GRANCO CLARK WORLDWIDE

Profiles

Volume 13, Issue 2

New quenching technologies all about control.

It sounds like a simple matter to cool down hot aluminum profiles after they've come through the press. Anything will cool down if you let it sit long enough, right?

But the truth is, the quenching process is actually a very scientific one, and it has a great deal to do with overall line productivity, both in terms of the speed at which the line can operate, and the amount of waste generated in the process. The more attention paid to proper quenching, the more useable product will exit the line, and in turn, the more profitable it can be.

This helps explain, no doubt, why the quenching process has generated some significant interest and advances in technology recently.

Trickier for some profiles than others.

Many factors go into determining the proper type and amount of quenching required on a given line at a given time. For many light-duty and "architectural" profiles, and with certain alloys, the needs are relatively minimal. Profiles can be allowed to simply cool naturally, or with air provided by an overhead duct system.

For profiles requiring more intense air cooling, ducts may be integrated with the run-out table, providing air cooling immediately below the extruded profiles. This is a particularly efficient use of space and time, as profiles are cooled as they are handled through the system.

Heavier profiles make heavier cooling demands.

Heavier "industrial" profiles are a different matter. First, of course, comes the fact that they are generally thicker, requiring a greater amount of cooling. As any extruder knows, that immediately suggests the use of water rather than simply air for cooling.

For modern heat transfer needs, a "water wall" or flood quench maybe adequate. In this design (of which there are several variations) the lead-out table converts to a trough, into which water is pumped to wash over the moving profiles. But for many industrial profiles, due to their weight and the types of alloys utilized, the only appropriate choice is high-pressure spray quenching.

Metallurgical concerns become critical with industrial profiles. This is because, while more cooling is required, it can't necessarily take a longer time to accomplish. For an aluminum profile to make its optimum metallurgical properties, it must receive not only the proper amount of cooling, but also the proper rate of cooling.

If it spends too much time within a certain predetermined critical temperature range, magnesium and silicon elements can precipitate and begin to form grains within the profile. (Proper growth and distribution of fine grains need to occur in the controlled environment of the age oven; if it begins to happen during quenching, larger and more inconsistent grain size can weaken the profile and prevent it from making properties.)

This is why a longer quenching unit or a slower profile speed as it moves through the quench are not always suitable answers.

Increasing pressure without increasing waste.

Given all this, the immediate tendency would be to move toward ever-more powerful spray quenching units, in the

continued on inside

The industry's best parts capability—and how to use it *less*!

Granco Clark is proud of its reputation for responsive service in replacement parts, perhaps the best among extrusion equipment manufacturers. And, of course, we're happy to help when an extruder's productivity is threatened because some part in his system requires replacement.

But from the viewpoint of those on "the other side of the desk"—the Granco Clark personnel who always seem to come through in those instances—extruders could minimize the need for those "emergency" parts orders by keeping a supply of some key parts on hand, within easy reach.

Rance Stowell, Parts Manager at Granco Clark, says that the situation can be traced to human nature, and that Granco Clark's ability to respond quickly in these areas may be partly to blame!

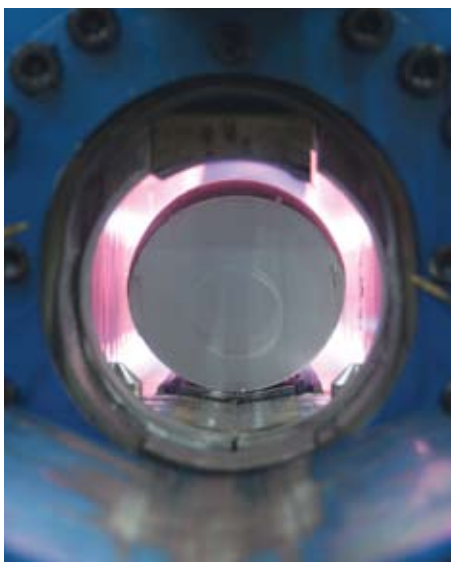
"I think sometimes we accidentally help train them that way," Stowell laughs. "They get parts from us so quickly that they don't stock enough of the things they should."

For less *downtime*, stock *up*!

Of course, parts cost money. And it's easy to understand why an extruder would hesitate to tie up any more dollars than necessary in a parts inventory. But that can be a little bit shortsighted, particularly when the need to replace consumable and other items is inevitable and can be easily anticipated. The same money will be spent later, often accompanied by the other more "hidden" costs of lost productivity and line delays.

The right mix of parts to "stock" can vary widely, depending upon your particular equipment and operation. But there are some general parts and assemblies that Stowell believes represent a sizable chunk of the "emergency" calls he receives from extruders. These include:

- **Probe assemblies, rod insulators, and sensors that are used to monitor furnace temperatures.** These are consumables that operate in a high-stress environment. You'll need them. Why not have them?
- **Internal furnace parts** like rollers, rails, and 30" roller rack segments.
- **Burner tiles.** These can fail from the drying and cracking of age and the heating/cooling cycle, and are easily damaged by even minor billet incidents or malfunctions inside the furnace. Stocking 5 or 6 replacements only makes sense.
- **Electrical collector shoes** on pullers. Smooth, unbroken contacts assure that your pullers receive uninterrupted power from the electrical feed. It only makes sense, especially for operations with multiple pullers, to carry a small supply for fast replacement when the contact deteriorates.



Stocking internal furnace parts can help protect productivity.

There are certainly other items that would be logical additions to your on-hand parts inventory, depending upon your particular equipment and system. Please feel welcome to call us for a quick consultation, and we'll be happy to suggest a parts inventory appropriate for your situation.

President's Message

Larry Difatta
President of Granco Clark

Tricks of the trade (shows).

I have a love-hate relationship with trade shows, and frankly most of the people I've talked to share that sentiment. And it's understandable when many of the most obvious realities associated with trade shows can be interpreted two ways. Let's look at a few of those:

1. It disrupts your routine.

True. And, especially at busy times of year, that's the *last* thing you need. When there are enough things on your plate to keep you there late every day, how can you possibly consider leaving the office for several days, maybe even a week if you're exhibiting?

On the other hand, the experts argue that sometimes the only way to think broadly about your business and the issues key to its long-term future is to get out of your foxhole for a while and consider the bigger picture. Sure, day-to-day concerns are important, but looking at the street signs won't help you much if you're in the wrong city!

2. All you're doing is showing a bunch of competitors what you're up to.

True again. It makes for some pretty awkward encounters with acquaintances and even some old "friends" who are now on the dark side. Not to mention your suspicion of that stranger who seems very interested in your booth, but isn't eager for you to see his name tag, or to engage in an actual conversation.

But customers in our business are intelligent people who generally talk to a number of suppliers fairly often. And if you think *anything* you are doing remains a secret for long, you're sadly mistaken. By avoiding the scene entirely, the main one you're depriving of potentially valuable information is YOU.

3. It's too expensive.

Okay, it's hard to deny that one. It *is* too expensive. Everything costs a lot more than it ought to, from the space and exhibit displays to the hotel, food, you name it.

But the truth is, most people feel trade shows are an important part of your marketing, especially when they only come around every few years. And if hiding out and counting the money you saved was a valid tactic, you'd certainly have seen it by now from the likes of Coke (or Pepsi), Miller Lite (or Bud Lite), or Verizon (or Sprint/Alltel/TMobile, AT&T/*ad infinitum*).

I guess my bottom line on trade shows is that they have one huge plus that you just can't ignore: networking. These days, as technologies are copied almost as soon as they're developed and price pressures are driving everyone into the same little molds, the equipment itself is only part of the story. The deal often comes down to relationships—the kind that help you breed confidence, build trust, and demonstrate integrity.

Trade shows provide a nice opportunity to do that. Even if one of the things we do when we get together is complain about trade shows!

continued from front: New Quenching Technologies

interest of bringing about the fastest possible heat transfer and causing the profile temperature to fall across the critical zone as quickly as possible. But this, too, brings potential complications.

Immediately upon extrusion, profiles are vulnerable to distortion. Because along with the optimal "cooling rate" every profile needs to achieve its desired metallurgical properties; each one also has a "critical temperature gradient." This means that if one section of the profile is cooled more rapidly than another, this can cause mechanical stress that can create distortion in the profile.

This is where the true metallurgical challenges arise. How do you deal with that "minefield" in which quenching can be too slow (jeopardizing the profile's metallurgical integrity) or too fast (risking distortion) — and in which each change in alloy, profile shape, or type can change the equation completely?

There are, indeed, situations in which the maximum cooling rate necessary to prevent distortion may be below the minimum cooling rate required for the alloy to make properties. To pose the question in decidedly non-metallurgical terms: then what? Is the answer simply to make the best compromise possible and hope for the best? Hardly.

High-pressure spray offers faster quenching…as long as the profiles can tolerate it.

Quenching control.

This situation calls for control; the precise control that takes into full account the variables that affect the cooling process, including alloy, profile weight and shape, the profile's critical temperature zone and critical temperature gradient. But it requires not only awareness of all these things, but the technology that allows the extruder to do something about them.

That is why recent advances in quenching technology are geared, almost exclusively, to providing a greater degree of control, with more sophisticated nozzle patterns and more "customizable" quench settings.

Because most profiles can accept a higher rate of temperature as their actual temperature is reduced, there is an answer: sequential cooling. The most advanced high-pressure spray quenches deliver an unprecedented degree of precision, not only in conforming the spray pattern to the specific profile shape, but also in varying the amount of pressure as the profile travels through the quench.

Flex2.

Granco Clark has taken a strong step in that direction with a unique new technology that delivers incredible control and flexibility with its new Flex2 Combination Quench. To be sure, a combination quench promises a certain efficiency, in that it provides the ability to quench with air or water in the same "footprint" along an extrusion line. That in itself is not new.

The important aspect of the Flex2 is its actual performance. Unlike earlier combination quenches that compromised high-end performance in order to offer flexibility, the Flex2 is capable of delivery truly high-pressure spray quenching.

The Flex2 is designed with carefully positioned blowers and nozzles to make quick and even quenching simple; and virtually all are totally adjustable, to meet the specific metallurgical requirements of almost any type of profile.

The optional high-velocity spray capability is even selectable within zones, allowing for the cooling of profiles gently at first, then faster, by using an increased spray pressure in the second zone, once the profiles are sufficiently stabilized to withstand the force.

They may not be four-letter words, but scrap *and* waste *seem that way to extruders.*

Getting the most out of your extrusion systems.

The author's first contribution to this newsletter appeared in April 1996. Many years' of experience working in, and auditing the operation of numerous extrusion plants had showed that, even when equipped with what was then state-of-the-art equipment, few extruders achieved benchmark performance.

The Double Puller System was a case in point. Some will recall the interest generated at the Third International Extrusion Technology Seminar, ET'84, when Granco's Charles Gentry introduced "The Exciting Double Puller from Norway." However, subsequent operational audits of, and visits to, extrusion plants equipped with double pullers revealed that few made effective use of its numerous working cycles, and many press operators were not inclined, or instructed, to change their familiar operating practices.

Clearly, the potential impact of the double puller on the profitability of an extrusion plant had to be explained. This was done by focusing on recovery, and in the event, three articles: "The Cost of Recovery," "Recovery: The Impact of Modern Handling Systems," and "Applying Continuous Improvement to Reduce Waste in Metal Recovery," preceded a fourth, with a complete description of the double puller operating cycles: "Understanding the Operation of the Granco Clark Double Puller System," appeared in "Hot off the Press," Volume 4, Issue 1.

The following is adapted from the first three articles:

The Cost of Recovery

Take a group of extruders to visit any extrusion plant, and within ten minutes they'll have dispersed all over the plant as each indulges their particular interests, or looks for the solution to their own particular problems. Watch what happens as they disperse and you'll see each individual pausing to study the butt discards, the stretching allowances and the scrap at the finish cut saw; they'll look at the alignment of stop marks on the tables; and they'll each invariably take a long hard look at any loose or baled scrap awaiting shipment to the remelt and casting plant. They'll demonstrate interest in any equipment to compress saw chips or to compact and bale extruded lengths.

The interest in what is after all "waste," is driven by each extruder's understanding of the problems that cause the scrap, and the added problems caused by handling and disposing of scrap material in the extrusion plant. But, take a look at the financial records for any extrusion plant and you'll find numbers recording the cost of this waste which may not reflect the intensity our visitors' interest in it.

Take a look at an extruder's accounting records and you'll find an item variously called "recovery" or "scrap" or "recycling cost." The sums entered against these headings will include credits which vary, depending on whether the scrap is sold on the open market, recycled through a third party, or recycled in the company's own remelt and casting facility. The "costs" incurred in generating the scrap will vary significantly from extruder to extruder, depending on the efficiency of the extrusion plant and how they are calculated.

The costs are minimized if the recovery from billet or log is maximized in accordance with a pre-determined "plan." However, much of the aluminum which ends up as scrap is not planned, and is often higher (rarely lower) than that allowed for by the extruder's planners and schedulers.

The true cost to the extruder of "recovery," "scrap," or "recycling" is invariably higher, and often much higher than that which appears in the company's financial records. Much of the difference between the true cost and the recorded cost of recovery is buried in the labor, materials and energy used to produce the waste in the first place, and in the cost of the additional labor, materials and energy required to dispose of the scrap and "do it right" the second time. The reported cost of "recovery" rarely—if ever—reflects the cost of the disruption created by deviations from plan, and I have never seen an accounting entry for the cost of the "lost opportunity" caused by the deviation from the company's production plan.

To improve profitability, unplanned scrap must be eliminated, and planned scrap minimized by **measuring, understanding, controlling and improving** the production planning, extrusion equipment and operating systems.

The Impact of Modern Handling Systems

How do we minimize losses?

- Use the production planning and control system to record the performance of every extrusion die, using feedback from the puller and press to measure die wear and the run-out of each billet.
- Use the production planning and control system to record the stretcher scrap and the requirements for sample material for every extrusion die.
- Use equipment which ensures tight control of the die, billet, and container temperatures. Control the extrusion process to ensure the production of extrusions with good surface finishes which meets the required properties.
- Use double pullers and cut on the fly to eliminate the die stop mark, and thus incorporate the transverse weld scrap into the stretcher scrap.
- Use double pullers and cut on the fly at the stop-mark to "recover" the metal between the platen and the die.
- Use double pullers and cut on the fly to eliminate the time which is wasted waiting for the puller and restarting the press when "double-pushing."
- Use belt handling systems with rectilinear motions to eliminate the damage to extrusions which is common with the use of lift-offs and walking beams.
- Use automatic batching and belt handling to move extrusions into and out of stretchers.
- Use automatic batching and handling to move extrusions into and out of under-table finish-cut saws to improve safety and remove another source of scrap.

Measuring and understanding the production planning, the extrusion equipment and operating systems shows where losses occur and how to control and improve extrusion operations. Understanding the true cost of recovery provides justification for expenditures on modern handling systems

Applying "Continuous Improvement" to Reduce Waste

Kaisen: the Japanese word which covers all actions resulting in the continuous improvement of a production system.

How do we start on the road to continuous improvement?

Start by improving metal recovery. And, measure, understand, control and improve all parts of the extrusion production system.

One Measure the waste to find where it comes from. Measure and record the butt discards, the stretcher scrap, and the scrap at the finish cut saw. Studying the scrap will show how much aluminum is wasted due to poor planning, and how much is scrapped due to poor process control. Measurement will show that we incur losses starting a new die, that we damage extrusions on the run-out conveyor, with the lift-offs and walking beams, and again when handling extrusions into and out of stretchers. That we use too much stretcher scrap, and don't plan for sample material. Scrap analysis shows where we damage extrusions in ageing ovens, and on the way to shipping.

> Don't cut scrap till you know where it came from. Account for all the metal supplied to the extrusion press during each shift. Make the scrap analysis part of every shift report.

continued on back page

NEW INSTALLATIONS

POSTLE EXTRUSION

Cassopolis, Michigan, USA

Postle Extrusion has chosen Granco Clark to supply the complete heating and handling system for a new 2,000-ton press line. The heating system will include a model 69-30-3 "Hot Jet" Log Furnace and an HBSC 6/9 Hot Billet Saw. The handling system will feature a 150' cooling table with integrated under-table and air duct cooling, along with the proven Granco Clark Double Puller. The system will be controlled using the SCSExtrude supervisory computer system.

INDALUM S.A.

Monterrey, Mexico

Indalum S.A. is retrofitting three of its existing press lines with Granco Clark equipment, including double pullers, new leadout and runout roller conveyors, and transfer belt systems for all three lines.

YKK AP AMERICA

Dublin, Georgia, USA

YKK is adding a 3000-ton press and has chosen Granco Clark to provide the handling system, which will be optimized for automotive products. Equipment includes a "one-of-a-kind" High Pressure Spray Quench to meet necessary process requirements.

NONFEMET INTERNATIONAL

ShenZhen, China

Nonfemet International has selected Granco Clark to provide a puller and quench upgrade for its exiting 2200-ton UBE press. A Granco Clark Double Puller will be installed in a cut-on-the-fly system arrangement to provide maximum recovery within the limits of the existing building.

The quench will be a Granco Clark High Pressure Spray Quench, with parameter storage and setup by die number. The stored parameters allow the operator to activate the automated setup with the touch of a button.

CAN ART ALUMINUM

Windsor, Ontario, Canada

Can Art Aluminum Extrusions Inc. has selected Granco Clark to supply heating and handling equipment for its new 3300-ton press line. A Model 69-45-5 "Hot Jet" billet furnace will provide heating. The handling system features a 150' cooling table served by the proven Granco Clark Double Puller with an enhanced chip collection system. Balanced cooling will be achieved with overhead and under-table air cooling systems; a 600 GPM high pressure spray quench will also be available for heavier profile sections. The order also includes a Granco Clark taper quench, and a double endflow age oven with automatic conveyor system.

GRANCO CLARK WORLDWIDE

Lawrence R. Difatta – President
John C. Bugai – Vice President
Lloyd Fisher – Director, Sales & Marketing
David Jenista – Senior Systems Engineer
Michael Werner – Senior Systems Engineer
Ken Mishler – Systems Engineer
Terry Knowles – Systems Engineer

7298 N. Storey Road,
Belding, MI 48809
e-mail: gcinfo@grancoclark.com
www.grancoclark.com
Phone: (616) 794-2600
Fax: (616) 794-2878

continued from Benchmarks

Two Understand the reasons for scrapping metal. Record the reasons: "Wrong billet size," "dents from the lift-offs," "too much stretcher allowance," "too little stretcher allowance," "twists at the stretcher," "scratching from seized rollers on the saw table," "didn't make properties," etc.. Note the quantity of scrap which can be attributed to each cause.

Record the reasons for scrapping aluminum and rank them in order of importance. Display the scrap analysis for all to see.

Use the information to plan improvements.

Three Find out why the wrong billet was used, why the stretcher allowance was wrong, and why the rollers on the saw table are seized. Control the operating practices and processes to reduce the waste. Maintain the equipment to eliminate damage. Check the production planning procedures, and ensure that the plan is followed. Control the aluminum log and billet inventory. Control the die, billet and container temperatures, monitor and control the extrusion exit temperature, and quench the sections properly.

Start by controlling the most frequent and the biggest reasons for scrapping metal. Ensure that documented best practices are in place, and are used all the time. Continually reinforce the use of best practices.

Four Use the resulting understanding of planning, equipment and process to develop better working practices and processes.

Plan and implement the improvements to working practices and processes. Reinforce the changes.

Five Measure the waste from the improved production system.

Go back to one!

"Understanding the Operation of the Granco Clark Double Puller System," will be updated and appear in the next edition of *Granco Clark Profiles*.

Newsletter Highlights

GRANCO CLARK WORLDWIDE

7298 N. Storey Road,
Belding, MI 48809