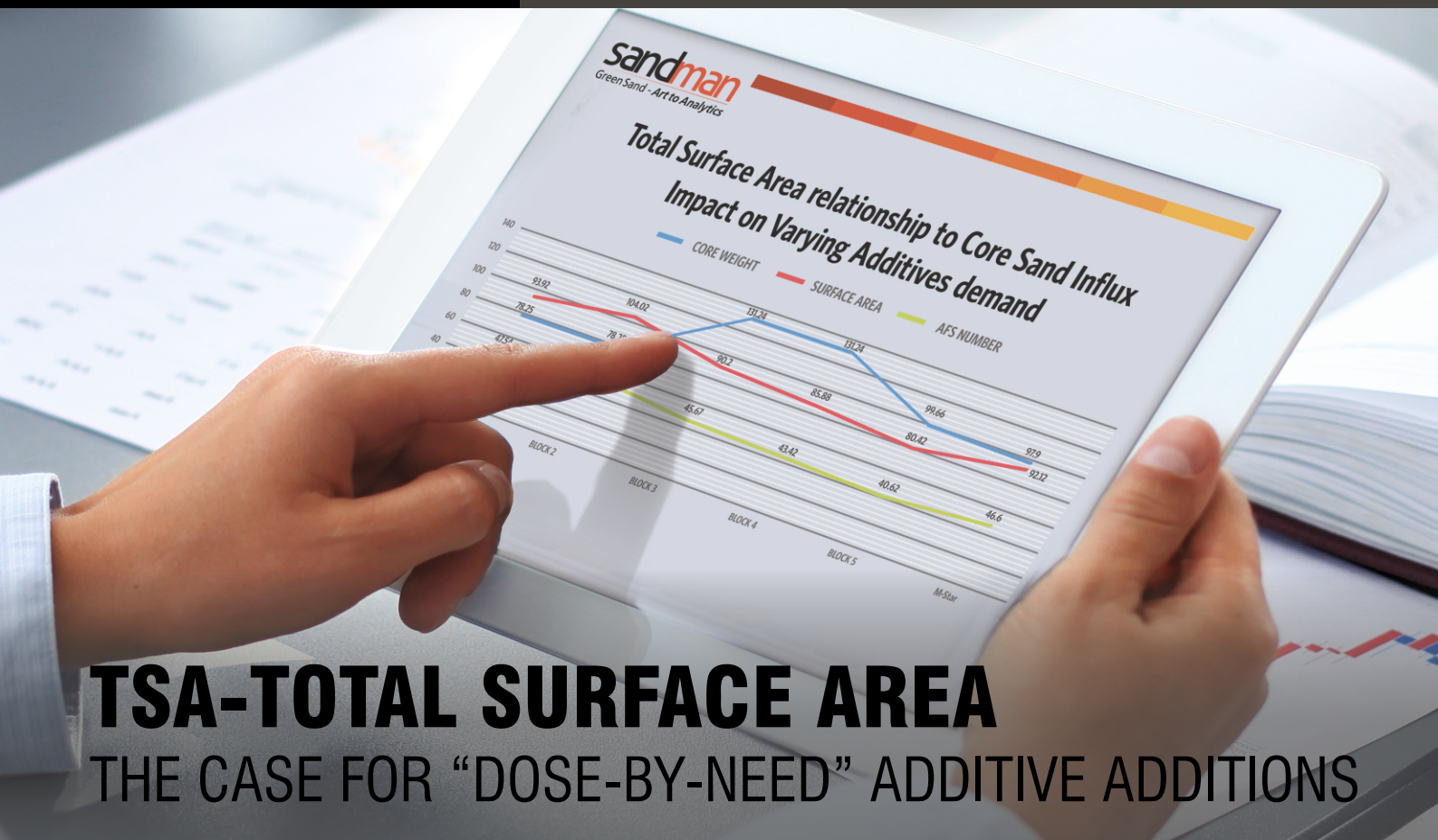




TSA-TOTAL SURFACE AREA THE CASE FOR “DOSE-BY-NEED” ADDITIVE ADDITIONS

Given the molding process dynamics and the mass balance logic of the total sand loop, defects are inevitable. However, some ‘finger-printing’ to predict possible causality is possible by estimating the Total Surface Area of the Return Sand & then its priority of discharge layer from the return sand hoppers to the next mix. It's simple to state, but in a dynamic sand loop it can be practically very complex to predict by human intervention alone due to the shear multivariate nature of the molding process. The advantages of a data analytics decision support is priceless in this context.

- Deepak Chowdhary
- Founder Owner of MPM PVT. LTD. Nagpur India
- Inventor of ‘SANDMAN’ data analytics driven molding sand control-for reduced rejections

Most ‘Block’ foundries are subject to sand fusion or ‘burn-on’ issues. There has been no evidence in sight for the causality of this defect and it continues to vex most foundries in this space almost with regular periodicity. Each time the problem resurfaces, there is a scramble for a variety of reactive analysis. Some of the most common and typical reactive questions are:

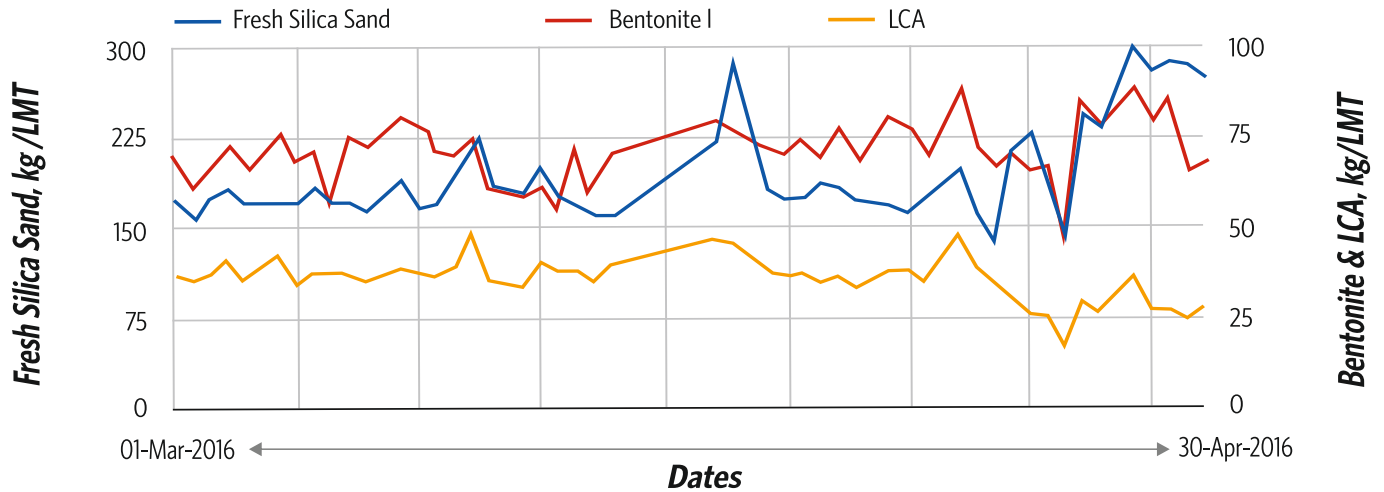
Has the supplier changed the Lustrous Carbon additive?

Has the bentonite supplier changed his source or has the supplier been changed?

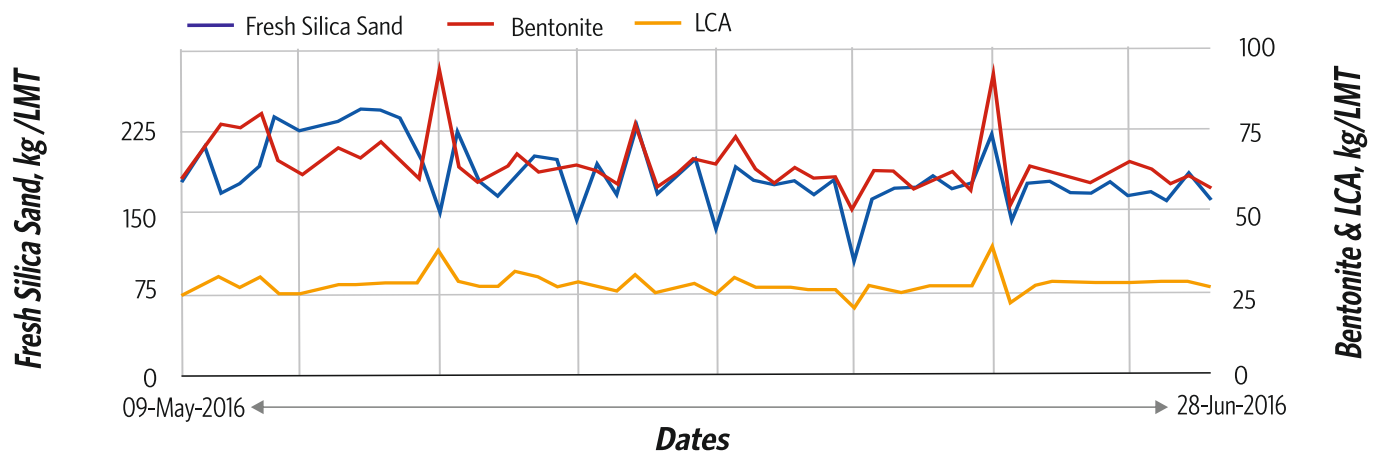
The answer to the above and the many more questions could be either yes or no. However, not many foundry process owners ask the question:

VARIABLE "DOSE-BY-NEED" ADDITION ADVANTAGE OF PRESCRIPTIVE ANALYTICS

Additives : Manual



Additives : SandMIX Analytics



Courtesy: www.mpminfosoft.com

- Has the GFN of the raw silica sand changed?
- Has the GFN of the core sand changed? (Since this is normally coarser than the GFN of the raw molding silica sand)
- Has the production planning for specific type of blocks changed?
- Is there more or less quantity or percentage of core sand infiltration?

Why are these questions of relevance to the incidence of

sand fusion? The answer lies in a very basic study of TSA done on the return/shake-out sand of specific block casting having varying core sand loads:

With the Return Sand Hopper having different layers of sand:

- In above study: Raw Core Sand GFN is lower than that of the Raw Molding Sand.

- The chart above shows that as the core sand influx increases, the TSA decreases and vice versa.
- Each Marker represents the return sand of a specific pattern.
- Reasoning: each pattern return sand will form a layer as it re-circulates into a storage hopper.
- The TSA of sand layer that will come through for the next molding batch mix can only be estimated
- The motivation is to examine the variability of the TSA of the sand before it goes into the mixer.
- The variability will decide how much make-up additives are required to achieve target properties.
- In absence of data analytics even variable additions can at best be approximate.
- Under-dosing or overdosing of the additive/s will also decide the rejection legacy.

Many foundries try and develop a return sand mapping logic. Many don't. In both case however, the additive additions are prophylactic or 'Fixed Dose'. In the absence of an advanced data analytic decision support system, which also takes into account among other complex logic, the complete sand mass balance logic; there is inevitably a limitation to the exact estimation.

- If there is no data analytic decision support available, it is still a better idea to map the return sand and have varying additive dosage program than having a single fixed dose additive program.
- However, if there is in place SANDMAN and SANDMIX type data analytics installed, then the foundry can actually get decision support on a near precise dose-by-need additive program. (More information

about SANDMAN and SANDMIX analytics is available from www.mpminfosoft.com.)

The advantages of data analytics decision support is seen from the given chart.

It's not only the optimisation of the additive consumption that is of emphasis here, there is also the collateral benefit of reduced sand related defects when a data analytic decision support is followed.

The motivation for determining TSA or graduating to data analytical decision support software is:

- To graduate from reactive decision making in targeting optimal sand properties in terms of controlling related rejections .
- To move towards process consistency reducing systems 'noise' by predicting and then optimizing the optimal target sand parameters.
- To move towards 'dose-by-need', variable additions of additives. Prevent overdosing and under-dosing the system sand. Optimizing consumption
- Thereby control, mitigate or reduce rejections .

Disclaimer: The above list is not exhaustive, nor 'cast-in- stone'. Sometimes some effects and related impacts are marginal and not evidently seen or recorded. This sharing of experience is just to make the reader aware of the logic of the use of additives in a judicious, diligent and aware manner so that the process can remain stable, reliable and repeatable with the ultimate view of keeping sand related rejects at minimum.