

# Shop

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## Metalworking Technology

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# *A Balanced* INVESTMENT

Quebec machine shop's focus on complex, tight tolerance work calls for high-end toolholding

**A**S A SHOP serving the aerospace, defense and high-tech industries, APN Inc., Quebec City, QC, must provide customers with parts that are as close to perfect as possible. Extremely complex, high precision and difficult-to-machine components are APN's specialty. Key to producing such parts to the highest industry standards, as well as faster and more accurately than the competition, is the shop's expertise in high speed, high performance three axis and five axis milling.

APN has been in business for 42 years and currently has 28 CNC machines, including two high speed three axis machines and five high speed five axis machines. The ISO 9001:2008 and AS 9100-C certified shop has had these machines for some time, but only recently discovered how critical toolholder selection is for such machine tools.

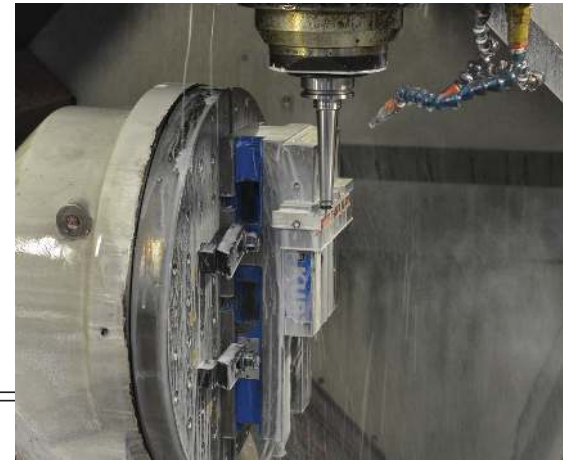
According to Yves Proteau, vice president of APN, the 100-employee shop always knew high speed, high performance machining required very high precision toolholding. And



when the shop first incorporated high speed machining, it relied on shrinkfit toolholding and other standard ER collet holders. The shop "soon realized such toolholding was not proving repeatable enough nor consistent in its performance, especially in the case of holding smaller diameter tools," says Proteau.

These problems, according to Proteau, stemmed from poor holder balance. The shop decided to test a different toolholding system, the Rego-Fix powRgrip, that operates mechanically as opposed to using heat.

"We immediately liked the system because it did not use heat," says Proteau. "But most importantly, we



Yves Proteau, APN's vice president, left, says Rego-Fix's powRgrip toolholding system has eliminated issues stemming from unbalanced toolholders.

were drawn to the system's extremely high repeatability and balance."

Short machine setup times are also critical to APN for meeting job delivery times. According to Proteau, the powRgrip holders contribute significantly to shorter overall machine setup times by providing faster tooling set up. Removing a tool from a holder and installing another, for example, takes approximately 10 seconds. The shop's shrinkfit holders, on the other hand, must be heated, the cutter installed, then cooled before the tool can be used.

APN has one powRgrip tool-changing unit and over 150 powRgrip holders that make up about 60 per cent of the shop's entire tooling. "When we add new machines, we typically add about 40 new powRgrip holders along with it," said Proteau. "Currently, 80 per cent of the tooling we have been purchasing, whether holders or collets, has been Rego-Fix."

APN's powRgrip holders are HSK

## Tighter hold leads to better finishes

The powRgrip system ensures high concentricity (T.I.R.) with deviations of less than three microns (0.0001 in.) for tool lengths up to 3x diameter (D) and length pre-adjustment with a repeat accuracy within 10 microns (0.0004 in.). And, the holders are 100 per cent balanced to G 2.5 at 22,000 rpm for steep taper-style holders and G 2.5 at 25,000 rpm for HSK-style powRgrip holders.

The balance and concentricity ratings of the toolholders are a direct result of their vibration dampening capabilities, which are especially beneficial for high speed and high feed machining. powRgrip toolholders practically eliminate vibration, which allows them to maintain much tighter T.I.R.s. This higher concentricity leads to improved part accuracies, smoother surface finishes and prolonged cutting tool life. The toolholder material's yield strength, or level of plastic deformation, is a known factor and one that is never exceeded. Staying under the material limits, so to speak, is what gives the system its high accuracy repeatability. The holder material remains undamaged, unlike other systems, such as shrinkfit, where a toolholder's material yield strength is often exceeded.



[www.apnca.com](http://www.apnca.com) | [www.rego-fix.com](http://www.rego-fix.com)

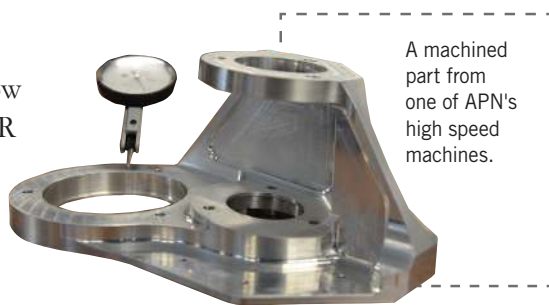
63—the shortest length being 3.149 in. (80 mm), the longest 7.875 in. (200 mm)—with 10, 15 and 25 collet sizes. The most beneficial feature is that the toolholders accurately and securely hold tools with shank diameters as small as 0.008 in. (0.203 mm), a tool diameter size that would be tough to hold using shrinkfit tooling.

All of APN's high speed, high performance milling machines now run either powRgrip holders or ER collets. The shop still uses some shrinkfit holders, but only for a few applications involving large diameter tools and other machines. The reason, according to Proteau, is that since the shop had already purchased the shrinkfit holders and heating unit, it would still like to get some return from that investment.

“In our high speed machining operations, we use a lot of smaller

tools as well as longer ones. If we had initially incorporated the Rego-Fix powRgrip system for these machines, we likely would have never used any other toolholding system,” says Proteau.

Tool sizes at APN are typically 0.1875 in. (4.8 mm), 0.125 in. (3.1 mm)



or 0.250 in. (6.35 mm) in diameter, and some of its drills measure down around 0.015 in. (0.381 mm) in diameter. These tiny drills are secured in powRgrip holders with coolant-through-style collets.



APN placed its powRgrip tool-changing unit near its high speed machines that use the toolholders.

Aerospace workpiece materials at APN range from stainless steels, tool steels, Inconels and titanium to copper, plastic and a host of others. Required machining tolerances for most parts are typically 0.0005 in. (0.012 mm), but some can be as tight as 0.0002 in. (0.005 mm). The majority, about 75 per cent, of workpieces measure less than 3 in. sq, and 50 per cent of those are smaller than 1 in. sq. However, on occasion, some measure up to 12 in. sq.

Job lot sizes vary from five to as many as 1,000 pieces, and the average is about 20. Half of these are regularly scheduled jobs/orders, while the other half are first-run jobs. At any given time, APN can be processing as many as 500 different jobs at one time.

In its three axis and five axis milling operations, APN typically machines parts using fast, light, high speed cuts at spindle speeds applicable

to workpiece material and the size of the cutter being used. The shop's three axis milling machines have 18,000 rpm spindles, while the five axis machines have spindles with maximum speeds up to 24,000 rpm.

When machining with a 0.500 in. diameter cutter in stainless steel, for instance, APN will run at the applicable spindle speeds. However, when it comes to machining aluminum parts, the shop typically runs spindles at maximum speeds. These operations require perfectly balanced toolholding.

When the shop first experienced balance problems with its shrinkfit holders, purchasing a balancing system was considered. That was right around the time when APN decided to test Rego-Fix holders.

"We may have benefited from a tool balancing system," commented Proteau. "However, since incorporating the powRgrip holders, the decision to purchase one has been postponed. We no longer see the need for such a system at this time. Our part precision is better than ever, and we no longer experience issues stemming from unbalanced toolholding."

APN situated its powRgrip tool-changing unit near the high speed, high performance machines that use the holders. The machines are arranged in cells, and one employee is in charge of setting up the Rego-Fix tooling. However, all of the shop's machinists know the system and will change their own tooling if necessary.



Or, in the case of a part with a long unattended cycle time, a machinist might prepare powRgrip tooling for the other machines while his machine runs on its own.

"After about a week with the system, all our machinists were quite comfortable with changing out tooling using the powRgrip unit. The system is easy to operate and is safe because there is no heat involved," explains Proteau.

After experiencing the benefits of the powRgrip system, Proteau says the toolholding contributes significantly to one of APN's competitive advantages: the ability to process extremely complex difficult parts, and do so using high speed, high performance machine tools. **SMT**



The powRgrip toolholders virtually eliminate vibrations, allowing for tighter high concentricity with deviations of less than three microns.

For more information on cutting tool technologies, visit Shop Metalworking Technology's **CUTTING TOOL ZONE** online at [www.shopmetaltech.com](http://www.shopmetaltech.com).

