Best Fit for Purpose –
Cast Iron and Steel Yankee Dryers

Jan Larsson, Director of Sales
One tissue machine for every need
.... but the Yankee dryer is still the heart of the tissue machine

Advantage™ DCT®,
technology
Plain tissue

Advantage™ NTT™,
technology
Plain and textured tissue

Advantage™ Thru-Air®,
technology
Structured tissue
Yankee History in Brief
Yankee dryer history

1820
First Yankee Dryer
Patented, cast iron,
heated by fire

1850
The Yankee paper
machine with steam
heated dryers is
“launched”

1860
KMW established as
a foundry

1891
KMW’s first paper
machine delivery to
Serlachius in Finland

1895
KMW deliver
Yankee Dryer to
Gothenburg
Paper Mill

1898
Yankee diameters
16 ft, first welded
steel dryers

1910
Yankee diameters
10 ft. steam
pressure 0-30 psig

1950
Yankee diameters
18 ft and above.
Steam pressure up
to 160 psig

1960
The internally ribbed
Yankee dryer shell
invented by Beloit

1970
Computer aided
engineering

1980
Improved NDT and
quality control

1986
Valmet acquire
KMW

1990
Improved full face
metallizing methods

2000
ENP against the
Yankee, "high load
Yankee dryers",
850 psi

2000
Ribbed Steel
Yankee dryers
Valmet Advantage™ Yankee Dryers
characteristics of a world class Yankee dryer

- Safety – safety is No.1
- Performance – in drying, creping and pressing
- Availability – minimum downtime for maintenance

• Our experience is our customers advantage but also….
• Feedback from our customers is an important part of the continuous improvement process
What determines type of dryer?
Process Specific Requirements
Different processes have different key requirements on the Yankee dryer

**Advantage™ DCT® technology**
Plain tissue

- Top speed machines – extreme demands on dimension stability, low vibration level and uniformity
- ViscoNip for maximal dewatering and energy efficiency requires high press load capability.
- Wide operating window for different grades and pressures
- Aggressive process water or chemistry - shell thermal coating

**Advantage™ NTT™ technology**
Plain and textured tissue

- Shell surface must be able to withstand elevated doctor loads
- Condensate removal system must be able to handle both plain and texture modes
- Shell surface exposed to more specialized process chemicals

**Advantage™ Thru-Air® technology**
Structured tissue

- Shell surface must be able to withstand very high doctor loads
- Shell surface exposed to more specialized process chemicals
- Drying load somewhat more moderate, "creping cylinder"
Steel is a stronger more elastic material and the pressure vessel codes allows for lower safety factors, therefore the steel shell can be made thinner.

Steel is a softer material and the shell surface needs to be metallized.

A cast iron shell is thicker to obtain the necessary strength, grinding allowance and higher safety factors stipulated, but with deeper grooves for high drying capacity.

Too thin shell can generate sheet marking from ribs.

Too high heat flow may cause sheet blistering and coating problems.
Cast Iron Yankee Dryer Manufacturing
Moulding and casting of high quality Yankee dryer castings
Valmet Advantage™ Casted Yankee Dryer

Excellent performance, high safety, availability and long service life due to simple design, high-quality castings, high-precision machining and rigid quality assurance.

Shell geometry and cast alloy optimized for high and uniform heat transfer and good wear resistance.

Well proven for all tissue making processes such as conventional DCT and WCT, premium TAD, and emerging hybrid processes such as Valmet NTT and other proprietary technologies, as well as for MG and other specialty papers.

Deliveries include the world’s largest diameter (23’/7000 mm – Tervasaari PM 3) widest (306” - GP Port Hudson TM 5) fastest running* (2210 m/min Hayat Kimya TM 2, 2200 m/min SCA Neuss PM 2, 2160 m/min FAPSA PM 4)

*24 hour TM world speed records
Valmet Advantage™ Steel Yankee Dryer

Based upon Valmet’s long experience of Yankee dryers and paper machines for high safety, top performance, availability and long service life

Optimized shell geometry and weld joints for high and uniform heat transfer.

Several patents and pending patents.

Infinikote® or HS600™ thermal spray coatings - the world standard for Yankee and MG cylinders.
Valmet Advantage™ Steel Yankee Dryer

Manufacturing – welding of head to shell

Long and extensive experience in welding from headboxes, press and cantilever beams, drying cylinders, trays, heavy framework, fiber and pulping equipment including boilers.

High precision and tailor made manufacturing equipment

- Welding
- Machining
- Assembly
- Grinding and crowning
Yankee Deliveries – Valmet Current Capabilities
Yankee Dryer Deliveries

- 600 Yankee dryers and MG-cylinders delivered since 1895 including the world’s largest diameter, widest and fastest running.
- Steel Yankee dryers sold, under delivery and started-up:

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Summary and Conclusion
## Cast Iron and Steel Yankee Dryers in Summary

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<th>Feature</th>
<th>Cast</th>
<th>Steel</th>
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<tr>
<td>Drying capacity (Theoretical)</td>
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<td>Vibration damping properties</td>
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<td>Corrosion and erosion resistance</td>
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<td>Maintenance and periodic inspections</td>
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<tr>
<td>Process compatibility (TAD, hybrid)</td>
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<td>Others (high load, high speed, stability)</td>
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### Comment
- **Stronger steel allows for thinner shell but can be compensated by deeper grooves for cast. Practical drying limitations.**
- **Relates to drying capacity. Drying more with Yankee reduce losses in AirCap. Yankee itself do not use less energy.**
- **Steel is better material for pressure vessel. But design and quality equal important. Valmet has excellent safety record.**
- **Both cast and steel shells are metallized with the same type of thermal coatings.**
- **Cast iron provides a good papermaking surface as is. A steel shell is too soft and must be metallized for papermaking.**
- **Cast iron has been used and proven for over 150 years with. Ribbed steel dryers has only been in operation some 10 years.**
- **High quality cast iron is uniform with even properties. A high quality welded shell has small variation between weld and plates.**
- **Grey cast iron has excellent vibration damping properties, 10-20 times that of steel. Concern for high speed PMs.**
- **The free graphite of cast iron form a barrier to corrosion. Steel has no free graphite and is more exposed to fatigue.**
- **Well established recommendations and methods for cast Yankee. How much maintenance and inspections for steel?**
- **TAD and hybrid processes utilize higher doctor loads known to quickly deteriorate metallized shells. Steel unproven.**
- **Very little experience in the industry with steel Yankees and high press load (fatigue) and top speed tissue machine.**
One tissue machine for every need

.....and a Yankee dryer for every need – best fit for purpose

Advantage™ DCT®
Plain tissue

Advantage™ NTT™
Plain and textured tissue

Advantage™ Thru-Air®
Structured tissue

Steel Yankee dryers
are suitable for:
- most conventional tissue making processes
- maximized Yankee drying rates
- press nip loads up to 120 kN/m (685 PLI)

Cast iron Yankee dryers
are suitable for:
- all processes but in particular
- high nip load applications (up to 150 kN/m (850 PLI))
- TAD and hybrid tissue making processes