

SUCCESS REPORT

NTN SPHERICAL ROLLER BEARINGS

NTN Extends Bearing Service Life on Thermal Rolls to Deliver the Ultimate Bearing Experience for Paper Manufacturer

NTN strives to deliver the Ultimate Bearing Experience by being a world class bearing producer, supplier and by supporting the success of our customers. In this comprehensive case study, we look at how a major Canadian paper manufacturer benefited from a customized bearing solution tailored to their exact needs.

Rising competition can require today's pulp and paper manufacturers to push their machines to new limits. Incremental increases in load, speed and operating temperatures will often reveal the "weakest" link in equipment that is operating above and beyond original design parameters. Sometimes that weakest link may prove to be a rolling element bearing.

At first glance, the easiest solution to mitigating bearing failures due to excessive and/or adverse operating conditions may be to install a larger, higher capacity bearing. Unfortunately, this will not always address the root cause. Furthermore, the required modifications to the machine can be complex and cost prohibitive. In these circumstances, NTN's Engineering team will design and produce a custom bearing with advanced capabilities designed to perform effectively under specific operating conditions.

This was the case when a major Canadian paper manufacturer, Catalyst (a Paper Excellence Company), began to experience frequent, catastrophic bearing failures on the thermal rolls in the calendar section of two separate paper mills. NTN's engineering team worked closely with Catalyst to review the application and operating conditions. Applied Industrial Technologies, LP (AIT) and NTN Bearing Corporation of Canada partnered to provide a solution that resulted in over 1.7 million dollars of savings in parts accrual, repair costs and downtime for this manufacturer.



VALUE ADDED BREAKDOWN

INCREASED PRODUCTIVITY
\$324,000*

INCREASED BEARING LIFE
\$1,400,000*

DOCUMENTED COST SAVINGS
\$1,724,000*

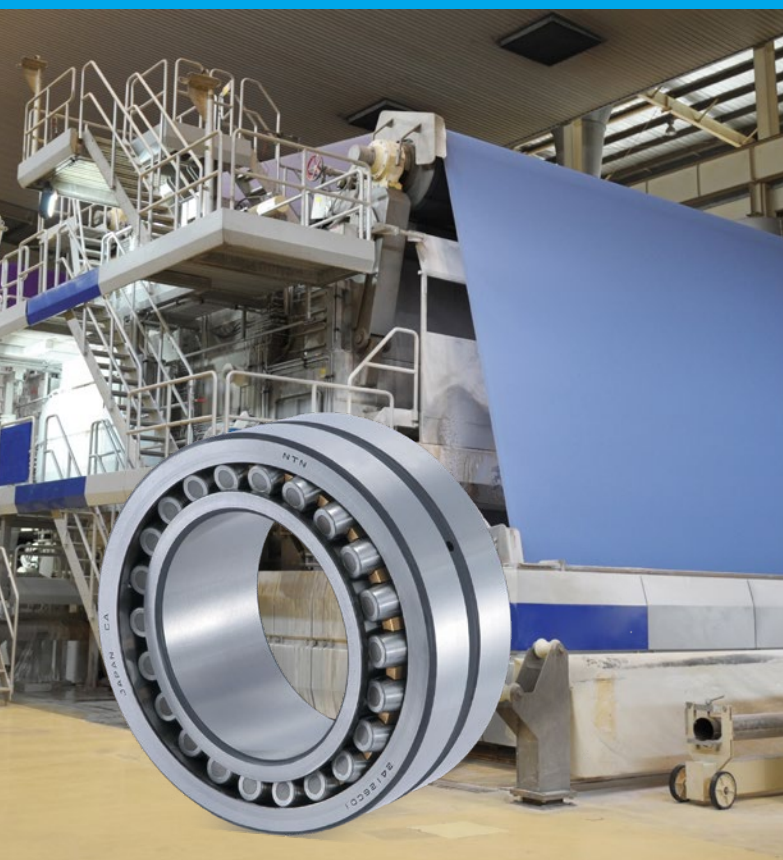
ANNUALIZED COST SAVINGS
\$944,000*





FAILURES IN THERMAL ROLL

Roller fractures may be associated with excessive shock load as well as poor roller dynamics, excessive temperature fluctuations and hydrogen embrittlement.



Bearing Failure Investigation:

Catalyst began to experience frequent failures in the thermal roll at two separate mill locations. Both mills experienced unpredictable roller fractures in a competitor's large spherical roller bearing. Within 18 months, the combined mills experienced 11 catastrophic failures resulting in a cost of over 1 million dollars in unexpected costs.

Failure analysis and application reviews at the mills were led by Drew Monk, AIT Manager TSR Services for Catalyst and Chris Rempel, NTN Engineering Manager. "Our customer's success is intrinsically tied to our own. The magnitude of these failures made this issue a top priority for all three organizations," says Chris Rempel.

Roller fractures are relatively uncommon and when it occurs, it is often secondary to another failure process (i.e., cage failure and subsequent loss of roller guidance). Roller fractures may be associated with excessive shock load as well as poor roller dynamics. Additional contributing factors may include tolerance issues in mating components, excessive temperature fluctuations and hydrogen embrittlement.

Ultimate Application Experience: designing a custom bearing solution to mitigate roller fractures

NTN, AIT and Catalyst collaborated to design and implement a custom bearing solution to mitigate roller fractures. As bearing failure costs were mounting quickly, a custom bearing was designed and produced in rapid fashion with an emphasis on reducing downtime.

Roller fractures were occurring with little to no additional failure symptoms and no warning, making the investigation difficult to diagnosis and predict. Although no definitive root cause could be assigned, several theories prevailed. A material enhancement was implemented that would mitigate the failure process. NTN, AIT and Catalyst worked to expedite bearing design, production, and implementation to stem the rapidly increasing cost of failures.

The Solution:

The Ultimate Bearing Experience leveraging the wide variety of NTN's material and heat treatment options

NTN's portfolio includes a wide variety of material and heat treatment options for rolling element bearings. In particular, NTN's capability to provide carburizing (case hardened) steel provided Catalyst with the opportunity to realize extended bearing service life. A custom case hardened, carburized bearing was designed and produced to mitigate roller fracture. Carburizing hardens the steel

from the surface to the proper depth, leaving a relatively soft core. This provided hardness and toughness, making the material suitable for impact loads and resistance to fracture. Case carburized material offered significant advantages over standard bearing steel for this application. “We investigated many options and NTN was able to offer the most promising and robust solution” said Drew Monk, AIT Manager TSR Services, Catalyst.

A Successful Outcome:

The NTN solution has delivered the Ultimate Experience in Bearing Life

The NTN Spherical Roller Bearings have been in service for over 2 years and overall maintenance costs have been significantly reduced. The NTN solution has delivered the ultimate experience in bearing life, lasting over 6 times longer without any failures to date. The two mills have been completely satisfied with the new case hardened, bearing solution.

An increase in bearing life was confirmed as the mills went from replacing 11 bearings in just over a year to the custom solution, still in operation, generating a total cost savings of \$1,724,000 to date.

There were several theories as to the failure process. Unfortunately, as is sometimes the case with some extreme examples, no definitive root cause of failure could be determined. However, these high-performance bearings have extended maintenance intervals and maximized productivity.

Conclusion:

Rolling element bearings in complex operating conditions often require advanced features. In this scenario, NTN was able to optimize bearing design and provide a versatile drop-in solution to address adverse operating conditions, resolving uncertainty and boosting the customer’s operating profit.

When designing custom solutions, the importance of collaboration with our business partners cannot be overstated. Catalyst, NTN and Applied Industrial Technologies were able to work collaboratively, interact and share ideas to develop a bearing solution that delivered a cost savings of 1.7 million dollars. Active continuous improvement and optimized collaborative activity enhanced productivity for Catalyst, helping to minimize operating costs for each mill site where these bearings were installed.

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NTN and AIT successfully implemented a solution to address the most plausible failure modes with case-hardened bearings. NTN’s commitment to delivering superior state-of-the-art solutions mirrors our own core values of innovation and adaptability, enabling our mills to operate profitably and sustainably.

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Gerry Dube, Paper Machine Supervisor,
Catalyst Powell River Division

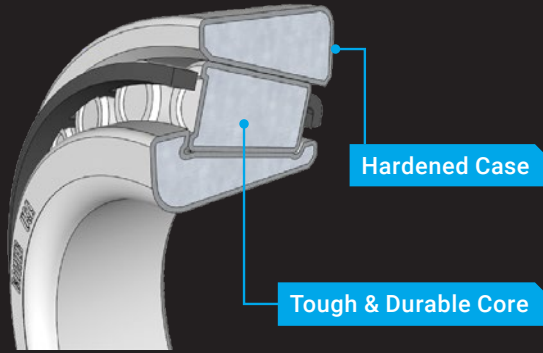


A well-balanced combination of technology, expertise and the rewarding dedication of each industry partner greatly contributed to the project’s success, delivering the **Ultimate Bearing User Experience**.

SPHERICAL ROLLER BEARINGS



Case Carburization



- The case carburization process creates bearings with a hard, wear resistant outer shell and a tough, ductile core.
- The tough outer shell helps protect the rolling elements from debris, while the ductile core allows the bearing to both absorb increased shock loading and operate under misalignment without failing.
- These traits are critical in heavy duty applications, in which bearings are forced to operate in heavily contaminated environments.



NTN SPHERICAL ROLLER BEARINGS ARE AVAILABLE IN OPEN & SEALED VARIETIES:

- Heavy duty cages available in either pressed steel or machined brass
- Up to $\pm 2^\circ$ misalignment capability



Let us take the heat off you.

We're here to help you achieve your productivity and performance goals. For more information, contact your NTN Sales Representative or **call 1-888-412-4122**. For technical questions, **email techsupport@ntn.ca**.

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Beyond Bearings

Training. Installation Support.
Trouble-shooting. And more.

When you choose NTN, your team is equipped with all the necessary tools and resources to get the job done right. From installation to problem-solving, we'll be there with the hands-on support you need to take on your toughest challenges. This includes extra services such as:



Technical Training Unit

On-site, mobile training unit offering specialized, hands-on instruction from NTN's technical team and always customised to your needs



Maintenance Training School

An intensive three day course on the design, application and maintenance of anti-friction bearings with hands-on workshops



eKnowledge

WEB-BASED TRAINING PROGRAM

Six online product training modules covering different bearing types and nomenclature (www.ntnamericas.com/eknowledge)



NTN Bearing Finder

Customizable search tool featuring exhaustive data sets, comprehensive part interchanges and interactive CAD drawings (www.bearingfinder.ntnamericas.com)

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