In the third of a new series by the author, P. Carlo Ratto* talks exclusively to Asian Glass on how a set of shared technical specifications for low-cost fused cast refractories is a necessity and a way to define its quality level.

Discussing about low-cost fused cast refractories procurement, among various critical topics, we mentioned the necessity of determining technical specifications capable to effectively describe a specific product and its suitability to be installed in a given furnace.

Technical specifications, when referring to fused cast refractories, are a complex set of parameters (and relevant thresholds, forks or typical values) capable of describing the specific material in relation to its application, and providing a clear guideline for customer inspections, which in most cases apply to a specific batch of ordered materials (one furnace, or part of it) typically set-up at the supplier premise.

The tech spec book used for the customer inspection is, in fact, mostly a detailed list of parameters describing the dimensional tolerances of single blocks and assemblies, the quality of joints, the level of classified defects against the AQL for intensity and frequency.

It is pretty clear that this set of specifications is the result of a long and complex analysis of what is required for a specific application and the manufacturer’s process capability. It is also easy to infer that whenever there appears to be a significant discrepancy between the two aspects, a manufacturer meets a problem of congruence with its application and must activate its R&D structure to “improve” the product toward the requested characteristic.

All the above, in a perfect world.

I do not know about you, but I have got a few reasons to suspect our world is far from perfection; specifications is yet another example of things that sometimes, in our real world, deviate from common sense.

In our once cozy western world, the few major manufacturers of fused cast refractories had quite strict internal technical specifications (those used within the process by the QS), representing an acceptable percentile of the standard production, and a set of Technical Specifications to be used at the interface with the customer and particularly at the customer inspection process, the latter technical specs normally being less restrictive than the “internal” version, in order to leave a safety margin for accepting border-line materials at the QS screen.

Most of the customers buying fused-cast materials from these western suppliers, though, do not formally utilize technical specs during inspection and, instead, apply generally agreed-upon criteria to evaluate what is and what is not acceptable. This is a consequence of a generally similar level of quality among the few western manufacturers (as a result of a quite mature technology level), of a remarkable level of confidence toward suppliers with a long history of reliability and, finally, of a great deal of experience and know-how about what is admissible in terms of fused-cast refractory quality.

A minority of Customers, as a consequence of a deeper understanding of fused-cast refractories and the perceived need of specific characteristics have developed their own Customer Technical Specifications, often (but not necessarily) more restrictive than the supplier’s specifications. These customer-specific specs are a matter for negotiation with a given supplier, both on the technical and commercial ground. Sometimes a more restrictive request translates into a higher rejection rate at the manufacturer’s process and therefore can be accepted against a price increase. In extreme cases, when a Customer Specification is out of the supplier’s process capability, the request must be negotiated or rejected and will become a potential topic for competitive leverage.

In this apparently peaceful land, though, not everything is sound and proper. In fact, if it is true that Customers (mostly glassmakers) do not have a great deal of understanding of what can and what cannot be done when producing refractories, it is equally true that manufacturers of fused-cast often have a not very clear knowledge of what is needed in a specific refractory application.

The insufficient level of technical cooperation between suppliers and customers (and sometimes the ill idea that “the more restrictive the better”) rests at the root of suppliers sometimes providing meaningless parameters and, on the other side, users forwarding mistakenly formatted requests.

One example of the first case is manufacturers of fused-cast providing needless CCS (Cold Crushing Strength) data, while one typical odd request from users is, for example, defining the ZrO2 content in a low-zirconia AZS...
as "ZrO2>32.0%", overlooking the fact that a largely zirconia-enriched superstructure block is very likely to develop cracks and, therefore, a fork for zirconia content is a much more appropriate request.

Another foggy area is the definition of extremely critical technological parameters like "oxidation", "blistering potential" and "dynamic glass corrosion" tests. In spite of a commendable attempt to standardize these specific tests by entities like ASTM, there still is a great deal of complication in regimenting the sampling technique (which greatly affects the result) and the laboratory equipment. As a consequence we can say that these tests are, in the real world, intrinsically comparative and must be based on a statistical evaluation (on a rather numerous population). In conclusion, every top manufacturer supplies relative or indexed typical data, without any hope for a customer to double-check the information, in spite of the extreme importance of these data toward the application.

Once more, the level of confidence between supplier and customer is the key factor to accept practically not verifiable supplier’s statements.

Luckily, dimensions, shape factors, joints quality, density, occurrence of defects and the like are parameters objectively measurable by all parties, so these are those variables checked at the customer inspection. For these inspections, western suppliers and customers do informally refer to generally agreed criteria, or to agreed-upon sets of technical specifications. In all cases this is the result of a deep interaction between parties and a certain level of confidence of customer toward supplier.

If this is the situation in our western world, what is the present status when dealing with low-cost fused cast manufacturers? We need to recall a few concepts. Western customers basically have either of two ways of approaching low-cost procurement:

Large global customers have (or try to develop) a direct interaction with low-cost suppliers for the basic aspects of procurement, including the materials technical specifications. They often provide their own specs to compare with the supplier proposal, when available, trying hard to get to a commonly agreed set of data, through a typically long and complex negotiation.

While medium and small customers typically access low-cost procurement through a western intermediation which provides those services missed from low-cost manufacturers (at the cost of a variable price mark-up), and very often provide meaningful and acceptable technical specifications pre-negotiated with the fused-cast vendor.

In both cases, someone (the large glassmaking company or the western intermediator) has to develop an agreed-upon set of specifications which have to be meaningful, realistic (feasible) and competitive, given a low-cost position.

The starting point of such a negotiation, from the vendor side, is often problematic. While most of manufacturers have basic specifications to be used within their manufacturing process and almost all have public technical brochures (catalogues very similar to those of western competitors), very few have a formal technical specification book to be used during a customer inspection.

Since for most low-cost vendors (looking at the actual level of tolerance, grinding and attributes) it is clearly not applicable the western "generally agreed upon" level of quality, it becomes necessary to create from scratch a specific set of technical specifications.

First it is necessary, for the manufacturer, to know its own process capability; SPC (Statistical Process Control) techniques appear to be not as much exercised as it should be advisable by these manufacturers, so it is often quite difficult to understand what can and what cannot be done and what the cost (rejection rate) could be when setting a given defect threshold. Here, a great deal of cooperation (and confidence in the provided info) is necessary to understand what the process capability is and to resolve, when and where necessary, critical situations. As the full picture becomes clearer, a "feasible" set of specifications must be compared with the competitive situation, considering that customers procuring low-cost materials will be prone to accept some difference but, generally, not to compromise on critical quality parameters. For instance they may accept a higher level of aesthetic surface defects or even bulging on hot faces, but will be reluctant to tolerate significantly worse joint quality and will definitely not accept showing-through cracks.

In the successive step, making a decision on what a western customer will be disposed to accept, it is necessary to use very much technical marketing know-how. These skills are very rarely found in the low-cost manufacturers’ staffs and therefore, the cooperating entity must provide these critical elements. When the cooperation is developed directly by a major global customer (glassmaker), there is an obvious conflict in establishing the proper AQL for defectiveness but, ultimately, the feasibility and cost of conformity will determine the shareable set of technical specifications.

Producing a set of Technical Specifications to be used as a shared formal document, covering most aspects of a customer inspection in case of low-cost fused cast procurement is somehow a boring, hard task to perform, in order to turn such a procurement into a manageable and successful process.

There is a remarkable amount of background struggle to get to this result but, along the process, there are very valuable opportunities to exchange know-how, to fix process slips and make the overall supply acceptable by a western customer who approaches the low-cost procurement under financial pressure but not willing to significantly compromise on quality.

If the process behind the preparation of a technical specification book is sound and proper (and not a result of a “me-too” or even a copy-paste practice), then the resulting profile will be a way to describe the actual level of refractory quality. Its competitive positioning will be complementary to the commercial aspects for a customer to approach a fused-cast low-cost procurement with full awareness.

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