Global Outlook

High Carbon vs. Low Carbon: The End-User Angle

For many years, a technical debate has taken place in the small world of metallic abrasives: which carbon steel abrasives particles are best? High carbon or Low carbon shot? Comprehensive analysis and comparisons show the better ability of high carbon to remove contaminants vis-à-vis the longer life of low carbon particles. But this debate has until now largely focused on the metallurgical properties of the particles, mostly from a lab perspective; the comparative industrial trials were all made on relatively small blasting machines far easier to monitor than multi-wheeled continuous lines, and were obviously influenced by customer-supplier relationships. In other words, this was a fight amongst experts and sales representatives. The purpose of this column is to revisit the matter, taking a step back and looking at it from the end-users actual behavior and economic needs, in the foundry industry.

Shot-blasting in the foundry industry

The steel abrasives clean the castings in shot-blasting machines with industrial objectives of productivity, cost efficiency, and consistency of the process. On one hand, this is a menial operation compared to the noble art of casting; on the other hand, this is a technically critical task to remove sand and contaminants from all the surface of the parts and make them ready for a safe machining, possibly with a good looking shine. In 2011, the foundries were the largest consumers of metallic abrasives: around 350 000 tons (25% of the global market) of which the automotive industry weights 235 000 T. The average global consumption of metallic abrasives was about 6 kg per ton of ferrous casting (excluding China).
The good news is the long-term growth of the global casting production, thanks to the steady rise of the automotive industry, which represents 2/3rds of the metallic abrasives consumption in foundries: from 80 million vehicles in 2011 up to a forecast of 110 million in 2020. Other good news is the current manufacturing revolution in the automotive industry, getting organized along the industrial concept of plate-forms, where several models will be assembled with the same parts. As the market is becoming global, each major manufacturer will operate two or three plate-forms by group of vehicles. The stakes have hence become enormous: one single part will ultimately be assembled into possibly a dozen models; the manufacturing quantities involved are jumping to the millions of parts range. This translates industrially into far longer series and heavier investments. In other words, this is a new industrial paradigm, which requires a much-enhanced productivity and must generate significantly lower costs.
The bad news is the enormous pressure on price, which squeezes costs and margin. This forces all foundries to make bold investments and tap any source of efficiency and productivity, in particular in the finishing area, until now below the radar detection of the "cost killers".

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Learning from the German foundry industry

The German car industry is at the forefront of this new industrial approach; the plate-forms were invented and first implemented by VW. The foundry sector is also the largest one in Europe and presents some tantalizing features:
The German consumption of metallic abrasives per ton of castings is higher than the global average: 7+ kg per ton of castings in the ferrous foundries. This surprising benchmark result is indeed due to resolved pursuit of the highest productivity in the large automotive-oriented foundries, with far more intensive shot-blasting operations than anywhere else in the world, hence generating a higher consumption of abrasives.
The foundry consumption of steel abrasives (31 000 T) has another peculiarity: 1/3rd low carbon steel shot, 1/3rd carbon cut wire, 1/3rd high carbon steel shot. In most other countries the high carbon shot still represent over 80% of the consumption (China and India being exceptions, but their high usage of cut wire is due to the insufficient supply of quality cast-steel shot).
This co-existence of large quantities of cut wire, low and high carbon, signals the industrial need of German foundries to cap their consumption of metallic abrasive, which is too high, while sustaining their performance of high productivity. Accordingly, this favors the usage of the two most resilient media, cut wire and low carbon shot, while high carbon shot and grit wear out too fast in intensive shot-blasting operations.

High speed wheels + Low carbon shot = better productivity & costs

All fellow foundry workers will agree that in the next five years, the automotive foundries will need even more productivity, lower costs, and ever better quality. The productivity requirements clearly necessitate investing in a new generation of shot-blasting equipment, with a continuous process and high-speed wheels (90 to 110 m/s). To remain competitive, the medium and large foundries of automotive parts will have no choice but to equip themselves with such excellent machines; and the need to cap the metallic abrasives consumption will be even more acute! This should trigger a surge in low carbon shot usage as these particles sustain the stress due to high velocity wheels far better than the high carbon ones, and are cheaper than cut wire.
The combination of high speed wheel machines blasting with extremely resilient low carbon shot is hence the most favorable formula for productivity and cost in the foundry industry; this should ultimately become the standard effective industrial solution to economically clean automotive castings.