

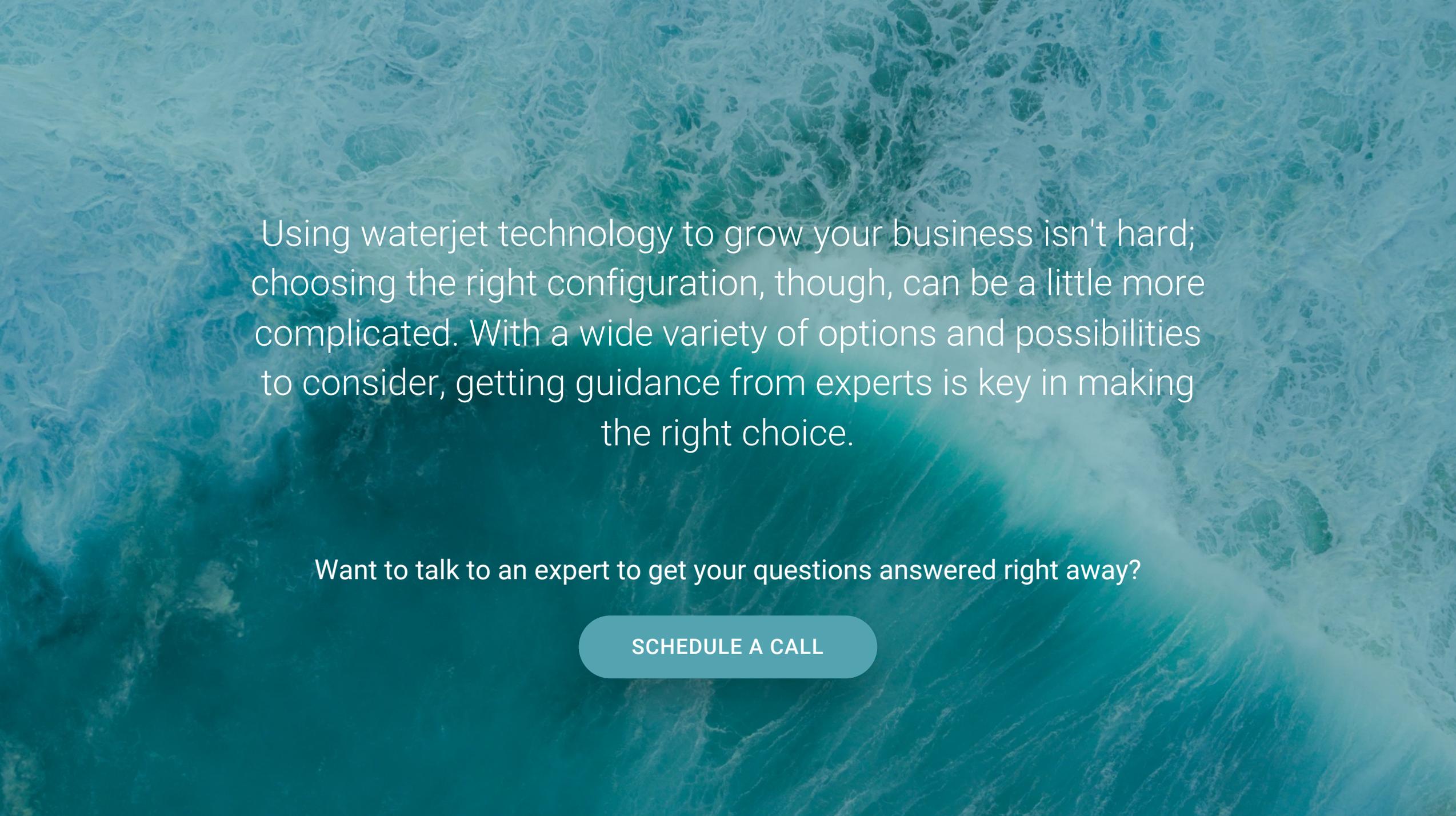
10 Critical Factors

You Can't Ignore When Considering Waterjet

E•BOOK

You can do a lot with waterjet.

Let's find you the **right** one.

An aerial photograph of ocean waves, showing white foam and deep blue water, with a semi-transparent teal overlay. The text is centered in the upper half of the image.

Using waterjet technology to grow your business isn't hard; choosing the right configuration, though, can be a little more complicated. With a wide variety of options and possibilities to consider, getting guidance from experts is key in making the right choice.

Want to talk to an expert to get your questions answered right away?

[SCHEDULE A CALL](#)

Table of Contents

CLICK ON A NUMBER TO JUMP TO THAT SECTION

- 1 What **material** are you going to be cutting?
- 2 What **size and thickness** is the material you'll be cutting?
- 3 What level of **precision** do you need?
What kind of work will be completed on the waterjet?
- 4 Do you have a need for **bevel** or **3D** cutting?
- 5 Consider the usability and capabilities of your programming **software**.
- 6 How much will you be running your waterjet?
What are your **production needs**?
- 7 Look for a system built for **reliability** and **longevity**.
- 8 Consider system **ergonomics** and your operators' convenience.
- 9 How can waterjet **complement** your other machine technology investments?
- 10 Consider finding the right team to **partner** with for the life of your waterjet.



What **material** will you be cutting?

FACTOR 1

What are you going to be cutting?

It's important to start by considering what materials you'd like to cut now and in the future. This will allow you to understand, at a minimum, how waterjet can help you grow your business.

Determine what materials you work with **80%** of the time.

For many job shop contract cutters, mild steel might be more typical, but cutting less common materials such as titanium, glass, steel alloys, or stone is where the waterjet process really shines and yields higher margins.

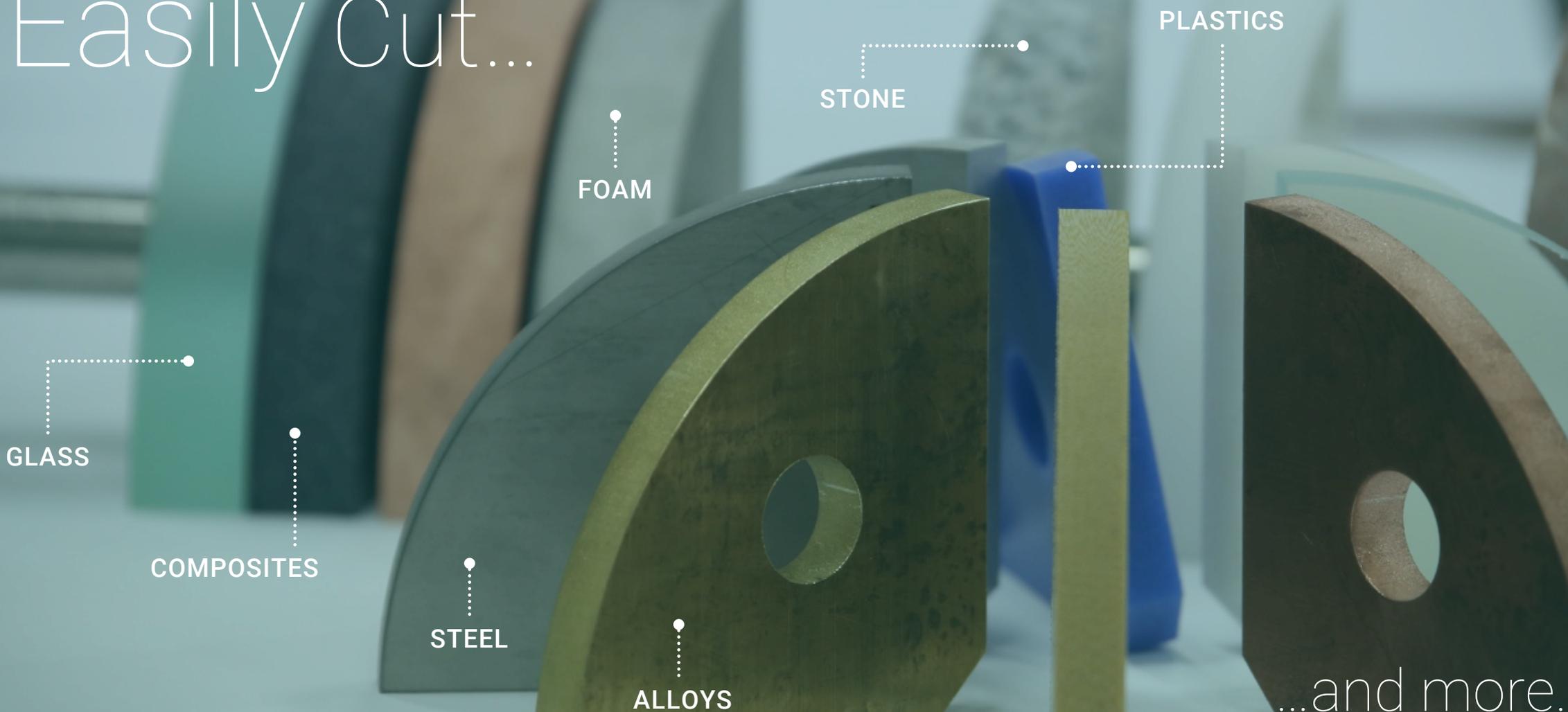
The versatility of waterjet is key.

The ability to use the same equipment for all materials greatly enhances machine utilization and your return on investment.

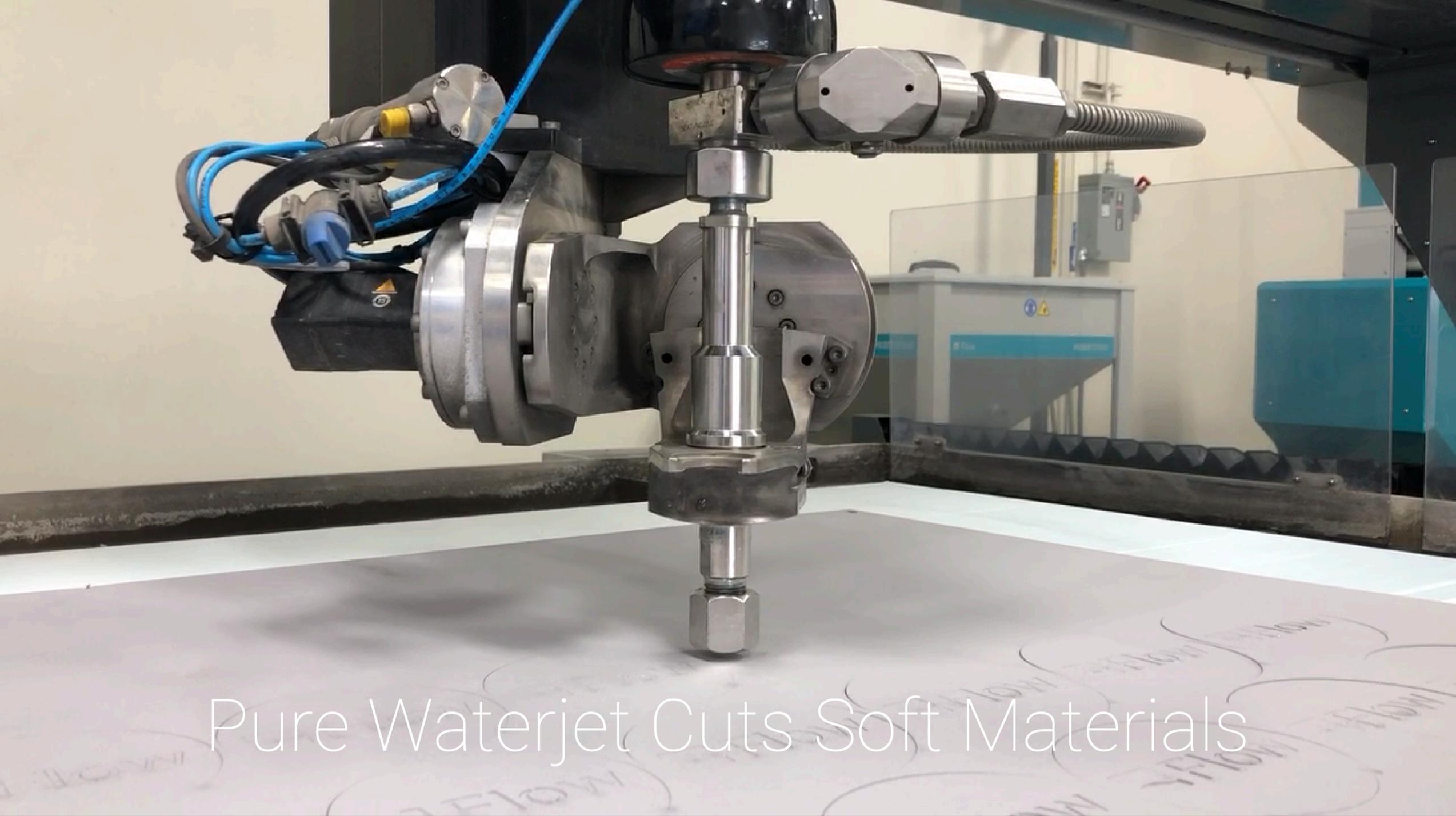
-  Cut Virtually Any Material
-  Cold Cutting Process
-  Reduces Secondary Finishing
-  Highly Versatile & Flexible

[READ MORE ABOUT WATERJET'S VERSATILITY »](#)

Easily Cut...



...and more.



Pure Waterjet Cuts Soft Materials



Abrasive Cutting Cuts Hard Materials

1 Generate Pressure

- An ultrahigh pressure pump generates a stream of water with pressure rated up to **94,000 psi** (6,480 bar)
- To put it in perspective, a fire hose contains a pressure of 390 to 1,200 psi (20 to 84 bar).

2 Convert Pressure into Velocity

- This pressure is converted in velocity via a tiny **jewel orifice**, creating a stream as small as a human hair which can cut soft materials.

3 Introduce Garnet

- To **increase cutting power** by 1,000 times, garnet is pulled into the supersonic waterjet stream.
- Water and garnet exit the cutting head at nearly **4x the speed of sound**, capable of cutting steel over one foot thick.



Glass, Composites, Stone

If you're cutting brittle or laminate materials, options like UltraPierce allow you to pop a starter hold before cutting starts.

Eliminates delamination, breakage, and edge fraying.



What **size** and **thickness** is the material you'll be cutting?

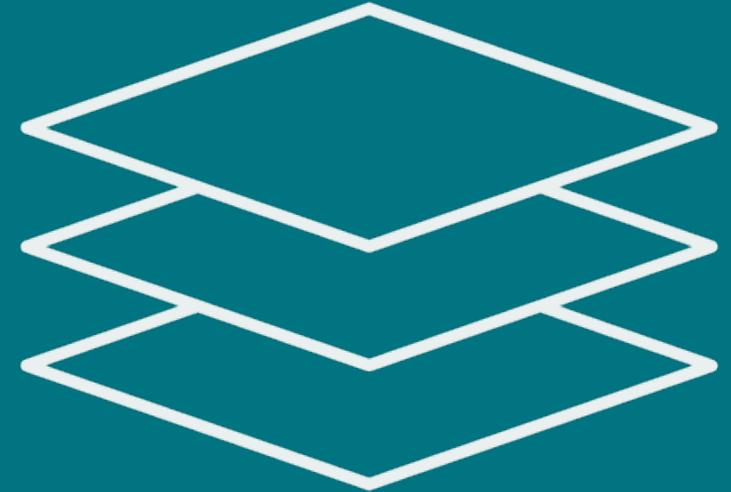
FACTOR 2

What size and thickness is the material you'll be cutting?

The size and thickness of the materials you intend to cut determines the power and number of **cutting heads**, the **pump requirements**, and the **size of the work bed you'll need**.

Optimal thickness for stacked sheet material is approximately 0.6" (15 mm) regardless of sheet thickness. If the thin material is not stackable because of small batch size, you can improve efficiency by putting power through two cutting heads with smaller jets.

With thin material you don't need larger jets because, surprisingly, they don't cut much faster than smaller jets. However, with thicker material over .25" (6 mm), going to a larger single head and increasing horsepower increases cut speed proportionally.

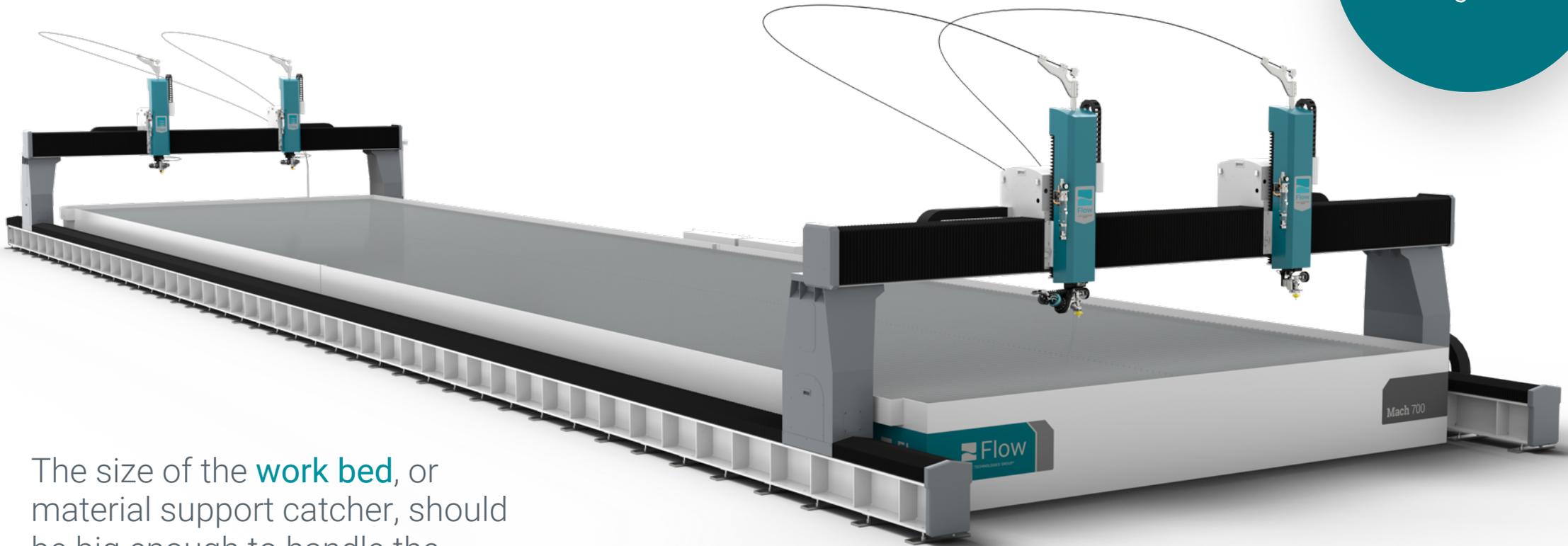


PRO TIP:

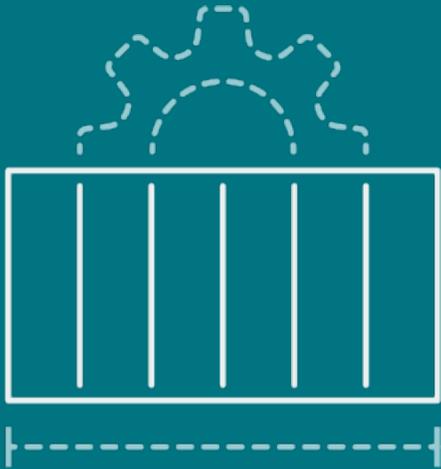
Thin sheet metal under .25" (< 6mm) (especially down to the 8-12 gauge level) can usually be **stacked** on your waterjet table to **increase production – and profits**.

Table Size

Larger tables allow dual cutting zones.



The size of the **work bed**, or material support catcher, should be big enough to handle the **largest sheet or plate that you commonly cut**.



PRO TIP:

A roomier work bed allows space to install multiple, **semi-permanent tooling locations** – enabling quick changeover from one job to another.

Table Size

An occasional oversized piece of material doesn't justify an enormous and expensive machine tool since you can hang larger material off an end of the catcher. Although not optimal, it is a more cost-effective solution.

If you plan to cut metal and/or stone, the most common sheet and plate sizes often dictate a **6.5 x 13 ft. (2 x 4 m)** work bed size. In North America, aluminum is sometimes available in 12-foot lengths, so the 13 ft. bed allows for easy loading. Similarly, the 6.5 ft. wide bed accommodates stone slabs that are sometimes delivered with a width of 6 feet.

You should get a work bed slightly larger than the stock material you intend to cut so that loading and fixturing is easy. The most common machine size is 2 x 4 m, or 6.5 x 13 ft.; this size covers nearly all North American and European material plate sizes.

CHECK OUT COMMON SYSTEMS & HOW THEIR CONFIGURATIONS MATCH UP HERE »



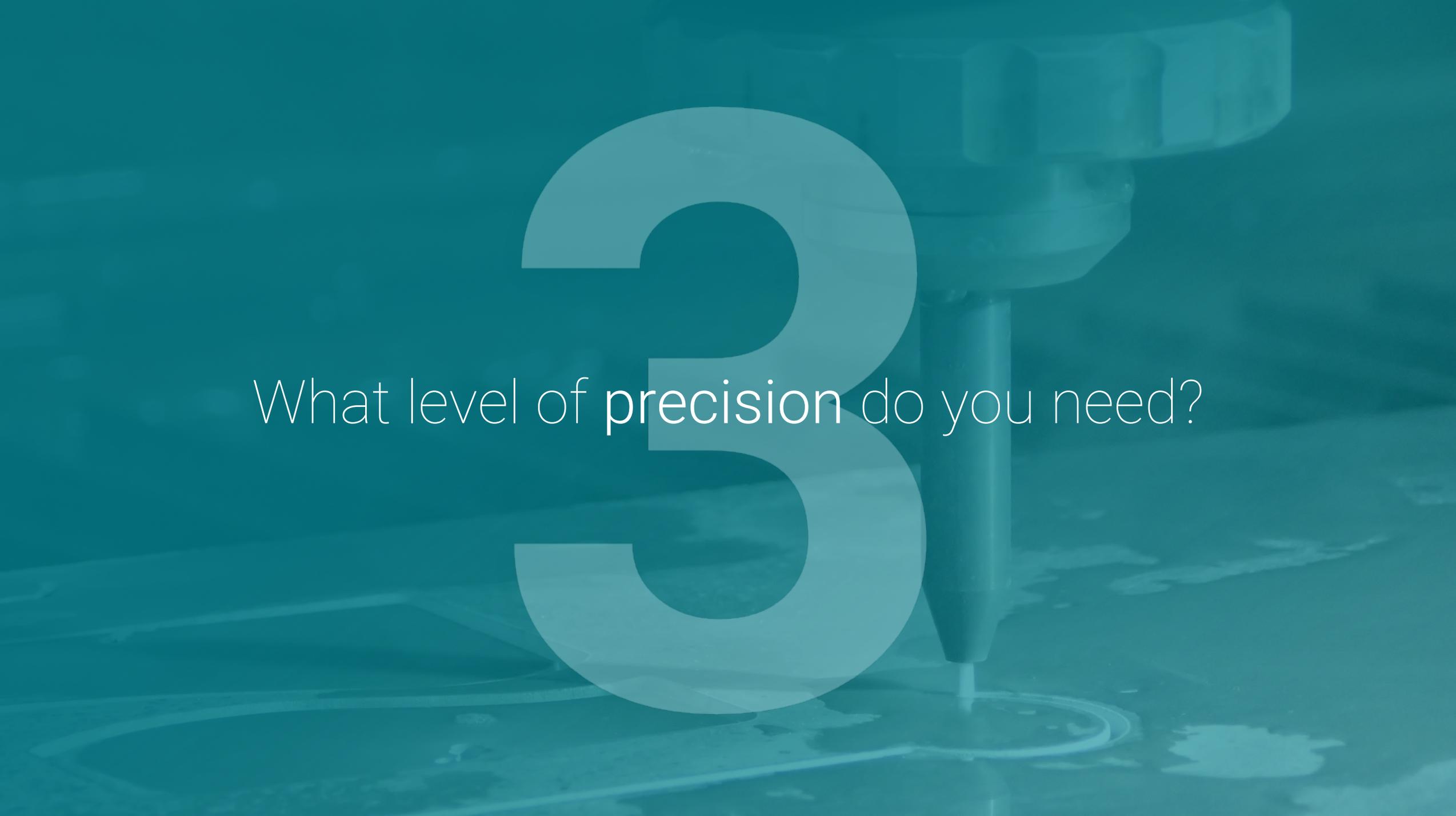
Material Thickness

It's no surprise that your material needs to fit easily under your waterjet cutting head.

STANDARD Z-AXIS HEIGHTS:

7, 8, and 12 inches of Z-travel

24 inches available on select models



What level of **precision** do you need?

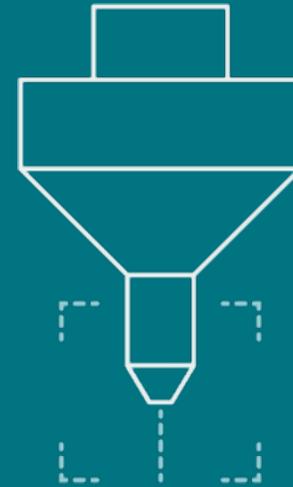
FACTOR 3

What level of precision do you need?

Waterjets vary in the precision they offer. Ranging from +/- .005" to .012", it's important to consider how you might use your system when determining the right fit for you.

A machine tool equipped with a basic waterjet cutting head, sometimes called a conventional waterjet head, can cut a +/- 0.005" accurate part out of any material up to approximately three inches thick. Beyond that, the finished part accuracy will be less.

Most operations are either fabrication or machine shops. Each have different needs when it comes to the level of cutting precision required. In general, machine shops normally need more accuracy than fab shops but some shops have both the precision chip making equipment of a machine shop and cutting, forming, and welding equipment of a fab shop.

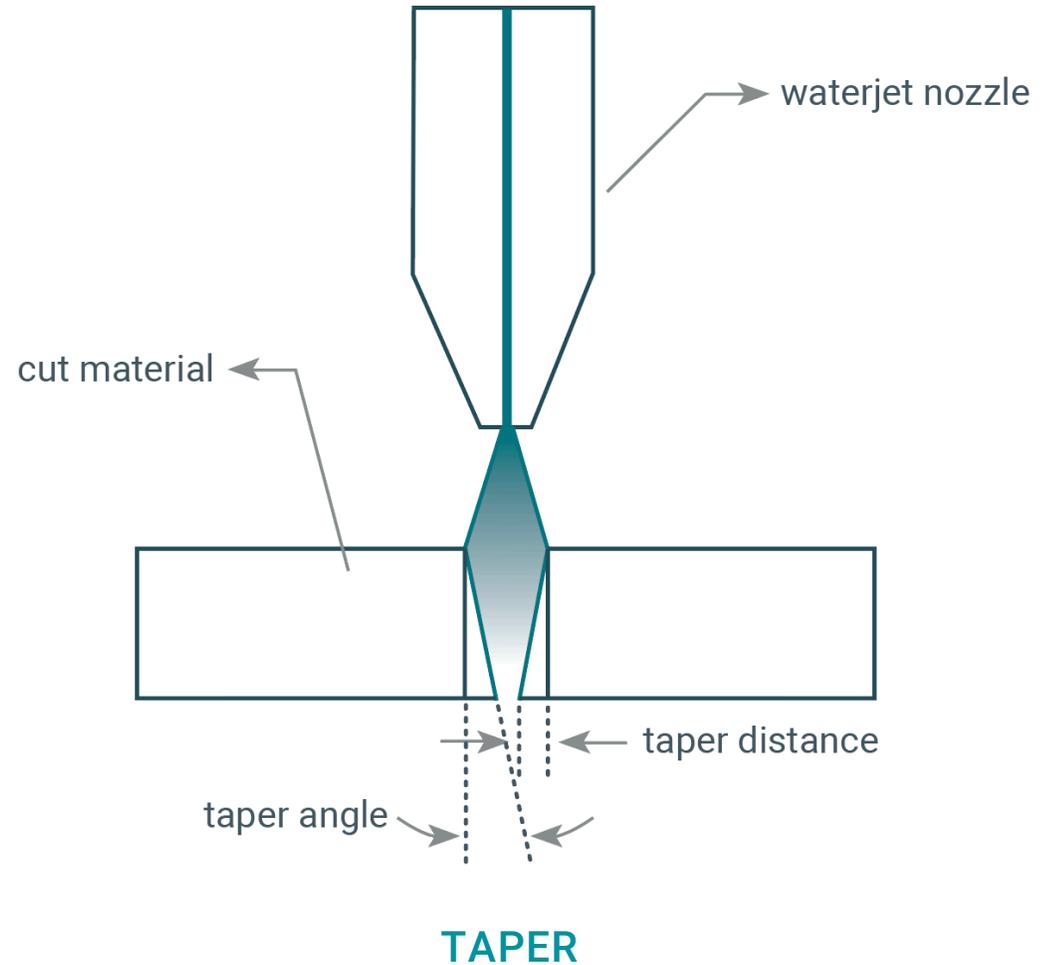


To cut to +/- 0.005" (+/- 0.13mm) tolerance with a conventional head, the machine cut speed must be reduced to approximately 15% of maximum cut speed.

This slow speed is needed to minimize corner washout caused by stream lag, and part taper caused by the V-shaped kerf created by the jet at high speed. Slower cutting reduces these errors, but does take longer and cost a bit more.

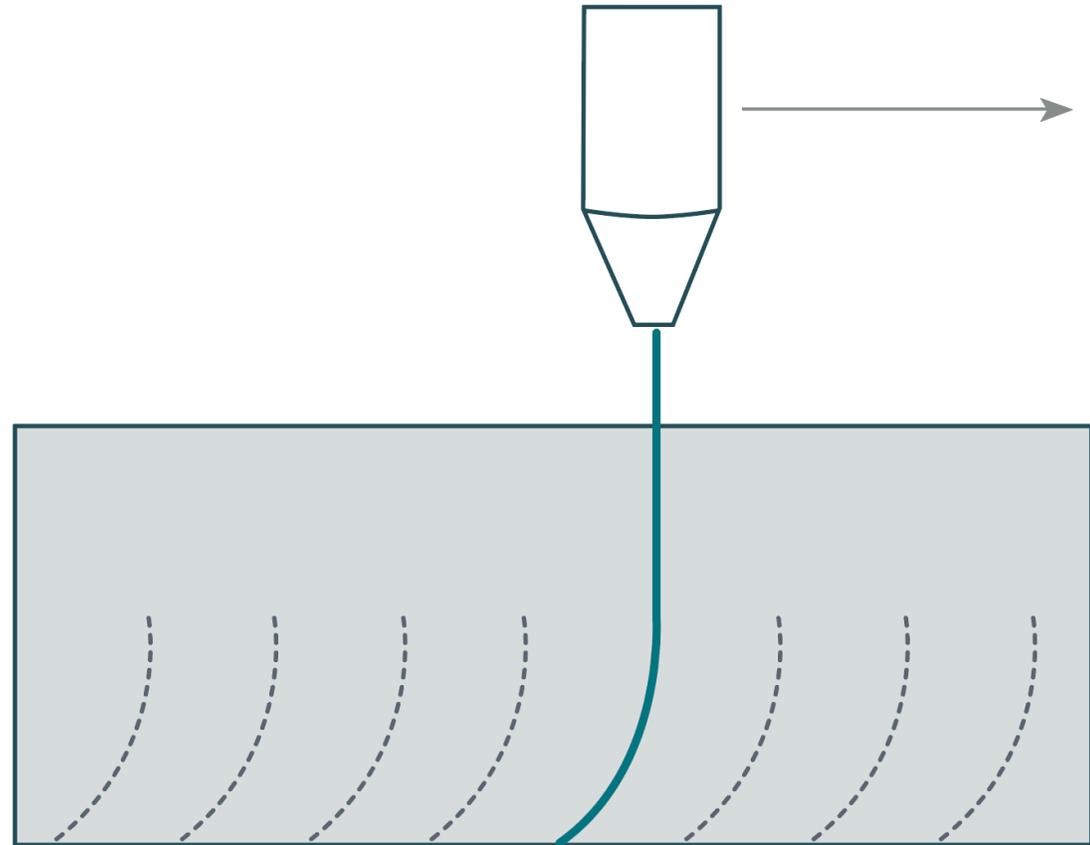
Taper & Stream Lag

Taper & Stream Lag are inherent to cutting with waterjet.



Taper & Stream Lag

Taper & Stream Lag are inherent to cutting with waterjet.



STREAM LAG



Controlling Stream Lag & Taper

- Controlling taper & stream lag is critical to cutting **high tolerance parts**. The faster we go the more exaggerated the taper and stream lag and vice versa.
- To minimize these with a standard cutting head, we **cut slower** (all via software) or we use a **Dynamic Waterjet®**.

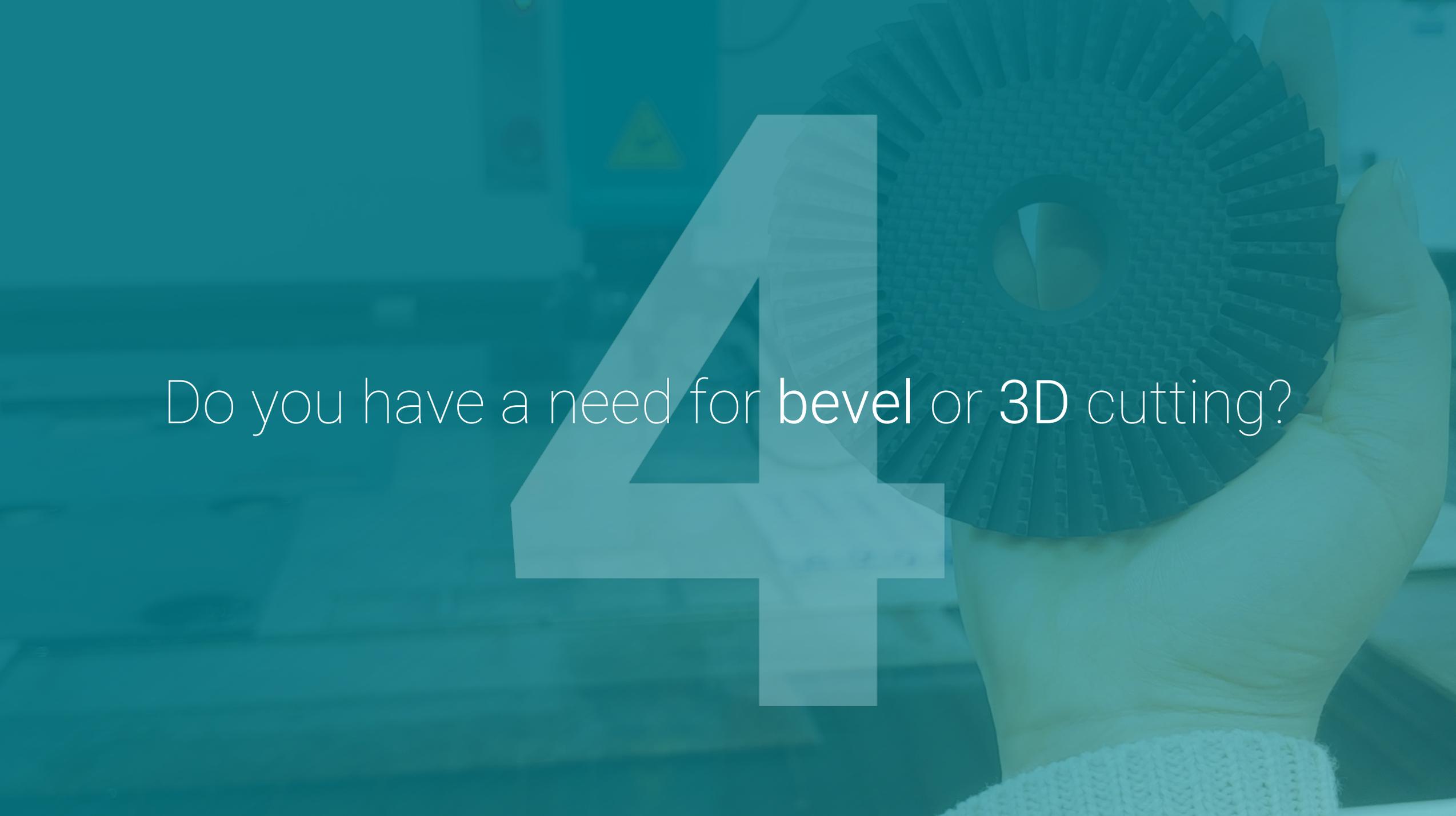


Dynamic Waterjet

Most systems Flow provides are equipped with Dynamic Waterjet® with Active Tolerance Control. Dynamic Waterjet is patented technology that automatically tilts the cutting head impingement angle to compensate for stream lag and taper in a behind the scenes operation based on cutting speed and type of material being cut. The result is two to four times faster cutting and finished part precision of +/-1 to 3 thousandths of an inch (+/- 0.03 to 0.08mm).

The technology allows the machine to move very fast, create a taper and stream lag, and then compensate for it automatically by tilting the head by up to 10 degrees.

[LEARN MORE ABOUT DYNAMIC WATERJET HERE »](#)

A hand holding a circular, textured, 3D-printed object with a central hole, set against a teal background with a large number 4.

Do you have a need for **bevel** or **3D** cutting?

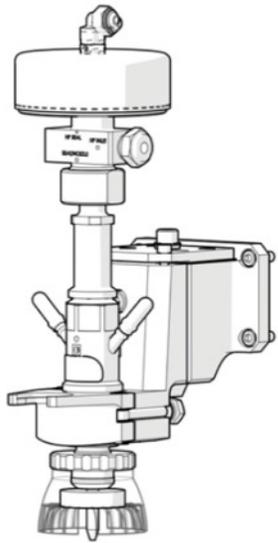
FACTOR 4

Do you have a need for bevel or 3D cutting?

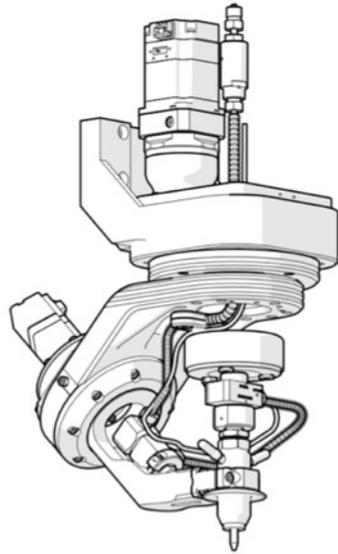
This is a pretty straightforward consideration, but it's important to consider from the start whether you will need this capability now or in the future.

Waterjets are often used for bevel and chamfer cutting. Depending on the precision and budget, there are different solutions you can consider.

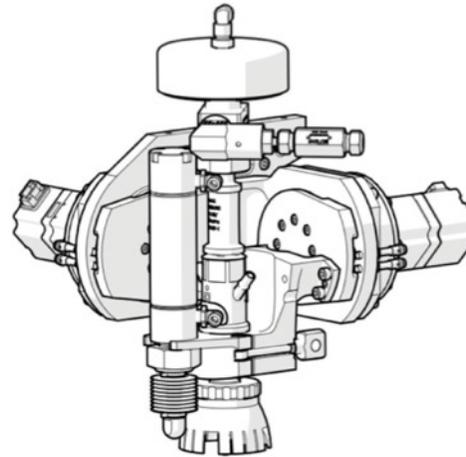
In addition to Pure Waterjet, Standard Waterjet, and Dynamic Waterjet, there are cutting heads with 5 axis capabilities: **Pivot+™** and **Dynamic XD®**.



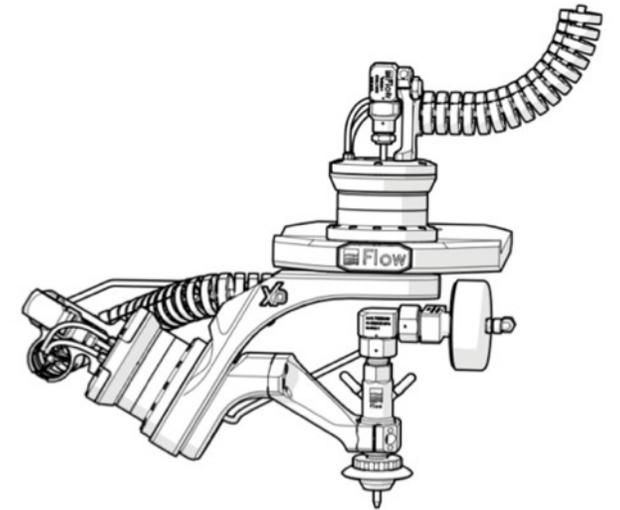
STANDARD WATERJET
Invented



PIVOT+™ WATERJET
Patented Technology



DYNAMIC WATERJET®
Patented



DYNAMIC WATERJET® XD
Patented



Pivot+

For **less precise 3D operations**, like when your production levels are lower than other manufacturing environments, Pivot+ is an excellent option. Weld preps and beveling applications up to 52° angles will find success with Pivot+.

Durable, compact, and streamlined bevel cutting.

[LEARN MORE ABOUT PIVOT+ HERE](#)



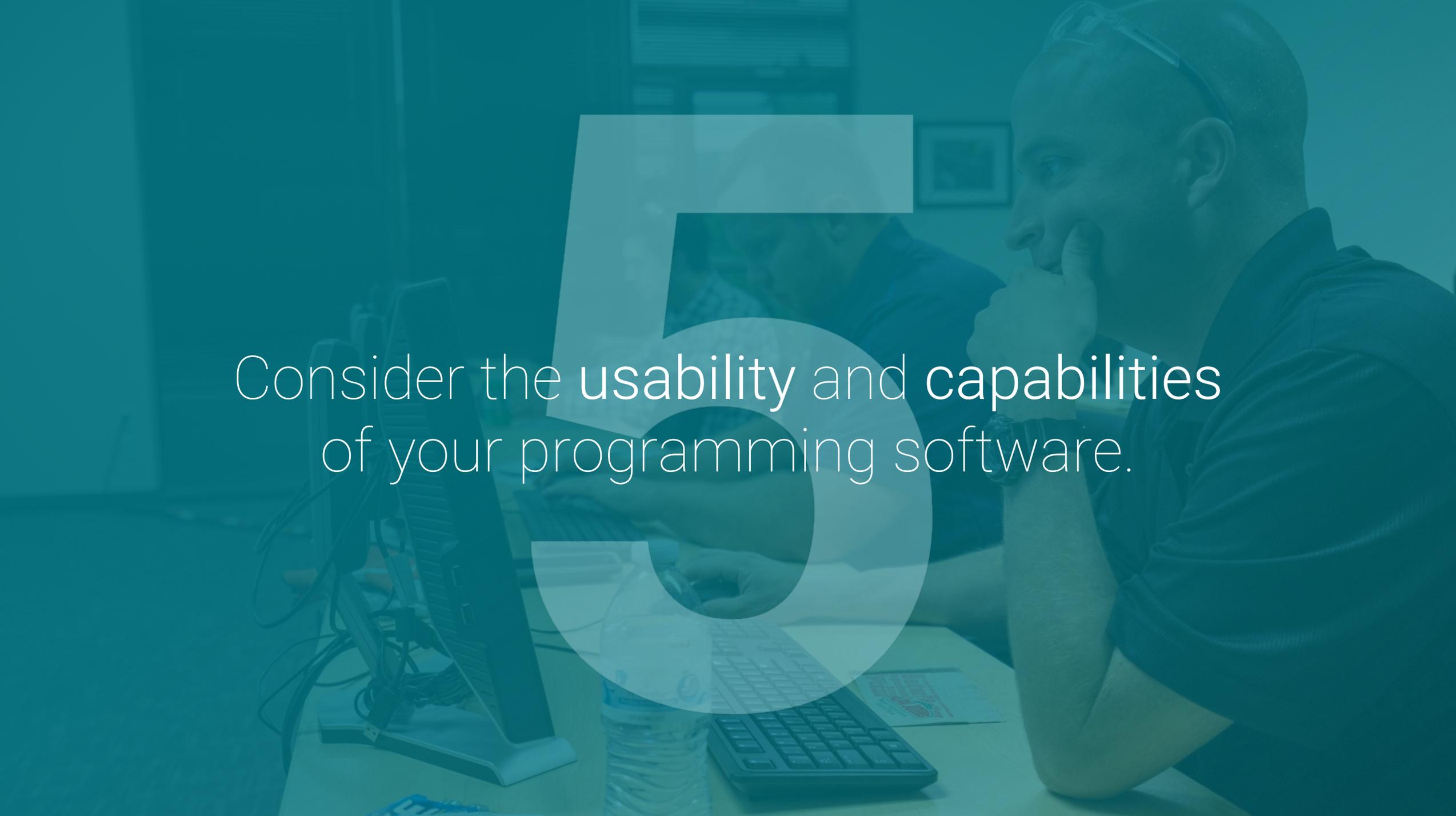
STATE-OF-THE-ART

Dynamic[®] XD

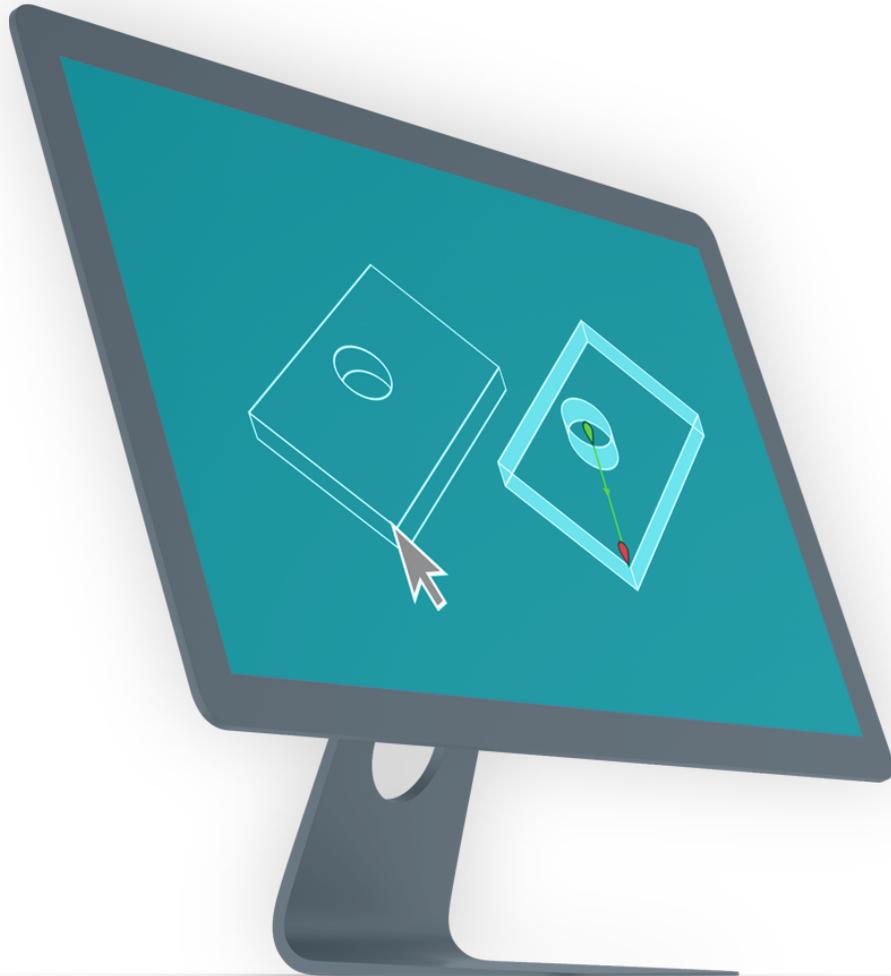
Dynamic Waterjet[®] XD is a popular solution for cutting **high-precision parts in 3D**. The first technology of its kind, it integrates 3D functionality with the speed and precision of Dynamic Waterjet – giving you the ultimate in accuracy, speed, and flexibility.

Faster, more accurate bevel and 3D cutting.

[LEARN MORE ABOUT DYNAMIC XD[®] HERE](#)



Consider the **usability** and **capabilities** of your programming software.



Smart Software. Smart Part.

Your software should do the hard work for you.

Software is used for 3 important things:

- 1 Draw / Design / Import your part (CAD + CAM)
- 2 Set an efficient path for your machine (tell it where to go)
- 3 Calculate algorithms that determine how to cut your part with your material.
 - Input material type
 - Edge quality

FACTOR 5

Consider the usability and capabilities of your programming software.

Invest in an intelligent control system designed specifically for waterjet. These controls are optimized to know how to cut materials and pierce holes with proper lead in and lead out entities, and other techniques that cut parts effectively. Intelligent CAD/CAM/Controls are often much easier to learn than more complex CAM- to CNC-based systems.

A CAD/CAM solution is more efficient, allowing you to complete all needed steps in one program. An intelligent software program

Programming your waterjet is an important part of producing parts. You need a software solution that is easy to use, intuitive, and powerful all at the same time.

will help you select the most efficient path for your waterjet, and then apply important algorithms behind the scenes to ensure you cut the best part.

A fully integrated solution, where no G code is required will make your life easier if you're new to programming. SmartStream models optimize your process using tested waterjet inputs behind the scenes.

[LEARN MORE ABOUT SOFTWARE HERE »](#)

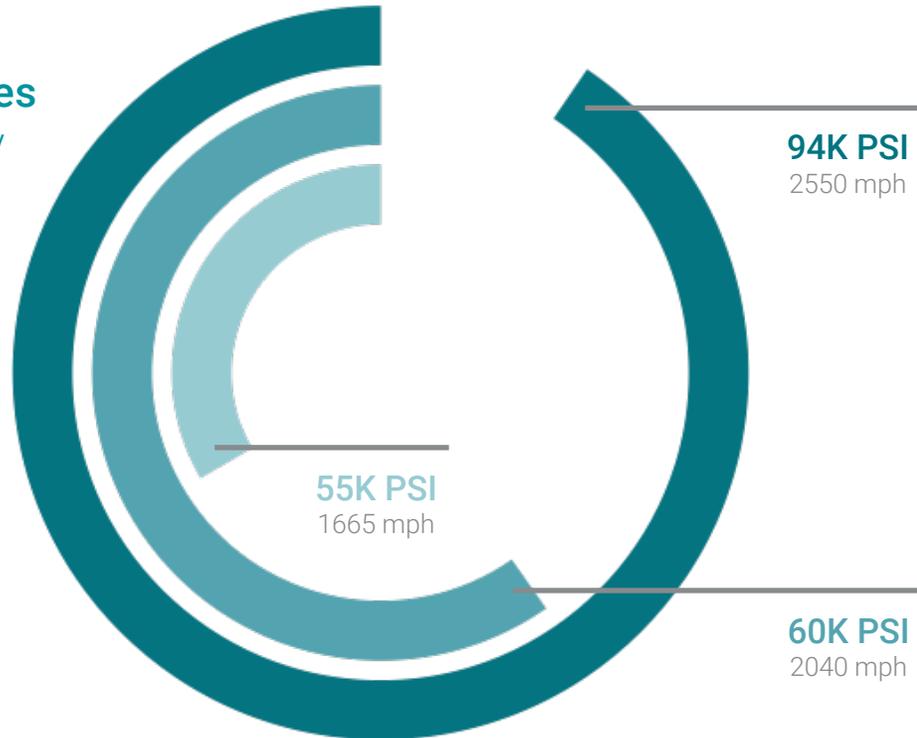
A waterjet cutting machine is shown in operation, with a high-pressure water jet cutting through a metal plate. The machine is a large, industrial-grade device with a complex structure of pipes and nozzles. The background is a solid teal color, and the machine is rendered in a lighter teal shade, creating a monochromatic effect. The text is overlaid on the machine, centered horizontally and vertically.

How much will you be running your waterjet?
What are your **production needs**?

FACTOR 6

There are two types of pumps used today in waterjet cutting:
Direct Drive Pumps & Intensifier Pumps

Pump
Pressures
& Velocity



FACTOR 6

How much will you be running your waterjet? What are your production needs?

If you're planning to operate four hours a day or one shift a week, then it may not make sense for you to invest in the fastest, most powerful waterjet. Instead of investing in a larger HyperJet® pump to increase speed, you're better served selecting a simpler, energy and space efficient, direct drive HyPlex® Prime pump. You'll still get the necessary work done, but at a **lower capital expense**.

In general, all shops would prefer to complete their work with fewer shifts. If a faster, more productive waterjet machine can reduce two shifts of work to one, the labor, overhead, and machine operating cost savings are significant and will dramatically **improve your ROI**.



HyPlex Prime®
Direct Drive

[LEARN MORE ABOUT DIRECT DRIVE PUMPS »](#)



HyperJet®
Intensifier Pump

When to Use an Intensifier Pump

If you have the work for more than one shift in a growing business, your best bet is to invest in a machine that will deliver high output such as a Dynamic Waterjet with a HyperJet pump. These two upgrades will vastly improve throughput. With a HyperJet pump, Dynamic Waterjet, produces parts two to four times faster than conventional waterjets. HyperJet is an intensifier-based pump (as opposed to direct drive) that increases water pressure to 94,000 psi from the 50,000 to 60,000 psi of typical intensifier or direct drives pumps.

The higher pressure increases efficiency and productivity enabling faster cutting with significantly less abrasive. This allows more work output and approximately half the abrasive to load and unload – a significant value to a shop running multiple shifts.

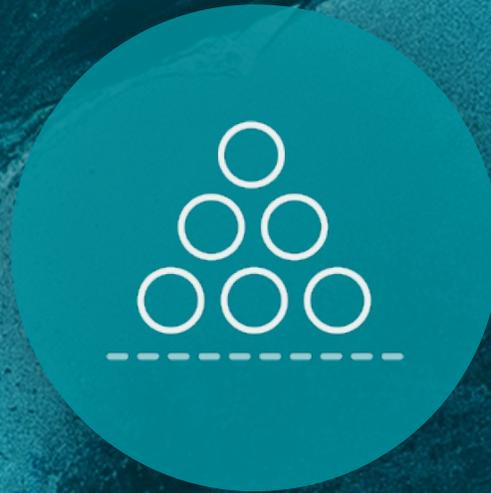
[LEARN MORE ABOUT INTENSIFIER PUMPS »](#)

HyperPressure Technology

PRESSURE = PRODUCTIVITY



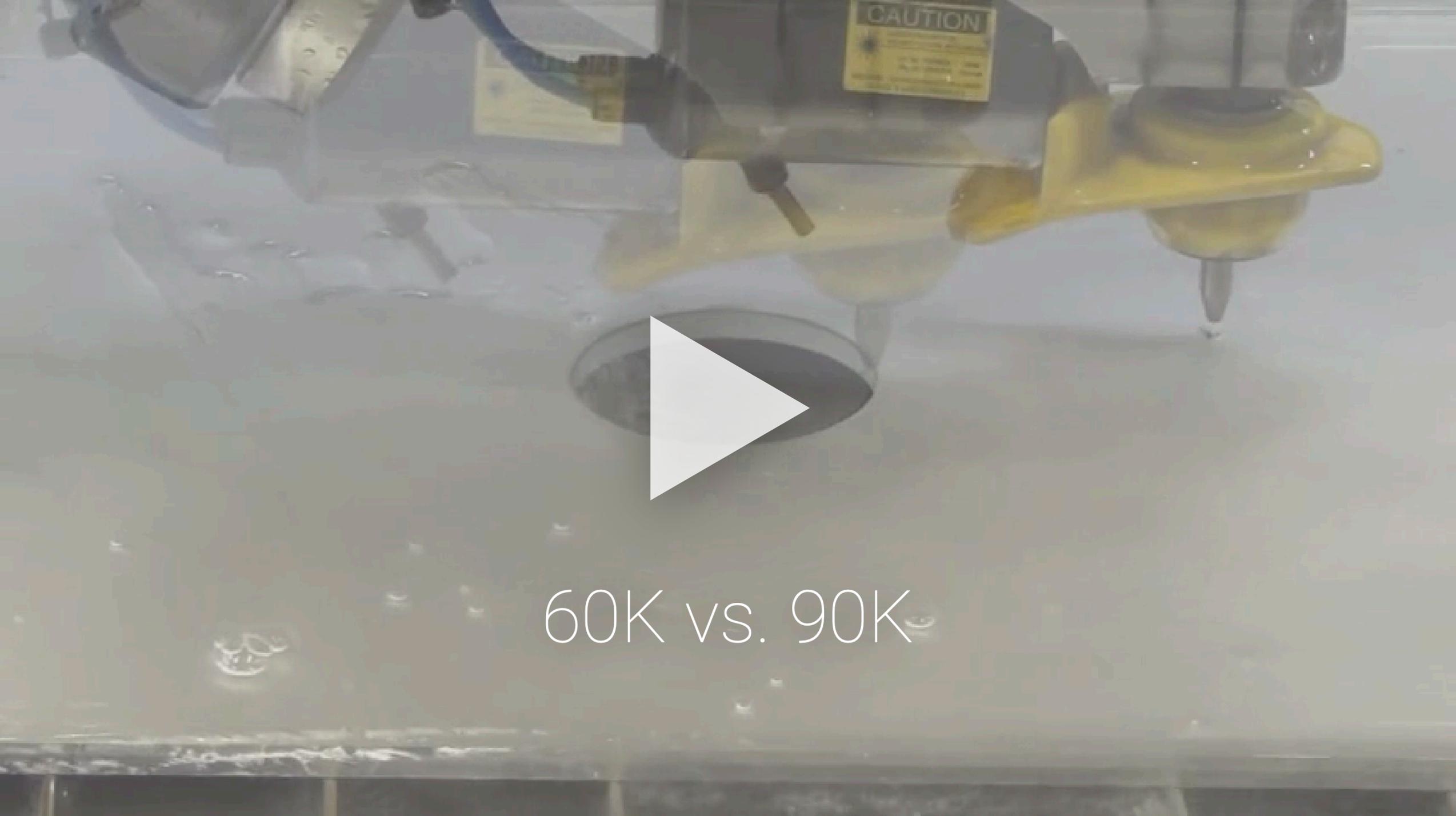
Faster Cutting



Less Abrasive



Lower Cost per Part



60K vs. 90K



Look for a system built for
reliability and **longevity**.

FACTOR 7

Look for a system built for reliability and longevity.

Machine design and construction matters. It not only plays a large role in your **cut parts**, but also in the **total life** of your system.

The components that make up your system should be **high quality** and **built to last**.

Important areas to look into include:



Drive system
(ball screw types and linear rails/guides)



Quality of communication connections
(ethercat is best)



Quality of material used in the fabrication of your system



The waterjet set up and joints

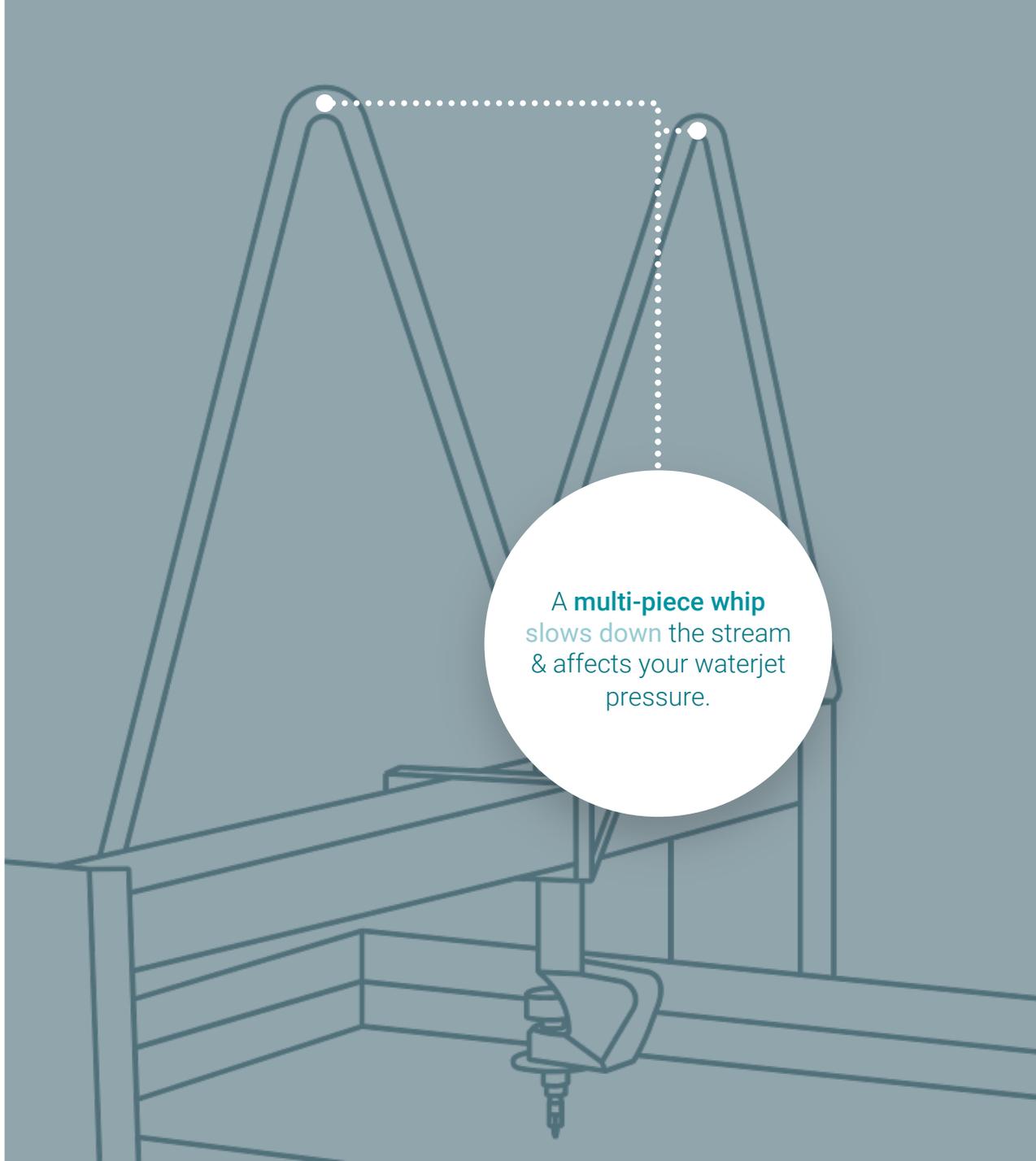


Placement of critical components (drives, electrical panels) in conjunction to operation

The Importance of a Single Piece Whip

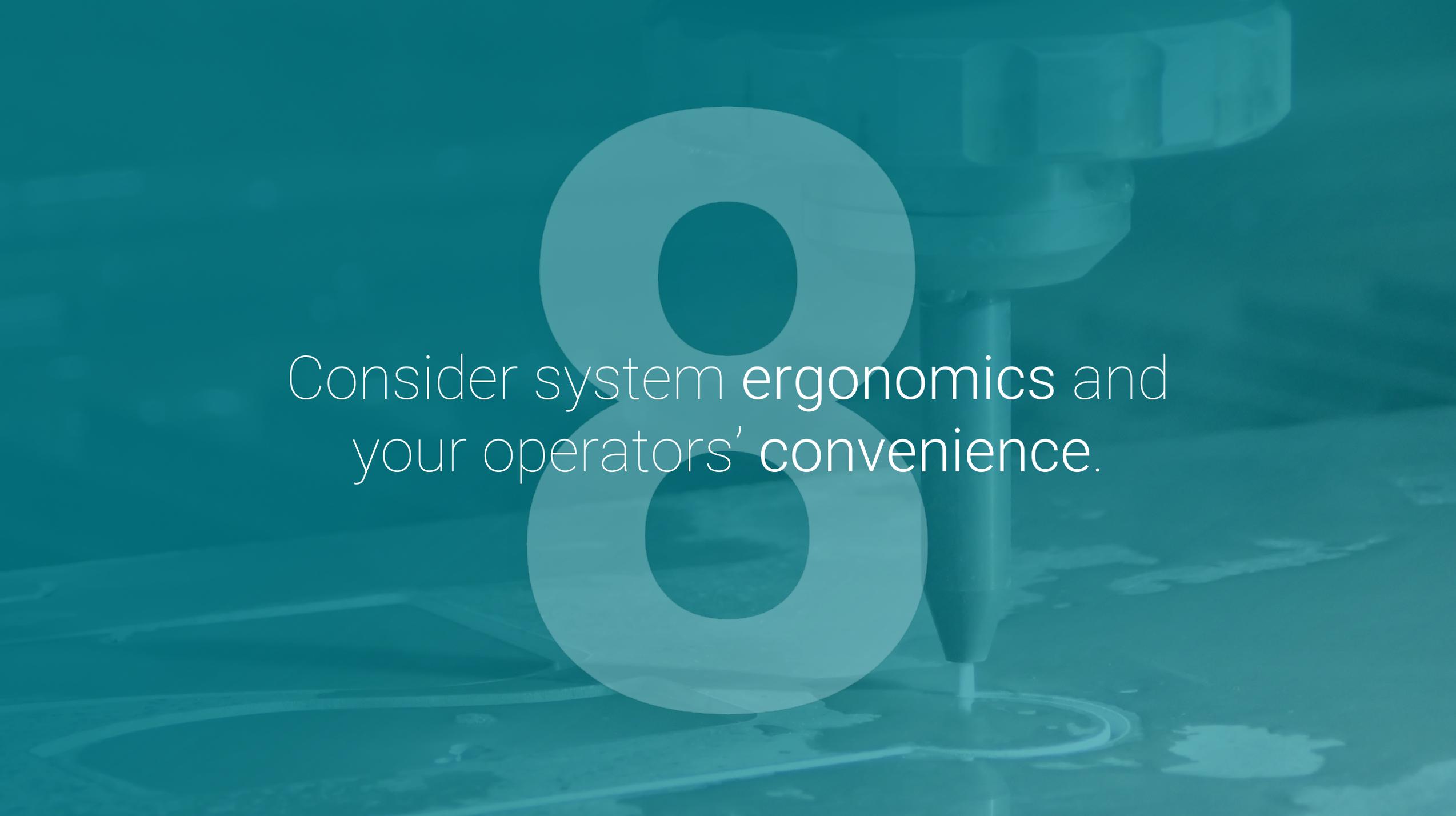


A **single piece whip** ensures there is no pressure loss and produces clean cuts.



A **multi-piece whip** slows down the stream & affects your waterjet pressure.

 **Flow**
SHAPE TECHNOLOGIES GROUP®



Consider system ergonomics and
your operators' convenience.

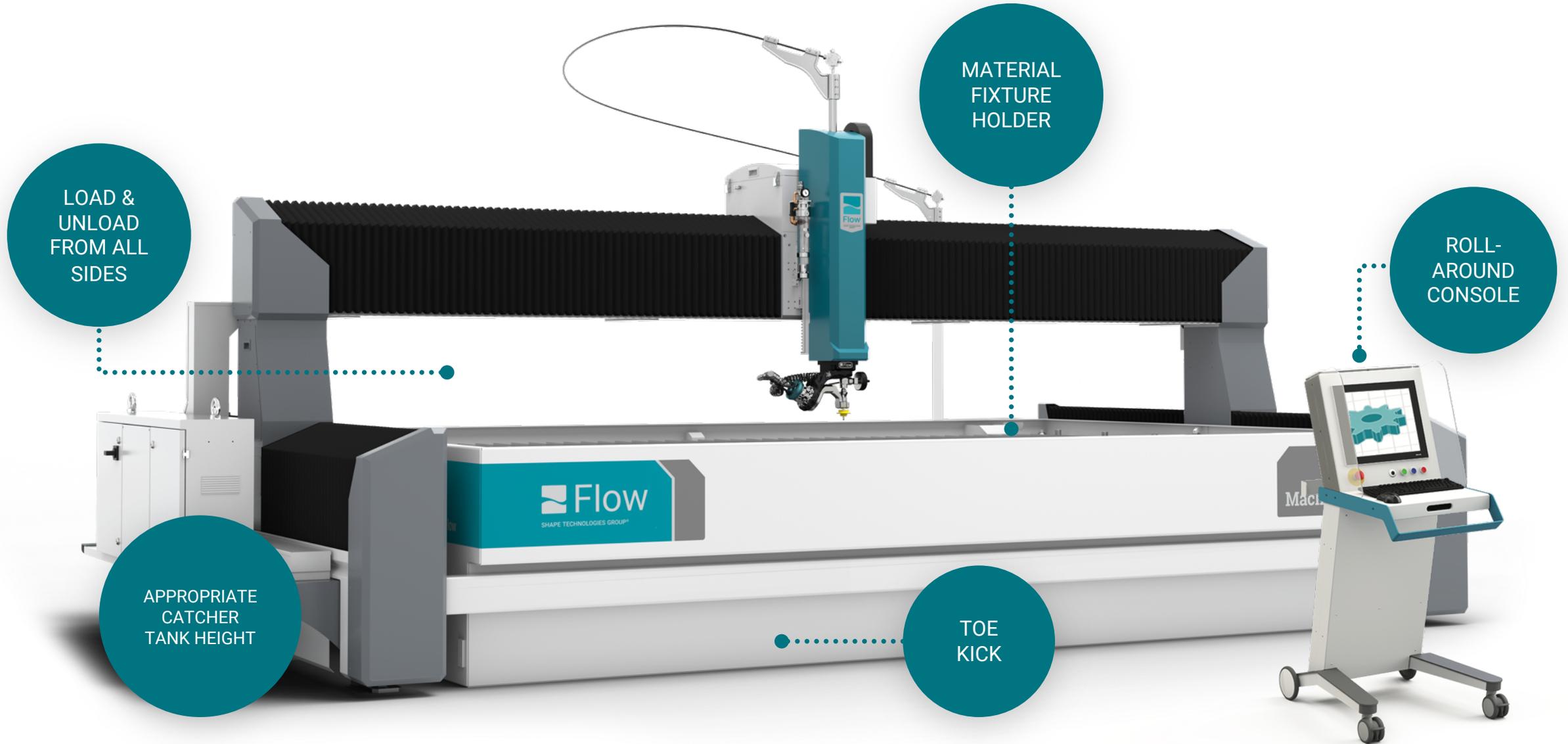
FACTOR 8

Consider your system ergonomics and operators' convenience.

Making sure your operator can quickly, efficiently, and ergonomically operate your waterjet is an important factor that you don't want to overlook.

Often, these considerations are lumped into an operator convenience package, but truly, we consider them more tightly related to proper ergonomics and efficiency than convenience.

- Loading your material easily from **all sides**
- A **catcher tank height** that is appropriate for easy access and fixturing
- A **toe kick** at the base of the catcher that allows the operator to get up close to the material and parts as needed.
- Material **fixturing** included with the system for easy clamping and holding of materials
- Roll around **control console** to allow operators to move their control station wherever is most efficient for them. Whether it's up close to the material and table, or over to the side.



These parts are essential to system ergonomics and operators' convenience.

A waterjet cutting machine is shown in operation, with a high-pressure water jet cutting through a material. The machine is a large, industrial-grade device with a complex structure of pipes and nozzles. The background is a solid teal color, and the machine is overlaid with a large, semi-transparent white number '9'.

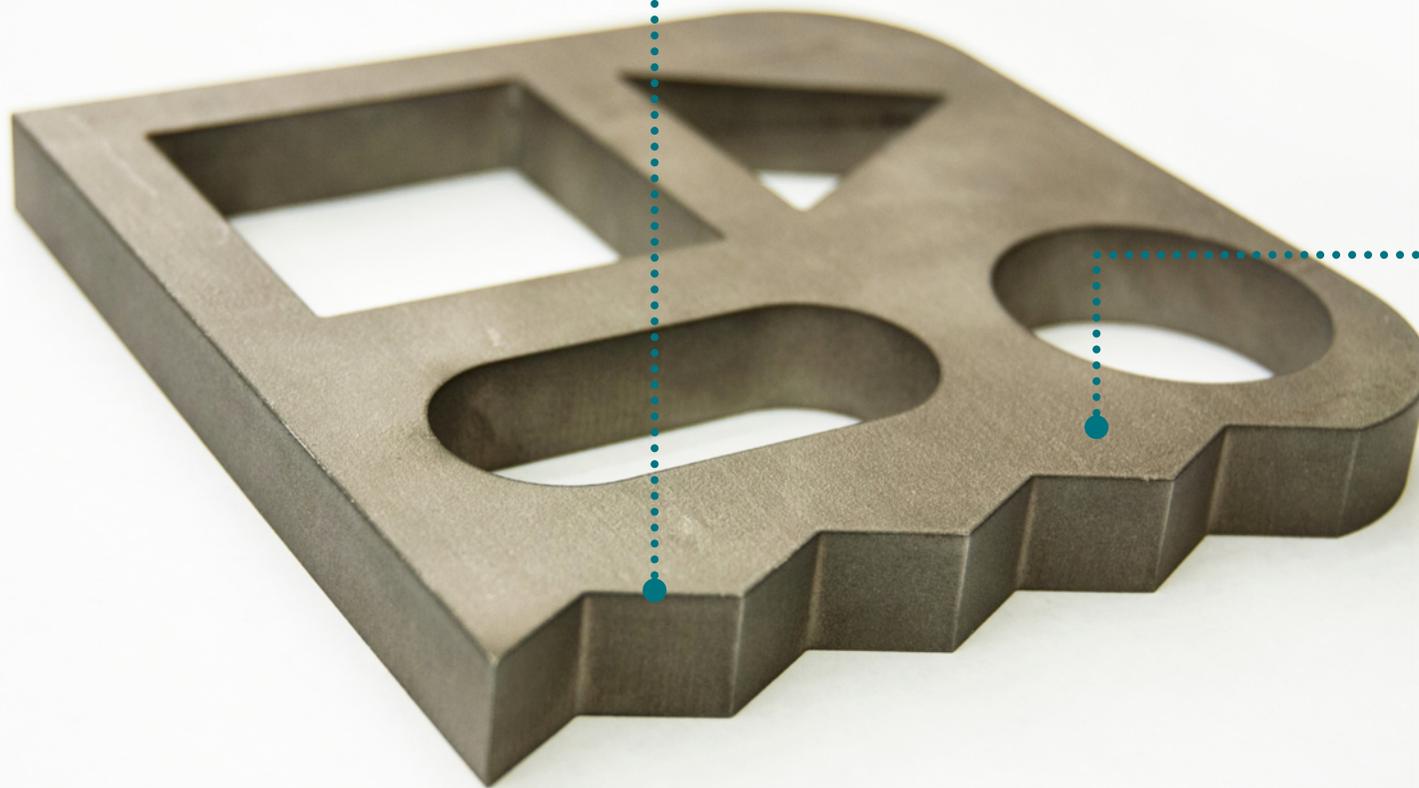
How can waterjet **complement** your
other machine technologies?

FACTOR 9

How can waterjet complement your other technologies?

Like any other process, the waterjet can replace plasma, laser, milling, routers, and EDM for many applications, but more importantly, most shops find that waterjet complements these other technology investments, thus improving overall shop efficiency.

[LEARN MORE ABOUT HOW WATERJET COMPARES TO OTHER SOLUTIONS »](#)



NO EDGE DAMAGE

Free of heat damage and stress

SATIN SMOOTH

80 to 125 Ra surface finish on abrasive waterjet cut surfaces.

Even smoother on pure waterjet cuts.

NO SECONDARY OPERATIONS

Parts can be **used as-is**
(except for tapping, bending, etc.)

10

Consider finding the right team to **partner** with for the life of your waterjet.

FACTOR 9

Find the right team to partner with for the life of your waterjet.

It's important to select a company and technology combination that will support you for the life of your systems.

Your business is important – and follow on support is critical to your success. Find a partner who will be there when you need them, and offers a plan that will fit your business specifically.

[LEARN MORE ABOUT FLOWCARE & THE SUPPORT WE OFFER HERE»](#)



Support & Partnership

- Not all owners require the same level of support – but all deserve **partnership**.
- Many owners select a comprehensive package like FlowCare Complete where the **maintenance and parts** are taken care of for you **automatically**.

What We Provide

- Local and **accessible service and support**. Remote options are available, too!
- Reliable **parts delivery** – genuine OEM parts make a difference
- One stop shop for parts, abrasive, service, and training
- Comprehensive **training solutions** to make sure you get the most out of your waterjet.
- Applications support
- Factory certified trained professional support team



Contact Us

+1 253 246 3473

motake@flowcorp.com

FlowWaterjet.com

GET A FREE TEST CUT • GET A QUOTE • GET A SOFTWARE DEMO

Thank you!

Have more questions? We'd be happy to help.

If you're interested in setting up time to talk with an Application's Engineer about your specific needs, let us know. We'll schedule time together.

[LET'S TALK!](#)

 **Flow**
SHAPE TECHNOLOGIES GROUP®