



TOSCOTEC STEEL YANKEE DRYER
The Pioneering Leader.

**ONCE UPON A TIME
THERE WAS AN IDEA...**



ESF



In 1999, Toscotec started designing Steel Yankee Dryers combining nearly 40 years of manufacturing experience in making steel cylinders with emerging methods of engineering analysis. One year later, in 2000, Toscotec launched the 1st grooved Steel Yankee Dryer... and the rest is history.

Toscotec, which started working with steel dryers in the paper industry in the 1960s, has supplied over 2000 Pressure Vessels for more than 1000 references worldwide. Starting with certified pressure vessel quality steel plates and utilizing a revolutionary welding process and bolting concept, Toscotec created an intrinsically safe Steel Yankee Dryer.

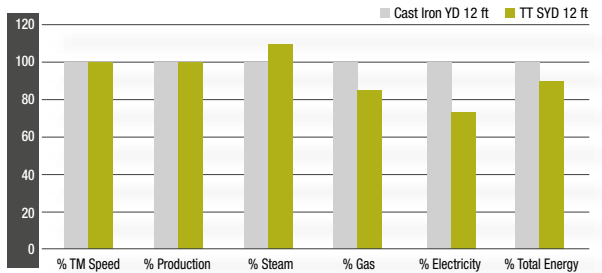
At the time of its introduction, Toscotec Steel Yankee Dryers (TT SYD) were only considered by the Industry for applications on narrow, low production tissue machines. In 2006 that all changed as Toscotec shipped the 1st 15FT Steel Yankee Dryer to WEPA, a major tissue producer in Europe, for an application in a high speed production machine that ran up to 305 mpm (1000 fpm) and was making 110 tpd.



The Steel Yankee "myth", as described by some competitors, became a reality and TT SYDs were no longer just considered for slow and economical machines. Now capable of reaching high speeds and with Toscotec's ability

to manufacture them in large diameters, Toscotec created a shift in the market traditionally dominated by cast iron foundries that, at the same time, were beginning to demonstrate their limits in reliability and production: **the Invention became an Innovation.**

The Yankee dryer has always been a critical element for tissue quality and a key component in the drying process. The combination of Yankee conduction and Hood convection determines the drying capacity of the tissue machine and has a substantial influence on plant capacity. It is an energy intensive process which makes the Yankee an area for potentially significant for energy savings.



Substantial field data available today from our years of experience with Steel Yankee Dryer applications has led to technological and manufacturing process guiding principles. The use of steel instead of cast iron allows a significant reduction in shell thickness which decreases thermal resistance and thus increases heat transfer. The result is higher drying capacity achieved by increased steam condensation inside the dryer. Data obtained from Steel Yankee Dryer installations have confirmed that the heat exchange coefficient and the drying capacity of Steel Yankees typically exceed those of cast iron by at least 30% given the same dimensions and operating pressures.

Today, Toscotec's experience gained from field installations have led us to implement an improved rib design in the second generation TT SYD introduced in 2012.

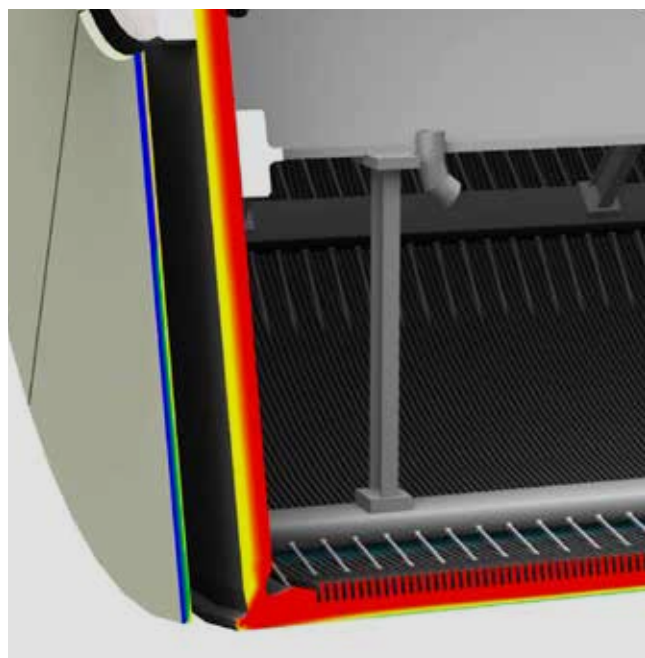


HIGH DRYING CAPACITY USING LESS ENERGY

TT SYD guarantees a higher drying capacity and significant energy savings when compared with conventional cast iron Yankee dryers.

Each size of TT SYD Steel Yankee Dryer offers a high level of flexibility in defining paper sheet width on the face length. Toscotec's broad manufacturing experience assures the highest construction quality for TT SYD and absolute operational reliability. Manufactured, tested and certified according to European (PED), American (ASME), P.R. China (CSEI) and Japanese (JIS) regulations, TT SYDs are capable of operating at up to 10 bar(g) (145 psig) of steam pressure.

Among the key features of this technology, the TT SYD allows for a wider tissue sheet to be produced compared to a same size cast iron Yankee dryer face length. **Even with the same Yankee frame, it is possible to install a TT SYD that will increase the net sheet width at the pope reel and provide an even quicker payback.** Toscotec also recommends its Patented Thermal Head Insulation which will reduce heat losses from the Yankee head thereby increasing energy savings.



TT SYD HEAD INSULATION

- No edge over-drying effect
- No edge fiber build-up
- Patented design





SAFETY

The most important benefit of a Toscotec Steel Yankee is safety.

Unlike cast iron Yankees, Toscotec Steel Yankees cannot explode.

In the event that internal stresses on the steel shell exceed the yield strength, the steel shell will deform but stay intact. If the stresses inside a cast iron dryer exceed the yield strength, the dryer will explode. This inherent property of steel makes **Toscotec SYDs intrinsically safe.**

Each TT SYD is individually designed by our Engineering team that analyze the reaction of the TT SYD models with FEM analysis in every operating condition. A particular emphasis is put on the response of the welds and bolted journals in critical conditions.

Upon completion, each TT SYD is thoroughly inspected with 100% Ultrasonic and Magnetic testing of all components.

Phased Array and 100% X-ray inspection are also performed on all structural welds. Dimensional and pressure tests are performed before final approval of the cylinder.

FIELD PERFORMANCES

Field data confirms that the main advantage of Steel technology is the higher strength of steel compared to cast iron.

This allows for the reduction of the shell thickness by approximately 30% and consequently increases the heat exchange of the system.

Since steel and cast iron have similar conductivity, a 30% reduction in thickness translates into a 30% increase in drying efficiency.

Assuming that in a standard tissue machine there is an even split in drying contribution between Yankee and hood (50% each), **the overall benefit of installing a TT SYD would translate into a 15% increase in production capacity.**

ADDITIONAL ADVANTAGES

The use of Steel completely eliminates problems arising from defective castings such as porosity, pin holes and non-uniformity of the shell material.

The elastic material properties of steel significantly reduces the risks for dramatic failures of the cylinder thus substantially increasing safety.

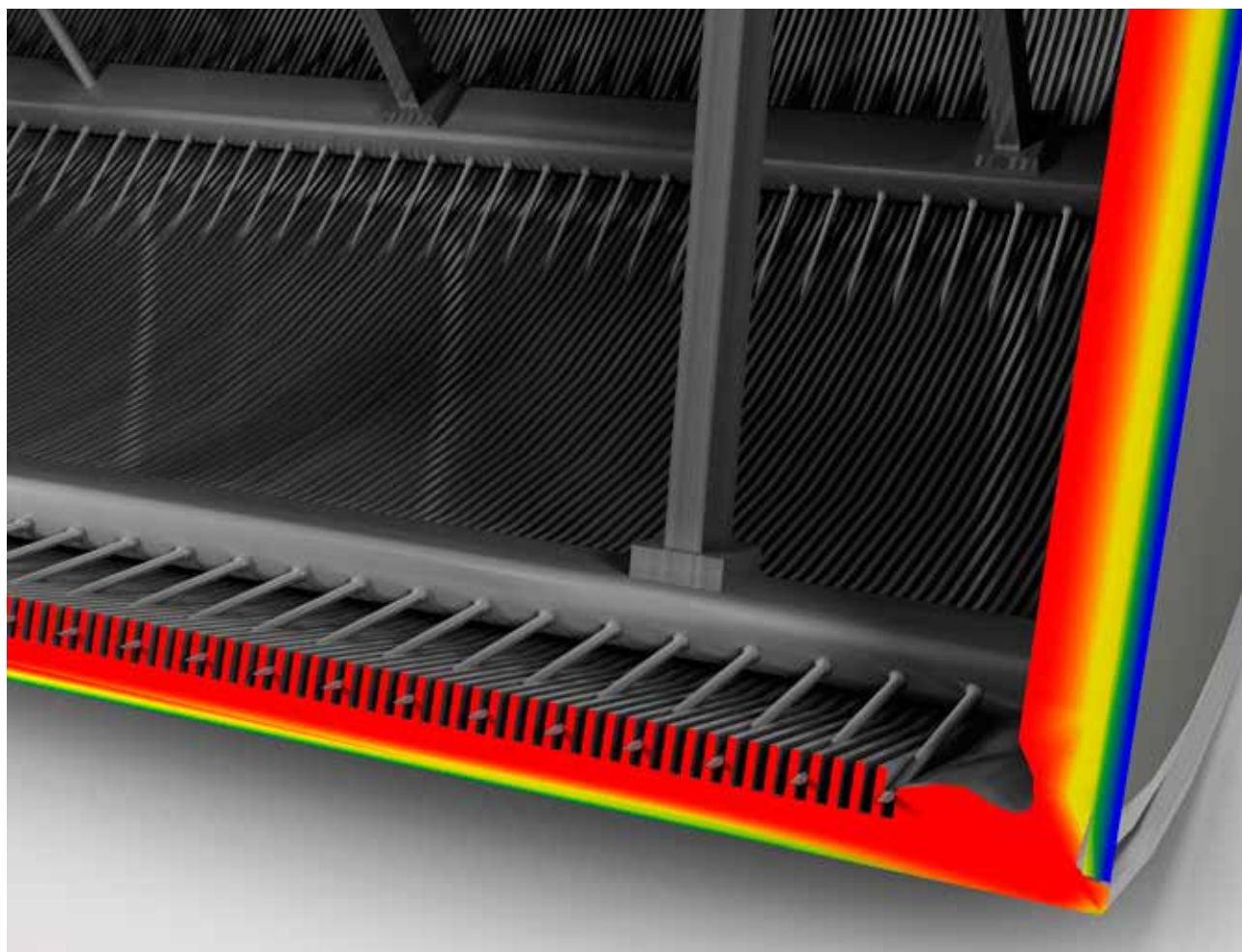
Greater shell hardness obtained by the spraying of a metal coating allows for a significant reduction of maintenance stops required with a cast iron Yankee

Metallization also eliminates the need for grinding as required with a cast iron Yankees. The removal of material on cast iron dryers eventually results in the derating of the dryer. Derating of the maximum operating pressure results in a reduced drying capacity of the tissue machine.

Steel Yankee Dryers are never derated.

TT SYD	Diameter	Net Trim Width	Maximum Load	Max Design
2500 MM	2500 mm (8.2')	up to 3600 mm (142")	95 kN/m (540pli)	10 barg (145 psig)
3200 MM	3200 mm (10.5')	up to 3600 mm (142")	95 kN/m (540pli)	10 barg (145 psig)
12 FT	3660 mm (12')	up to 5600 mm (220")	120 kN/m (683pli)	10 barg (145 psig)
15 FT	4572 mm (15')	up to 7620 mm (300")	120 kN/m (683pli)	10 barg (145 psig)
16 FT	4876 mm (16')	up to 7620 mm (300")	120 kN/m (683pli)	10 barg (145 psig)
18 FT	5486 mm (18')	up to 7620 mm (300")	120 kN/m (683pli)	10 barg (145 psig)
20 FT	6096 mm (20')	up to 7620 mm (300")	120 kN/m (683pli)	10 barg (145 psig)
22 FT	6705 mm (22')	up to 7620 mm (300")	120 kN/m (683pli)	10 barg (145 psig)

TT SYD is manufactured, tested and certified according to European (PED), American (ASME), P.R. China (CSEI) and Japanese (JIS) regulations.
Table reflects standard Yankee Sizes. Each Toscotec TT SYD is designed to customer specifications.



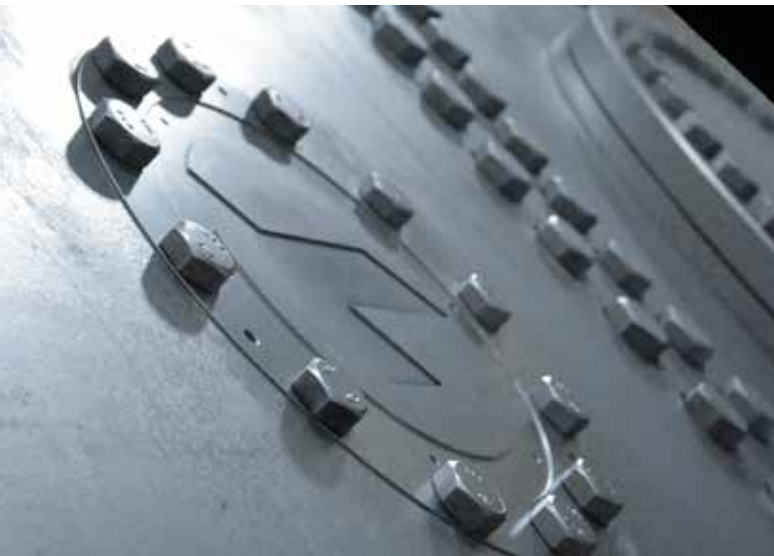
CUSTOMER BENEFITS

Field measurements and direct mill communication regarding TT SYD operation have yielded extremely positive data. Calculations made on the increased production capacity (without considering the benefits of energy savings) give a very fast return on investment. In some cases the payback can be as short as one year. These improvements come without having to change operator centerlines as the operators continue to run the Steel Yankee Dryer just as they operated with the old cast iron dryer.

- **Higher performance and energy savings on the PM.** With the same production output, energy savings of 5% to more than 15% are realistic expectations.
- **More flexible production process.** Delivery times are normally shorter.
- **Working safety.** No risk of explosion or crack propagation due to elasticity of steel.
- **Easier logistics and faster installation.** Much less weight.
- **Easier maintenance.** Fewer parts to repair, small grinding allowance and fewer shut-downs necessary, reduction of the wall thickness during lifespan due to hard metallic coating.

10 REASONS TO CHOOSE TT SYD

1. Higher evaporation rate resulting in a 30% increased drying capacity for the Yankee Dryer.
2. Lower consumption and less power required for the drive.
3. Complete elimination of problems due to porosity which can lead to pin holes.
4. Uniformity of drying across Yankee face length because of consistent properties of steel plate.
5. Wider sheet width capability on existing bearing centerlines.
6. Reduced maintenance due to no head to shell bolts and less inspection needed vs cast iron.
7. Reduced steam energy losses due to patented head insulation.
8. Metallized coating, no need to derate over the life of the Yankee.
9. Homogeneous and elastic material allows for optimal crown.
10. Fast pay back of investment when replacing cast iron.



THE STORY CONTINUES.

The success of this technology is a fact: all tissue producers that installed their first TT SYDs never went back to conventional cast iron units!

The Pioneer. The Technology Leader. The Proven Market Leader. Based on the number of deliveries and current orders, **Toscotec continues to be the recognized market leader including a 70% market share in replacement Yankees.**

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