HOODS REDUCE ROUTINE MAINTENANCE (Continued from p.3)

In a remote control system, a routine maintenance inspection should confirm that all hood profiling positioners and operators are functioning properly.

Nowadays profiling tools, like steam showers, are much more efficient. Since profiling with impingement air implies a reduction in drying capacity, the hood profiling usage should be questioned and profiling dampers readjusted to maximise the hood drying efficiency.

Jactuator systems are used primarily to retract the hoods during sheet breaks. Jactuators are screw-type actuators, typically driven by air motors. They drive gear boxes, which in turn drive lineshafts connected to the hoods. The following routine maintenance should be performed monthly on the jactuator retraction mechanism:

1. Lubricate the jactuator gear box with extreme pressure grease (EP No.1)
2. Check the threads and carriage of the jactuator and ensure that the moving parts are kept lubricated all times.
3. Keep the protective casing over the jactuator screw. Clean the air motors, wheels, and wheel ramps of any dust.
4. Lubricate the air motor bearings.
5. Check the motor air sets-regulator, filter, and lubricator.
6. Check and lubricate the cross shaft bearings.

PAPER MACHINE HOOD TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>Visual Inspection</th>
<th>Potential Air Systems Problems</th>
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<tbody>
<tr>
<td>Sweating and water dripping off the outer skin of the hood wall panels.</td>
<td>Hood is operated at too high humidity - hood deterioration occurs suggesting lack of hood exhaust capacity - Panel joints are not airtight.</td>
</tr>
<tr>
<td>Roof panels with caved-in shape.</td>
<td>The hood roof panels have lost their thermal resistance, thus the capability to contain high humidity.</td>
</tr>
<tr>
<td>Sweating on the front lifting doors windows.</td>
<td>Improper hood balance; hood zero level too low; possible lack of hood exhaust capacity, etc.</td>
</tr>
</tbody>
</table>
| Zero level: Use safety glasses or tissue test.  
  . Above 8 ft - negative pressure  
  . Lower than 4 ft - pressurized | Excess of exhaust and/or lack of supply. Lack of exhaust and/or excess of supply. |
| Machine operating with the tending side doors partially or fully open. | Bad sheet profile, lack of hood supply and sheet runnability issues caused by bottom pockets. |

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