Where is the extruder?


Paul Robbins

Having just returned from ET'08 the Ninth International Aluminum Extrusion Technology Seminar and Exposition, I'm sitting at my desk going through a stack of business cards that I brought back, and thinking of the men that gave them to me. I hadn't seen some of them for some time, and it's interesting to note that a few of their titles have changed. Here's one who has always been an excellent Plant Manager. I'm really pleased to see that he is now a VP. And some of the larger companies now have IT Managers. That's a fairly new title. But a title that was not uncommon a number of years ago seems to now have disappeared entirely. It was simply "Extruder".

The Extruder was an owner-manager who spent most of his time on the shop floor trying to increase his profit by more effectively converting aluminium billets into saleable product, and the rest of his time selling his services. The absence of that title, and the delegation of the responsibilities it implied, sometimes unfortunately results in an opportunity to upgrade the extruder's production system being overlooked, or at best delayed.

When the Extruder was in the plant, in his efforts to increase profit, he had two distinct priorities. First was to maximise productivity with the production system he was operating. That is, maximum ram speed, maximum recovery, minimum scrap, minimum unscheduled downtime, and so on. Second, to be always aware of any new technology that might be profitably incorporated into his production system. The decision to make any changes to the components of the existing system was always considered too critical to the future of the company to be made by anyone except the Extruder himself.

The company grows. Soon the Extruder can no longer manage everything himself. The first executive addition is almost always a Sales Manager. The next is usually a Plant Manager. The extent of the Plant Manager's mandate from the outset to identify is from where a serious and usually unanticipated problem can originate.

Plant Managers generally are experienced and capable extruders who do their best to get maximum productivity from the production system they are operating. The Plant Manager, however, who is expected to research, select and then justify the purchase of new equipment which reflects any new advance in the technology of extrusion, has an unenviable task. He has almost no real incentive to make a change. He has little to gain personally if his decision proves to be profitable, but the blame will be immediate if, for any reason, the new equipment fails to meet expectations. For any expenditure of this kind, there is always at least some implied risk. Why take a chance?

If the Extruder, who's card now reads CEO, retains the authority to upgrade major production equipment, and is able to decide from whom the new equipment will be purchased, or at least establish a firm company policy that all decision of this nature must be made by senior management, he will avoid putting the Plant Manager in an almost untenable position. He will also ensure that the company will continue to make best use of all technical advances in the extrusion industry as soon as they can be proven to be profitable.

This year, as well as providing an international forum for the exchange of cutting-edge technical knowledge, ET was, as usual, a showcase for a broad spectrum of the best as well as the newest production equipment. These included the single-cell die oven and the quick response container.

The single-cell die oven has been so universally well accepted that the old, outmoded chest oven can now be fairly equated with loose dummy blocks. Surely, there is no extruder who is not familiar with the disadvantages of a chest oven, and the overwhelming advantage of the single-cell oven. Heating a number of dies simultaneously in a chest oven is clearly unsatisfactory, because repeatedly opening the oven door, plus placing cold dies beside hot dies, makes uniform heating completely impossible. One or two billets are then wasted at the start of each run, in order to heat the die uniformly to operating temperature. The single-cell die oven brings each die uniformly to the calculated optimum operating temperature rapidly, accurately, economically, and safely.

The thermal mass of the container is much greater than that of the die stack. Accordingly, as soon as the die is firmly sealed to the end of the liner, heat transfer begins by conduction, and thermal equilibrium is reached between the container liner and the die almost immediately. The viscosity of the alloy being extruded is extremely temperature-sensitive. The Die Designer must, however, assume that the die will remain completely and uniformly at optimum operating temperature at all times during extrusion. For this to happen, the temperature of the exit end of the container liner must therefore be very closely controlled. Considering the diameter of the billet, and the brief time it is actually passing through the container, the actual affect the temperature of the liner has on it is negligible. It is the carefully controlled temperature of the end of the liner that, for the first time, really stabilises the die. We now can mange the die temperature, and therefore the aluminium flow through the die, with the container.

The liner temperature is best controlled by correcting any variations as soon as they occur. The time taken to respond to a demand for heat is in direct proportion to the distance between the temperature sensor and the heat source. In a quick response container, cartridge heaters are located very close to the liner. Their purpose is to immediately summon heat to the liner when needed, not to the container mantle. Specially-designed double thermocouples are used to monitor the temperatures of both the liner and the mantle simultaneously. Heating elements are positioned close to the sensors. As a result, the quick response keeps the temperature of the liner fairly constant. For the first time, the thermal and therefore the physical stability of the die can now be controlled by close thermal control of the container liner.

It is both unfair and impractical to charge the Plant Manager with the responsibility of replacing existing production equipment with a new product that may incorporate an important advance in the science of aluminum extrusion. This is so critical to the continued success of the company that it should only be implemented by a member of senior management. Just now, in very large extrusion companies, it is possible for the CEO to have neither any knowledge of the extrusion process, nor any real interest in it. He does, however, have a responsibility to the shareholders to ensure that the plant is being operated in a manner that will maximise profit, and if senior management is not clearly committed to a policy of ongoing productivity improvement, this responsibility is being abdicted and an opportunity disregarded.

Conversely, in a very few multi-plant corporations, the focus from the top down is firmly on better extrusion, and the results are outstanding. These are the Superextruders of today.

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