

29 September -1 October / 29 Eylül - 1 Ekim 2016 TÜYAP Fair, Convention & Congress Center, İstanbul

8. Uluslararası Döküm Kongresi / 8th International Foundry Congress by TUDOKSAD Academy In conjuction with Ankiros / Annofer / Turkcast fairs

«Sodyum Bentonit ile Daha Verimli Üretim»

«Effect Of Sodium Bentonite On Foundry Performance»

Brian Officer (MTI Metalcasting Group)

4.Oturum: Döküm Teknolojileri Kalıp

4th Session: Moulding Technologies

Oturum Başkanı/Session Chairman: Bülent Şirin (Componenta Dökümcülük Tic. San. A.Ş.)



Oturumlarda yer alan sunumlar 3 Ekim 2016 Pazartesi tarihinde akademi web sayfasına (akademi.tudoksad.org.tr) yüklenecektir.





PERFORMANCE IMPROVEMENTS WITH SODIUM BENTONITE

BRIAN OFFICER TECHNICAL SUPPORT MANAGER MTI METALCASTING GROUP





- PRODUCTION OF HEAVY DUCTILE IRON CASTINGS AUTOMOTIVE
- DISAFORM MOULDING MACHINE
- SAND:METAL RATIO 3.5 -5:1
- LONG COOLING LINE
- ISSUES WITH MOULD CRACKING, MOULD COLLAPSE AND METAL LEAKAGE
- OCCURRENCE OF METAL PENETRATION DEFECTS





• COOLING LINE AND WEIGHT TRANSFER









SAND PROPERTIES

- ACTIVE CLAY 12%
- MOISTURE 4.8%
- VOLATILES 2.6%



TO COUNTERACT MOULD CRACKING AND LEAKAGE

CONSEQUENCE OF HIGH ACTIVE CLAY

CONSEQUENCE OF HIGH MOISTURE





METAL PENETRATION – WATER EXPLOSION







MATERIALS USED – GREENSAND

- ACTIVATED CALCIUM CLAY
- COAL DUST
- AFS 50 SILICA SAND







RECOMMENDATIONS

- REPLACE IMCUMBENT BENTONITE WITH BLEND OF SODIUM AND EUROPEAN ACTIVATED CLACIUM BENTONITE
- MAINTAIN EXISITING COAL DUST AND SILICA SAND PRODUCTS



REASONS FOR CHANGE



IMPROVE THERMAL PROPERTIES OF GREENSAND (DRY AND HOT STRENGTH)

REDUCE MOULD CRACKING AND METAL RUN OUT

ALLOW REDUCTION IN ACTIVE CLAY REDUCE MOISTURE CONTENT AND METAL PENETRATION DEFECTS





FUSION TESTING



ACTIVATED CALCIUM BENTONITE



SODIUM BLEND





HOT COMPRESSION STRENGTH



7% bentonite93% silica sand40% compactibility5 mins wet mix time



Product	Na blended	Activated Calcium Bentonite	
	bentonite		
HCS 900 °C (psi)	475	370	
HCS 1010 °C (psi)	290	175	
HCS 1100 °C (psi)	70	35	



RESULTS POST TRIALS (6 MONTHS)



Property	Pre trial	Post trial
Active clay (%)	12	10.5
Total Clay (%)	15.5	12.5
Moisture (%)	4.8	3.4
Volatiles (%)	2.6	1.4
LOI (%)	6.2	4
DCS (psi)	45	56
GCS (psi)	28	25
WTS (n/cm2)	0.35	0.32



RESULTS POST TRIALS (6 MONTHS)



- MOULD CRACKING AND METAL RUN OUT ELIMINATED
- METAL PENETRATION ELIMINATED
- CASTING PEEL IMPROVED
- SAND "FEEL" IMPROVED (MORE MOULDABLE)
- COST SAVINGS INCURRED (CONSUMPTION LESS)



RESULTS POST TRIALS (6 MONTHS)



• IMPROVED SAND PEEL OFF







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RESULTS POST TRIALS (6 MONTHS) MATERIAL COST SAVINGS



Bentonite and Coal Dust costs per tonne of metal poured					
Before Maxibond (June 2011 data)	Kg	Unit Cost (£)	Material Cost (£)		
Bentonite	85.3	165	14.07		
Coal Dust	20.7	275	5.69		
Cost per tonne metal poured (£)			19.77		
Withr Maxibond (Sept2015 data)					
Bentonite	68.5	185	12.67		
Coal Dust	13.1	275	3.60		
Cost per tonne metal poured (£)			16.27		
Saving per tonne metal poured(£)			4.50		
%			22.7		







• MOULD CRACKING, MOULD COLLAPSE ELIMINATED DUE TO GENERATION OF HIGHER DRY AND HOT COMPRESSION STRENGTHS



CONCLUSIONS



METAL PENETRATION ELIMINATED DUE TO REDUCTION IN ACTIVE CLAY, MOISTURE AND CARBONACEOUS ADDITIVES IN THE GREENSAND

EXCERPT FROM 1986 AFS PUBLICATION "EXPERIENCES IN DEFECT DIAGNOSIS - METAL PENETRATION"

Water explosion penetration is a process where molten metal collides with the mold wall with a certain critical force causing an explosive evaporation of the water present at the sand grain-metal interface surface. This mechanically forces liquid metal into the pore spaces of the mold aggregate. Oxidation and a chemical reaction occurs simultaneously. This causes the molding sand to fuse on the casting's surface.

Under certain conditions, because of mold configuration, metal flow patterns and velocity, explosive evaporation of the water present at the mold face generates explosive forces that can force liquid metal a great distance into the mold (Fig. 30).



CONCLUSIONS



A secondary contributing condition, when the moisture content is high, is excessive organic additives. Organic additives always require more water for tempering and most organic additives do not contribute to the bonding process. They can be termed "antihonds."^{34,35} Since they require water in the mixing operation to mold properly, they do not hold water rigidly and release it prematurely (except for cereal and starches). At the same time, as these organic additives burn, they create gas and are a source of carbon, which increases temperature and pressure and adds to the explosion forces.







• HOW WAS A BIG REDUCTION IN COAL DUST ACHIEVED

LOWER ACTIVE CLAY AND AFS CLAY

LOWER WATER DEMAND

LESS BURNING =LOWER COAL AND CLAY FINES GENERATION LESS COAL REQUIRED







CONCLUSIONS











Thank you Brian Officer