



WHITE PAPER

LIGHTS OUT MACHINING

ONE OF THE BEST WAYS TO MAXIMIZE PROFITABILITY.

Lights out Machining is not a new term, and many organizations have started to look at their internal processes to help increase their profitability. Have you thought about do it? Read below for our advice on ways to start working towards a light out machining environment.

ABSTRACT

It's getting harder to maintain sustainability of profits with all the challenges posed to be being profitable in manufacturing. Between competitive pricing from overseas, soaring cost of energy, materials, and tooling (cost and delivery) and the more recently highlighted issue of manpower- Is there a reprieve or some sort of hack to get ahead? Simply put Yes...

WHAT WE'LL COVER IN THIS WHITE PAPER

- Lights out machining is simply unattended machining. Keeping your spindles turning with no bodies sitting in front of the machine.



What are some ways to help achieve lights out machining?

Methodology

As a complete manufacturing services business one of the primary focuses is on our customers success, and in doing so we often get brought into their fight for profitability. Unattended machining is an avenue we often lead customers down. A key advantage that we have in being able to help support the effort to achieve lights out machining is having great relationships with auxiliary accessory/option suppliers. Years of being asked the same style questions and seeing similar trends in achieving profitability has forced Millennium to look at customer relationships differently. Millennium has been fortunate enough to be able to devote resources to focus specific efforts in the lights out machining support.

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Lights Out – Baby steps.

Lights out- you need to walk before you run.

Trying to achieve lights out should be done in baby steps, especially at first. The number of pitfalls associated with rushing and not properly planning can be catastrophic. The word Catastrophic was chosen because we've seen organization have such catastrophic failures that they burned machines to the ground with lack of proper planning.

PART 1- Safety & Monitoring.

(I guess this can be likened to tying your shoes before you even start to walk)

Safety should be the foremost concern with any lights out machining, whether your goal is 2 hours or an entire shift. A great insurance policy and the best money spent is an in-machine fire suppression system. If a fire would start in an unattended environment who's there to put it out? A fire suppression system that can automatically discharge inside of the machine is the answer. There are a lot of brands that are offered across the industry, and we specifically use Fire Trace. They have a very reliable and user-friendly system, and they also have a proprietary blend of suppressant that does not tramp and damage the cutting oil/fluids. Having a peace of mind will give the confidence to move forward.

Right behind safety is machine monitoring. Again, as with fire suppression there a lot of companies that make great systems. With our experience through testing, field trials and gathering data from customers who use monitoring systems, we have focused on a Mitsubishi product called IMA. It's a great monitoring system (that is very capable but also affordable) that can give you live up to date machine information. It can also send out alerts to your phone if the machine stops and what the error code is. This will give you an eye of sorts on what your machine is doing.

PART 2- Accessories to "start" the journey

Much like anything else machine related you could add accessories/options to ad nauseum, but do they have a return in value? For the purpose of this paper, I'd like to focus on a couple basic items to start with.

Since our primary focus is Swiss machining, the guide bushing and subsequently material are the heart of the machine. Like the saying says, "crap in- crap out"! Historically (*assuming the guide bushing was good*) the material was the contributing factor to how a process ran. Like any seasoned Swiss machinist knows, material can shut a machine down faster than other single item. This makes lights

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out running difficult as it only takes 1 bad spot in a bar to create a machine failure. Material itself isn't necessarily as easy or a cheap fix and having custom ground material can be expensive and create un-acceptable timelines for PO completion. However, over the recent years several manufacturers have created the adaptive guide bushing (AGB). The AGB has been designed, tested, and implemented with great success. This AGB allows you to run material in production (and still achieve required tolerance) without the concern of shutting the machine down for material related concerns. The AGB also allows a less skilled machinist to keep a machine(s) running with less intervention. What's an AGB- it's an auto adjusting guide bushing system the replaces the standard guide bushing system. Several manufacturers like JBS and Skillcraft are great resources and work exceptionally well in the Citizen platform.

Oil. Yes oil! Think of your machine as a Ferrari (*that's probably roughly what you paid for your machine*). Would you run any old cheap oil in its engine? I wouldn't! This goes back to the "*crap in, crap out*" saying. Oil is primary way your machine stays lubed in the inside the machining area and one of the primary way your chips and tooling react to each other.

There are literally hundreds, maybe even thousands of different oils you can use in your machine. Do your research and pick a good one, cost should not be the objective- performance should be the primary focus. We have settled on Blaser Oil as our go to for nearly all machine platforms from Swiss to chucker's. Blaser GT22 has become the standard for Millennium when we choose cutting oil (neat oil). It's clear, non-staining and performs great in most materials and operations.

Most of us are not cutting tool engineers. We may play one on the shop floor, but even machine experts (like Millennium) rely on tooling reps. We like to use the OEM reps, typically they have best product knowledge and the OEM reps know the intimate details and can usually get quicker answers. Ask for samples and test them! Have the rep available to help with the testing. Find tools that will last at least as long as you'd like to run light out (*part count, time, etc.*)

What's LFV. Low frequency vibration. I'll skip most of the detail, we have plenty of documents, videos, testimonials, and information readily available that we'd love to share with you. However, LFV may be the single biggest gamechanger to the machining world since High Pressure

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coolant was introduced. It truly is a change of the dynamics of how we machine. The high point of LFV is the ability to control breaking chips in all materials, eliminating chip wraps on tools and HP lines and eliminating chip dents from chip wraps getting into the sub spindle and eventually clapping on the OD of the part. The LFV process when applied correctly can all but eliminate the need for planned machine stoppages to remove chips.

Last for this discussion (*there are other great options, but for time's sake we'll stop here*) are ways to help eliminate scrap or bad parts while running unattended.

Of equal importance to being able to keep the machine running unattended is making good parts while it runs. It would make no sense to run an unattended shift if the machine produced bad parts that entire time; not only have you wasted billable time, but you've also wasted material and tool life. Two areas we like to focus our efforts on have been broken tool detection as well as is auto-comp.

Millennium has been able to test several options for tool breakage. The low cost, but still very effective option is

touch style. This is where you have a unit in the machine that on command (*M code will actuate a wire/wand*) and physically try to make contact with a tool. A hit means the tool is present, the absence of a hit means the tool is broken. This is a common system that has been used across many machine types and platforms for many years. A manufacturer that we have had great success with is Techna-Tool (*BK Micro*), they have very reliable systems which adapt easy to the Citizen and Miyano platforms.

The second option which we also have had great success and is widely used across many Citizen platforms uses vibration monitoring as well as spindle power consumption. This is are highly technical system that requires a more in depth installation process and training, however when they are applied properly the system can not only detect broken tooling but also tool wear allowing you to perform predictive tool management. Caron Engineering is one of the leading providers of this style system, with TMAC being their primary product that meets these needs.

This leads directly into auto-comp. I say that because again Caron engineering has developed a system directly with

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Citizen that takes data from a performed measurement (*either in-line or off-line*) and then uses that measurement to auto-comp the Citizen through the Citizen Cincom controls. This allows you to flatten the curve allowing the machine to run a better controlled process through constant monitoring and adjustment. Machine uptime and process capability should always go hand in hand.

CONCLUSION

Lights out machining is a process, start slow- try an hour, maybe 2- find what works. Gradually adding to unattended machine time will give you the confidence to work towards your goal. Don't be afraid to reach out to companies already running lights out or to Millennium Machinery, we are always a great sounding board and have a great list of contacts and options to help you down the path.

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