



Aggregate Heads 101:

What you don't know could leave you less productive and losing business!

Are you struggling with moving your work from one machine to another? Do you have to re-position the work-piece on your machine? Is your machine unable to perform specific criteria, which causes you to turn down business? If you have answered "yes" to any of these questions, continue reading this article!

An interview conducted with Chris Kelly, Aggregate Sales Specialist at GUHDO USA Inc.

W&W: There has been much discussion about aggregate heads, yet many companies still don't know exactly what an aggregate head can do, what limitations it has and how they might benefit from one. What factors should they be concerned with?

Chris K: Generally, the consideration of an aggregate head purchase comes up when an additional axis would reduce material handling and speed production, or existing equipment does not have the capability needed to efficiently perform a job at hand. Since there are many styles and types of aggregates, choosing the right one is essential.

When contemplating the purchase of an aggregate head for a CNC machine, there are three primary considerations. 1) How long you will be "in the cut."? (Excessive heat resulting from the cutting action can cause aggregate failure) 2) How are you cutting the material? (i.e. will you be primarily routing or sawing?) And finally, 3) What type of material are you cutting? (i.e. is it a dense material or a soft material)?

Aggregate head bodies are constructed of aluminum, which keeps the weight to a minimum on your machine spindle and in your carousel. This also allows the heat to dissipate, keeping the aggregate as cool as possible while it's in the cut. Internally, our aggregates use beveled, calibrated gears to ensure there is minimal "backlash" in the gearing. As you can imagine, there is a lot of energy transferred to the gearing when the aggregate first enters the cut. That energy is transformed to heat. Based on this scenario, how you keep the aggregate cooled is critical to the longevity of the aggregate.

Viscous grease is the most common method of cooling/lubricating the gearing. A greased gear-lubricated aggregate is ideal for routing and light scoring of material. But, with viscous grease lubrication, there is a "catch". During operation, the temperature of the aggregate **cannot exceed** 185 degrees Fahrenheit. That is the maximum heat index the grease can withstand. If the aggregate temperature exceeds 185 degrees, the grease will burn off, creating a metal-on-metal situation with the gearing, greatly increasing the temperature internally.

W&W: How do you know what the temperature of the aggregate is while it's on your machine?

Chris K: The aggregate comes with a temperature gauge on the side. This will allow the user to monitor the aggregate while running. When, or if the aggregate becomes too hot, the aggregate will need to be shut down and given time to cool off.

W&W: So, given these critical pieces of information, it becomes clear why the three factors mentioned earlier, i.e. how long in the cut, type of material being cut, and how you're cutting the material are critical factors in determining the aggregate head that is best suited for a company.

Chris K: That's right. Now for aggregate heads that are expected to be more of a "work horse", an oil-bath aggregate will offer the best of both worlds. They are the "tanks" of the aggregate industry. The aluminum body is larger than that of their grease counter-part, allowing heat to dissipate at a quicker pace and, the gears are submerged in oil, eliminating the possibility of metal-on-metal contact. Oil bath aggregates are ideal for gang-sawing operations, running a moulder head, or continuous duty operations, where the down time of the aggregate is nominal.

W&W: That's great information Chris. You've given us a lot of details needed to make a decision on where to start.

Chris K: There are a few more important factors to determine. We still don't know how the material is being cut! Is a routing aggregate or an aggregate with a saw mounted preferable? Should the aggregate work at a dedicated 90 degrees, or is flexibility important? (capability of using the aggregate from 0-100 degrees, for instance). Again, these are all critical factors in determining the proper aggregate. And, of course, let's not forget aggregate options for vertical or horizontal drill and boring, dowel positioning, and so much more. In short, a precision aggregate head truly completes the capabilities of a CNC machining center. Whether routing, drilling, boring, sawing, moulding....horizontally, vertically or in any possible angle, an aggregate head can fill the need!

W&W: How does this multitude of machining options affect the design of specific use aggregate heads?

Chris K: Aggregates are normally geared at a 1:1.48 gear ratio. So, your machine spindle is putting out 10,000 rpm's and your aggregate is putting out 14,800 rpm's. This is fine for routing, but what if you are going to run a 12" diameter saw blade to saw solid wood, making multiple passes taking out 3/4" of material? If your primary use of the aggregate is for sawing, gear reduction is the best action plan. You don't want to exceed maximum rpm on the saw blade (most quality saw blades have this information engraved on the saw body for safety purposes!) and you want the blade to cut the material as cleanly as possible. Reducing the gearing down to 1: 0.676 in such a case is a better alternative. You'll be able to keep the spindle rpm's within your desired range and provide the aggregate the rpm's needed to produce a clean cut. The gear reduction is available only on the oil bath aggregate, but being there is a lot of energy going back to the gearing via the saw blade, it's the best option for the longevity of the aggregate head itself.

W&W: Does the material you are cutting play any role in the selection of a specific aggregate head?

Chris K: Great question! Yes, a dense, heavy material will create heat on the cutting tool. That heat, or energy, will be transferred to the gearing of the aggregate head. If cutting a soft material, there is less energy created, allowing the aggregate head to run cooler. The type of material is not as important as the tooling used and cycle time, but it is a determining factor in choosing an aggregate that is best for specific needs.

W&W: Back to grease versus oil bath...are there other differences?

Chris K: Well, now that we've addressed the basic factors that determine an aggregate purchase, our aggregate line has three product classes to choose from that will best fit a customer's needs:

Smart Line A greased gear-lubricated aggregate in a compact design. This aggregate has a smaller body, meaning less aluminum to dissipate heat. It is the perfect solution for someone using their aggregate intermittently. Because of the smaller, compact design, this aggregate has a shorter duty cycle than its "big brothers".

Function Line: A greased gear-lubricated aggregate with a larger body than the Smart Line. Because of the larger body, this aggregate can dissipate heat at a quicker rate. This allows for a longer duty cycle.

Ultra Line: Oil bath gear-lubricated aggregate. This aggregate has a larger body than the Function Line and is available in gear reduction. This is the "tank" of the aggregate world. The Ultra Line has the longest duty cycle of all aggregate heads. Oil bath aggregates are being used whenever a high torque is needed. The higher the torque, the higher the risk that the grease film between the teeth will be interrupted, therefore an oil bath is preferable. High torque is required, for instance, for a large diameter saw blade or a heavy duty profile cutter etc.

W&W: Are there any other important considerations we haven't touched on?

Chris K: I'd like to touch on the term "duty cycle". Duty cycle refers to the amount of time it takes the aggregate head to reach 185 degrees. At that temperature, you have reached 100% Duty Cycle. Now, you might ask yourself, "Are all aggregates 100% duty cycle?" The answer is, 'Absolutely!' But remember, all the factors we've talked about determine that duty cycle. If you achieve 100% duty cycle (185 degrees) with an entry level aggregate in 15 minutes. Your duty cycle might be 45 minutes with a Function Line aggregate, and 90 minutes with the Ultra line version. It's critical that you understand this when you purchase your aggregate.

Our aggregate heads are manufactured in Germany by Atemag AG, a company with years of expertise and highly trained engineers and technicians. During the build, they constantly monitor the run-out from the gearing to the aggregate output. By achieving minimal run-out, the aggregate runs cooler and quieter. The use of precision ground gears also assists in the overall performance of the aggregate head.

I hope I've explained the basics of aggregate head selection and capability and what questions need to be asked concerning an aggregate head purchase. Aggregates come in a variety of configurations. From ER collet pockets to saw blade arbors to combination outputs. From fixed 90 degrees to variable angles that range from 100 to -100 degrees. From **Lock Recess** aggregates, which allows you to deep pocket mortise to **Soft-Touch** aggregates which allow for adjustments of .01mm.

The addition of an aggregate head on your CNC creates increased flexibility, endless possibilities, and boundless opportunities!

W&W: Chris, thank you so much for your time. It's been a very informative aggregate session.

If you have any questions about our products or services please call us at 1-800-544-8436