

# **The Role and Importance of Using Only High Quality Green Sand Moulding Additives to Ensure the Consistent Production of High Quality, Defect Free Castings**

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# Main Casting Defects Attributable to Moulding Sand

## Defect

- Penetration
- Broken Moulds
- Surface Blow Holes
- Burnt on Sand
- Scabbing
- Mould Swelling
- Erosion
- Sand Inclusions

## Cause

- Coal Dust
- Bentonite
- Permeability, Water Content
- Coal Dust
- Bentonite
- Bentonite
- Bentonite
- Bentonite



# Bentonite



Swellable Clay Minerals Formed by the Disintegration  
(Weathering) of Volcanic Ash

# Composition of Bentonite

- Bentonite consists mainly of the mineral Montmorillonite (Smectite)

## Other Constituents

- Quartz, Feldspar, Glimmer
- Limestone, Dolomite, Iron Oxides
- Other clay minerals Illite, Kaolinite

## Classification of Bentonite

- Natural Sodium Bentonite
- Natural Calcium Bentonite
- Activated Bentonite

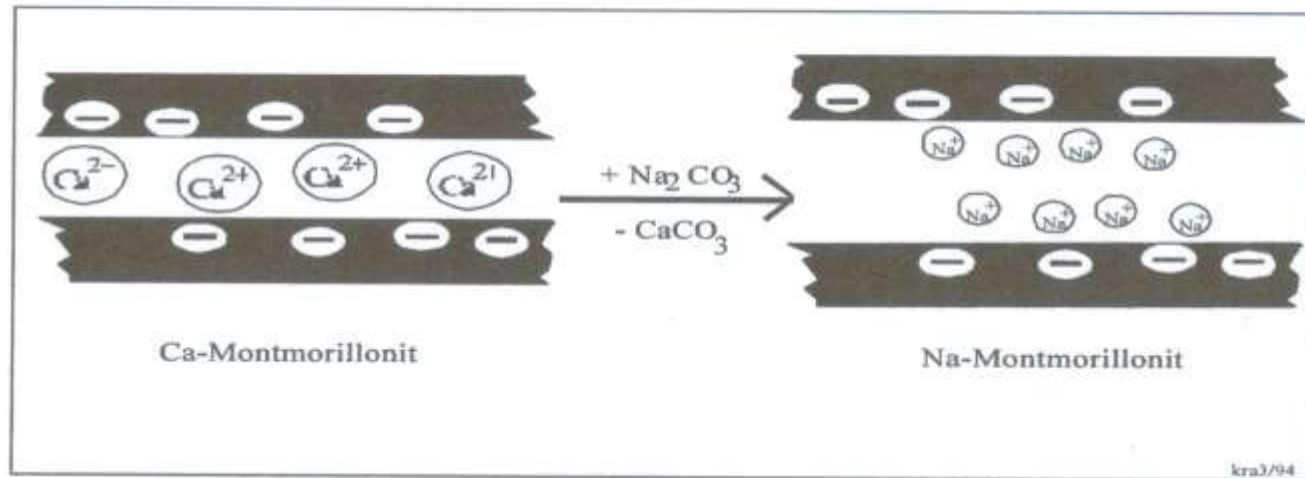


## Important Properties of Bentonite

- Montmorillonite has a structure consisting of very small flexible platelets having a high specific surface area
- It possesses the ability for cation exchange due to the low negative electrical charge of the basic particles
- It has the ability for reversible absorption of water at the interstitial cations and at the Montmorillonite surface, this is accompanied by a volume increase (intercrystalline swelling)



# Principles of Soda Activation



# Intercrystalline Swelling of Montmorillonite



Swelling shows the ability of Montmorillonite to absorb water many times it's own weight

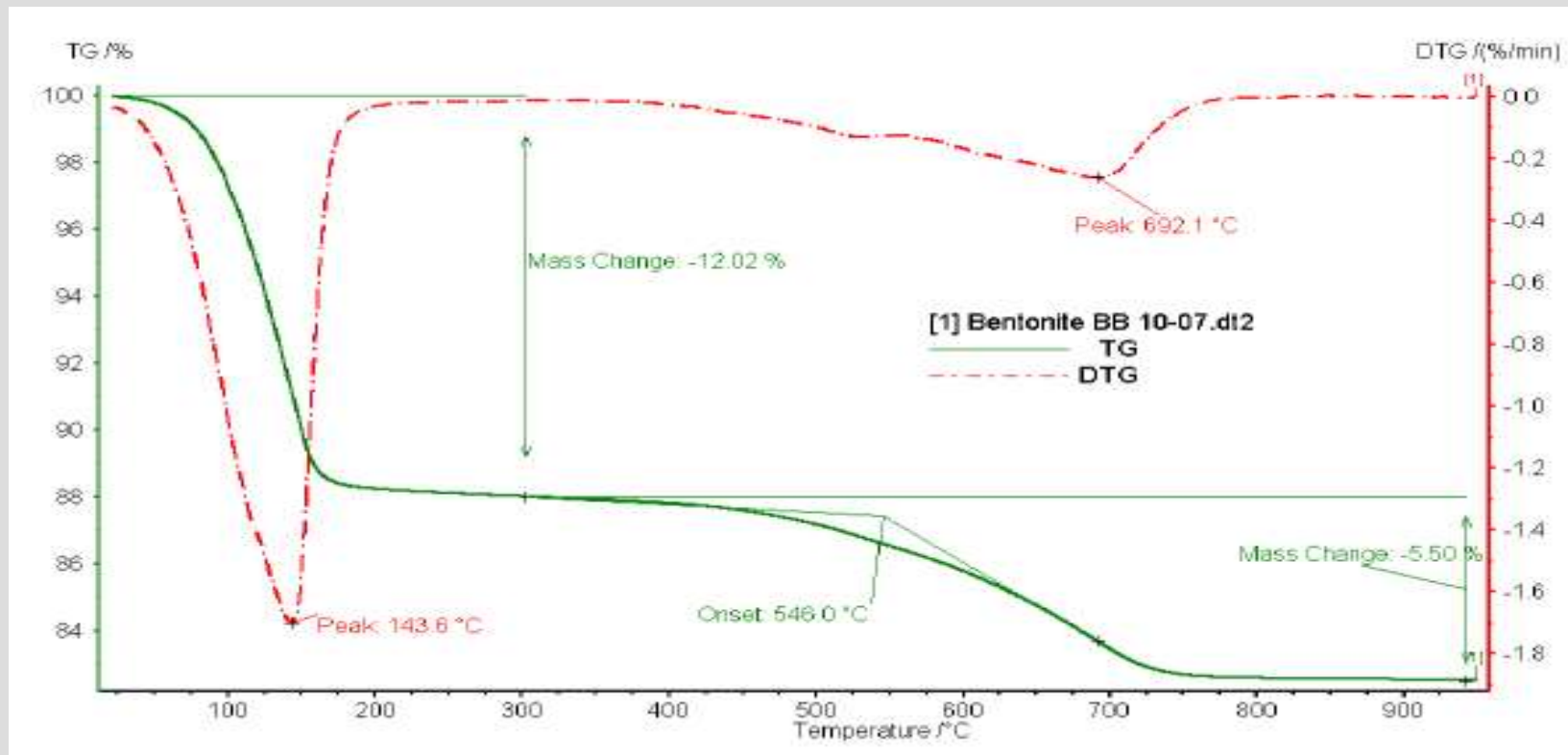


## Important Technological Properties for Foundry Bentonite

- High Specific Bond Capability – Optimum mouldability, low defect ratio
- Thermal Stability – Low consumption, low fines generation
- Reclaimability – Ability to re-hydrate and provide adequate bonding of silica grains
- Hot Strength Behaviour – Low defect ratio
- Development Rate in the Mixer – Important for development of characteristics where sand is not in optimum condition



# High Thermal Durability

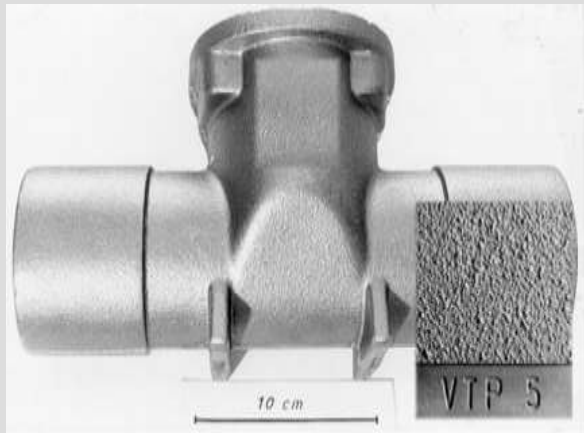


➤ After 600° C bentonite will lose the water of crystallisation and will lose their bonding capability

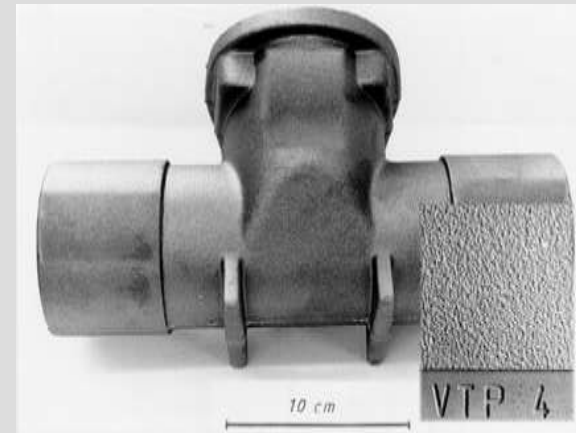
➤ Low thermal stability – high fines generation – high water demand

# Processed Carbon

- Increased development rate in the mixer
- Enhanced mechanical properties
- Increased flowability
- Increases compaction
- Reduced water demand
- Decreased surface roughness

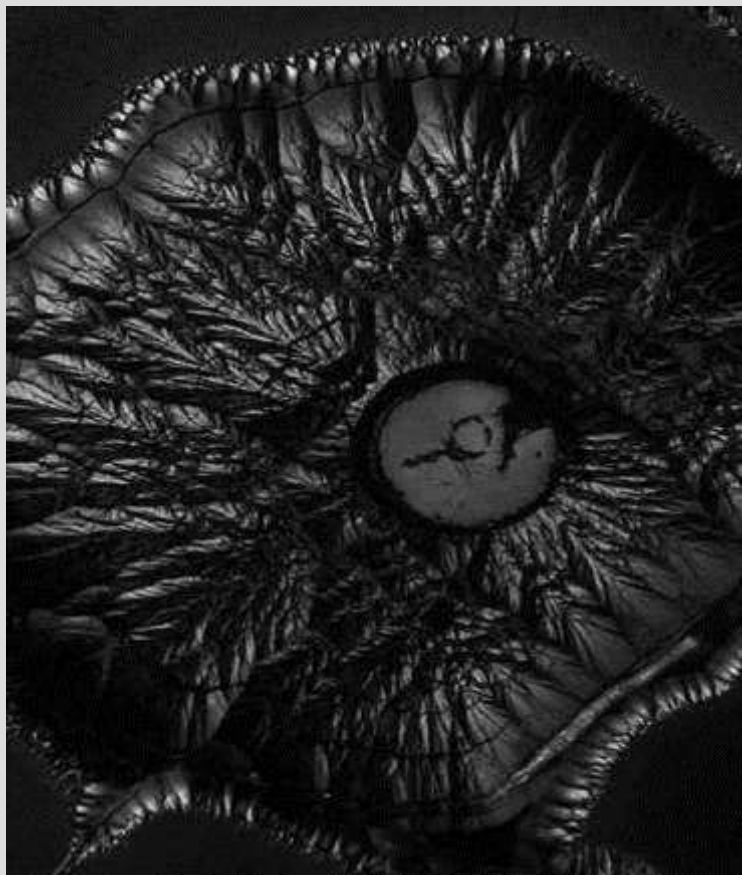


Without processed  
carbon valley depth  
25 $\mu$



With processed carbon  
valley depth 16 $\mu$

# Lustrous Carbon Formers (Coal Dust)

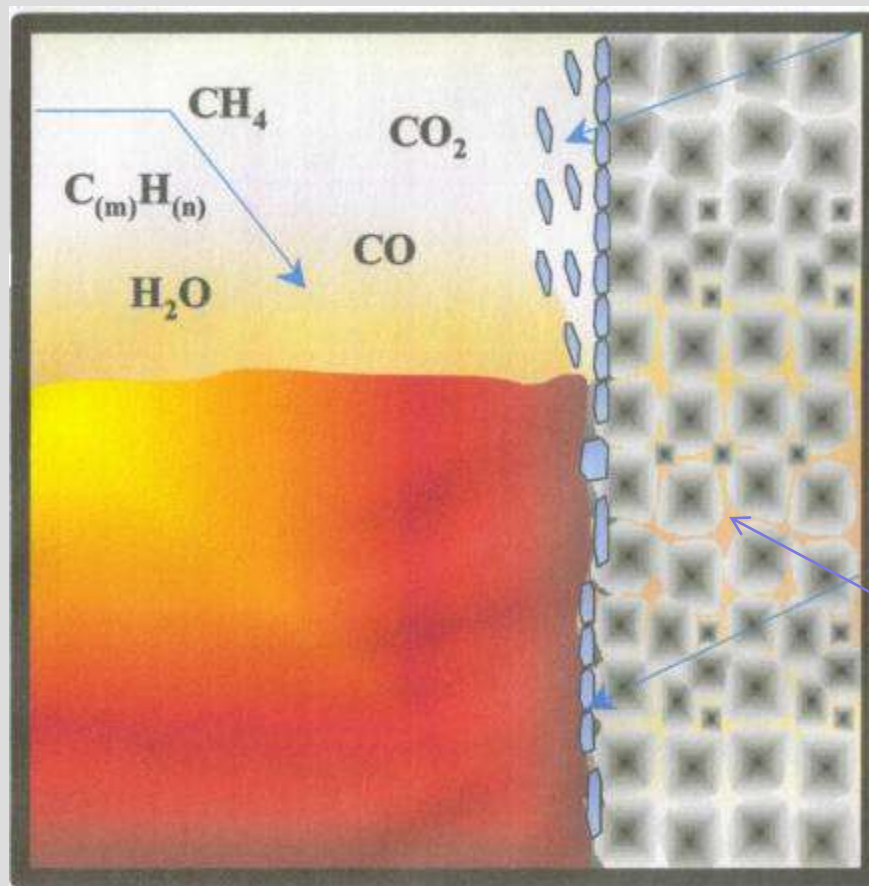


- Essential for the formation of lustrous carbon (Macro graph)  
A crystalline modification of carbon.
- Formation from gas phase at temperatures in excess of 650° C

# Function of Lustrous Carbon Producers

## Reducing mould atmosphere

Decreases wettability of mould surface due to the absence of oxygen.  
Avoids oxidation reactions.



## Formation of Lustrous carbon

Above  $650^\circ\text{C}$  formation starts from gas phase which is enriched with hydrocarbons. Lustrous carbon is separated on hot mould surfaces and avoids wettability by melt.

## Softening of coal

Builds up a protective layer the on mould surface (seals surface pores)

Intergranular softening allows for expansion of Quartz

# Important Technological Properties of Coal

- Reduces the wettability of the metal by the precipitation of lustrous carbon onto the mould face
- Produces a reduction atmosphere inside the mould cavity for the prevention of oxidation defects.
- The softening of the coal to form coke – seals mould surfaces- reduces compressive stresses inside the mould.



## Desired Physical Properties of Coal

- High Volatile content – Production of hydrocarbon gases
- High lustrous carbon formation - Reduced wetability of metal
- Low ash content – Low fines formation, low water demand
- High swelling index – Reduction in compressive stresses
- High carbon content- Necessary for reduction atmosphere
- Low S and N content – Metallurgical issues



# Conclusion

Casting defect reduction can only be achieved through the use of the highest quality moulding sand additives that will

- Produce a moulding sand with optimum flowability
- Provide the optimum packing density
- Provide adequate permeability
- Provide the optimum mechanical properties and thermal stability
- Provide sufficient LC formation for prevention of oxidation reactions inside the mould.

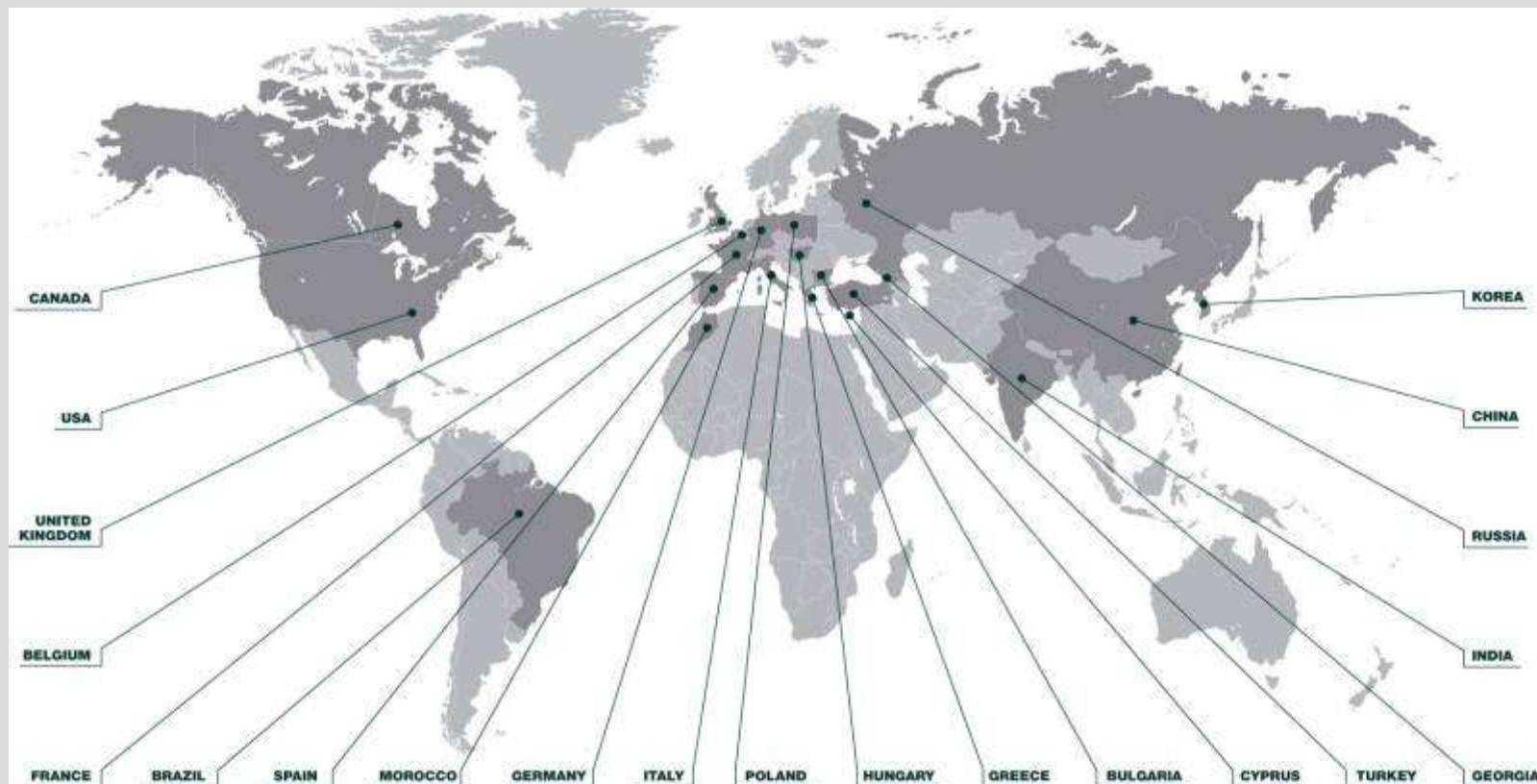
**ULTIMATELY PROVIDING A  
STABLE, CONSISTENT, WELL  
CONDITIONED MOULDING SAND**





# S&B Industrial Minerals: The Group

- S&B Industrial Minerals S.A. group:
- International presence with subsidiaries, affiliates, offices and distribution facilities in:



# Bentonite Division Photos Aggeria Mine, Milos



# Our Company



**Solutions for Foundries**  
**Customised Moulding Material Technologies**



# FOUNDRY PRODUCTS

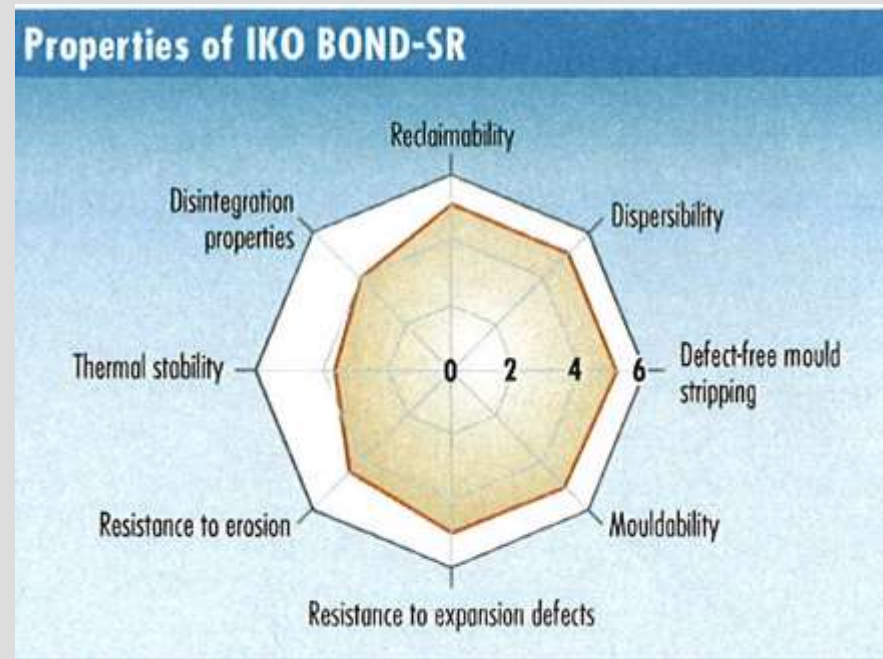
## Bentonites :

### IKO Bond BFA

- Activated calcium bentonite from Bulgaria.

This new quality was developed after the acquisition of JSC Bentonite by S&B in 2004.

- Main characteristics :
  - Low moisture demand
  - High mechanical characteristics
  - Low consumption



# IKO Bond D / QuickBond D

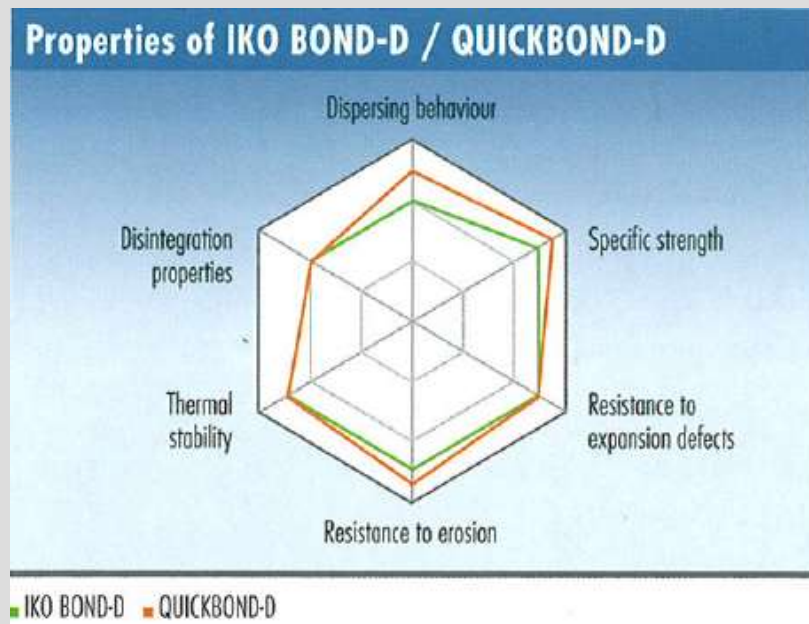
- Activated calcium bentonite from the Island of Milos.
- The mine is the largest recorded bentonite mine in the world.

The size gives a definitive advantage for the homogeneity of the material and ensures that the high quality characteristics are maintained.

A strict operating program helps to ensure the long term future of the mine.

➤ Quickbond is a process that treats the bentonite with macro crystalline processed carbon enhancing the properties of the material.

- Main characteristics :
- Main benefits for the foundry :
- Low bentonite consumption
- Consistent results.



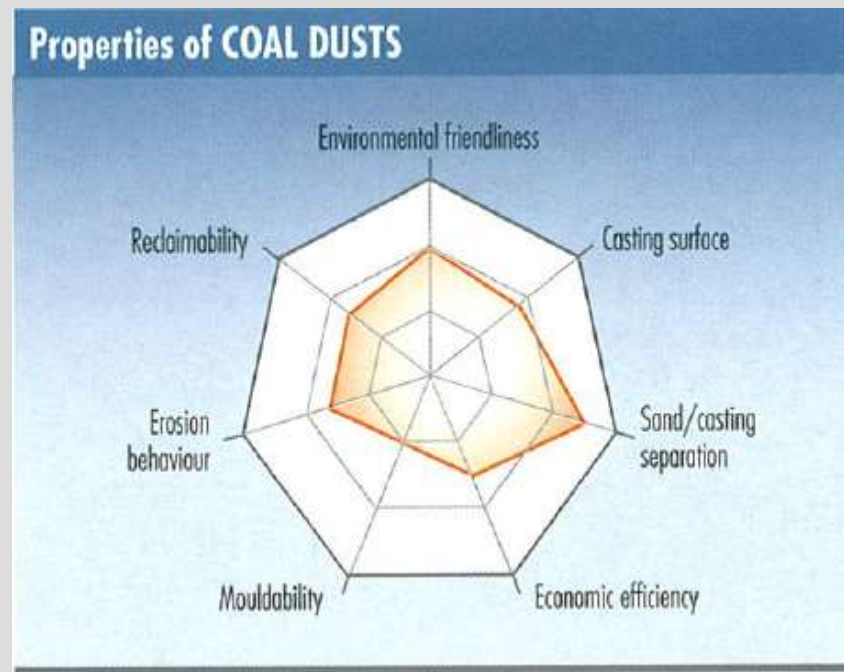
- High strength
- High resistance to erosion



# Lustrous Carbon Formers

## IKO Special

- Coal dust the classic solution.
- Manufactured through the careful selection and grinding of low Sulphur and Nitrogen coals.
- Medium volatiles
- Low ash.
- High swelling.

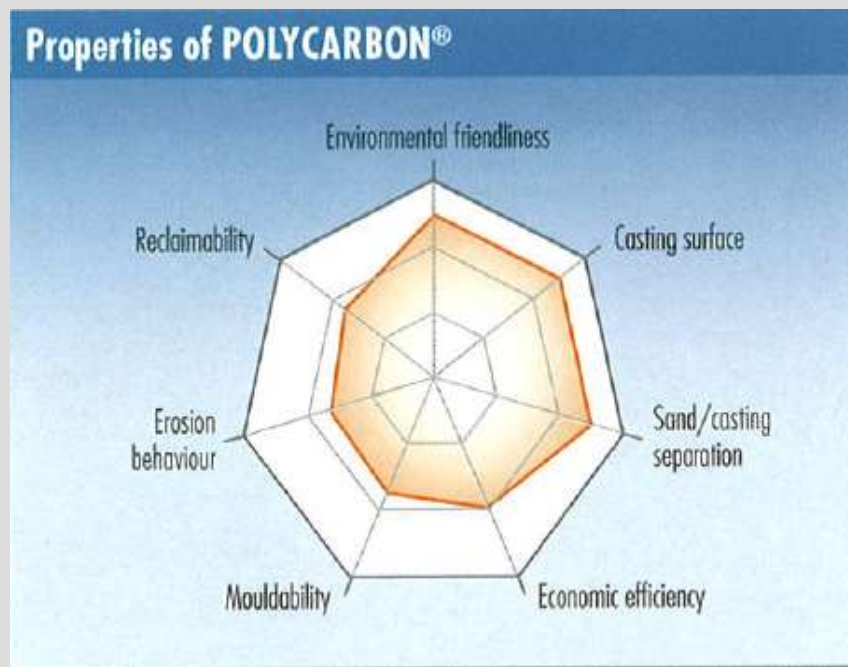


# POLYCARBON

Conventionally enriched lustrous carbon former consisting of high grade hydrocarbon compounds blended with coal dust.

## Advantages

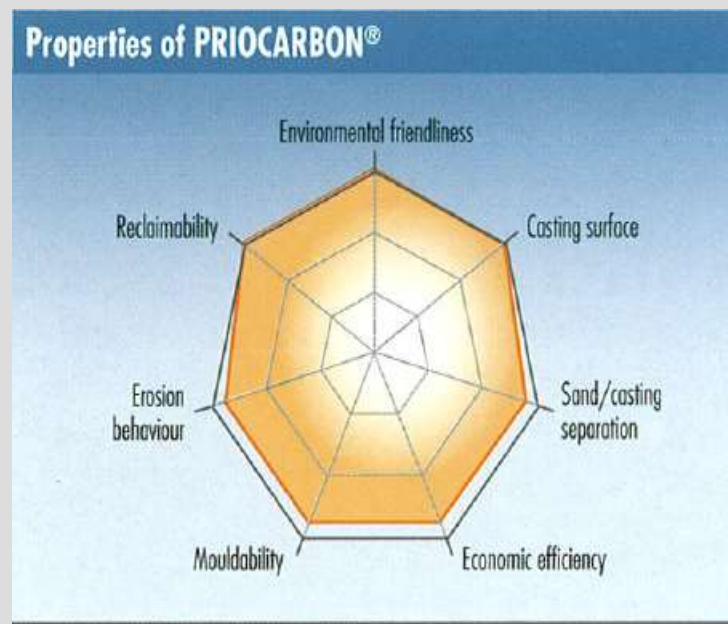
- Faster lustrous carbon formation.
- Lower additions.
- Reduced moisture demand.



# Priocarbon

A highly enriched coal product and the jewel in our crown. Satisfies the highest ecological demands.

- No air pollution.
- Reduction in odour produced both inside and out side the foundry.
- Significant reductions in disposal costs.





# MARKET TREND

In order to avoid self ignition and explosion risk (ATEX area).

The trend is the addition of a ready to use Blend (Bentonite + LCP).

This solution gives a technical advantage with regular additions, proportionally balanced to the specific needs of each moulding line.

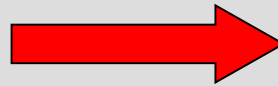
**EACH FOUNDRIES PROCESS MUST BE ANALYSED  
BEFORE ANY BLEND INTRODUCTION**



# BLEND THEORY

## MOULDING SAND REQUIREMENT

**HIGH MECHANICAL  
CHARACTERISTICS**



**BENTONITE**



*Requests*

**WATER**



*Requests*

**LCP**

In order to keep the necessary reduction  
atmosphere in the mould cavity

# Product Evolution

2000 — 2004



GO - APIC

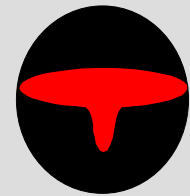


- Danish Technological Institute
- Svenska Gjuteriföreningen Service AB
- Castings Technology International
- Volvo Powertrain Corporation
- Vanguard Foundry Ltd.
- Laycast Ltd.
- S&B Industrial Minerals GmbH
- DISA Industries GmbH

2004 — 2008



ENVIBOND®



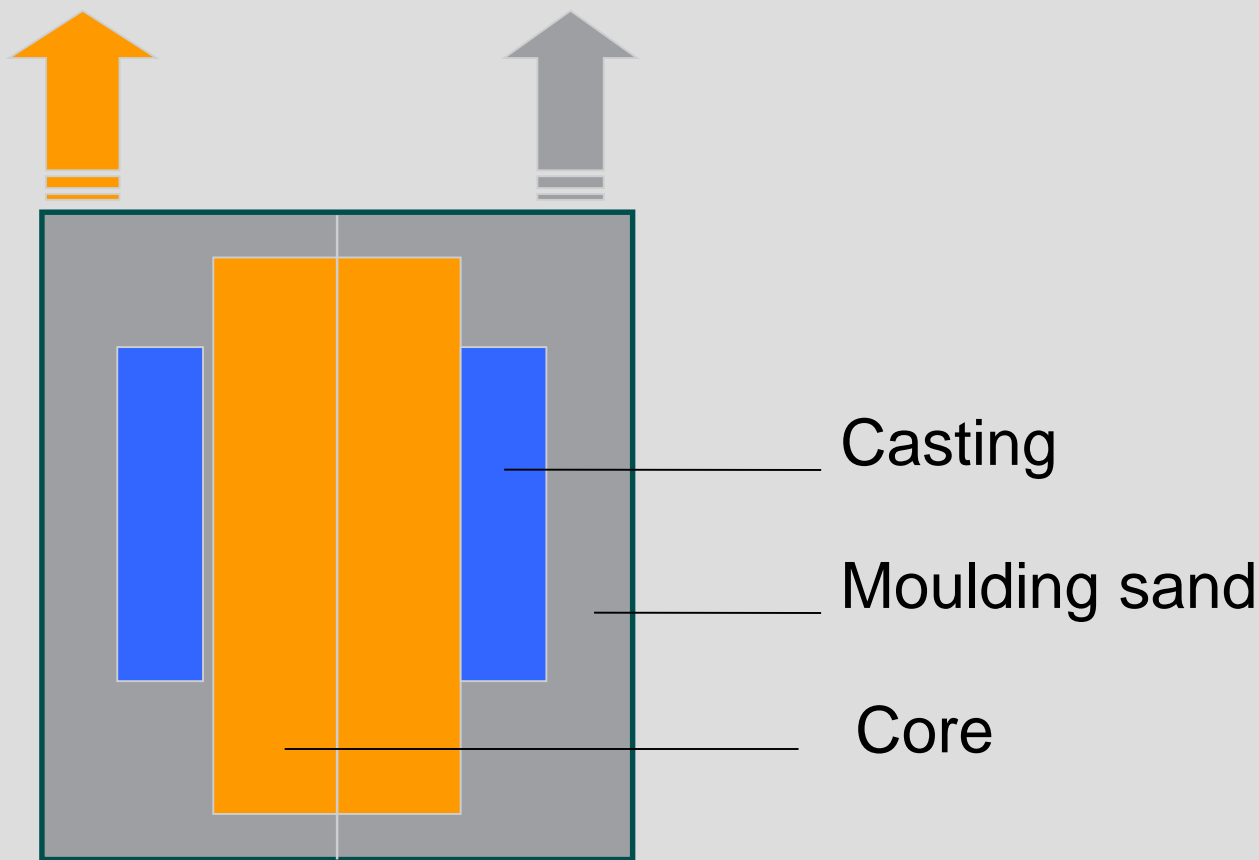
TU Krakow



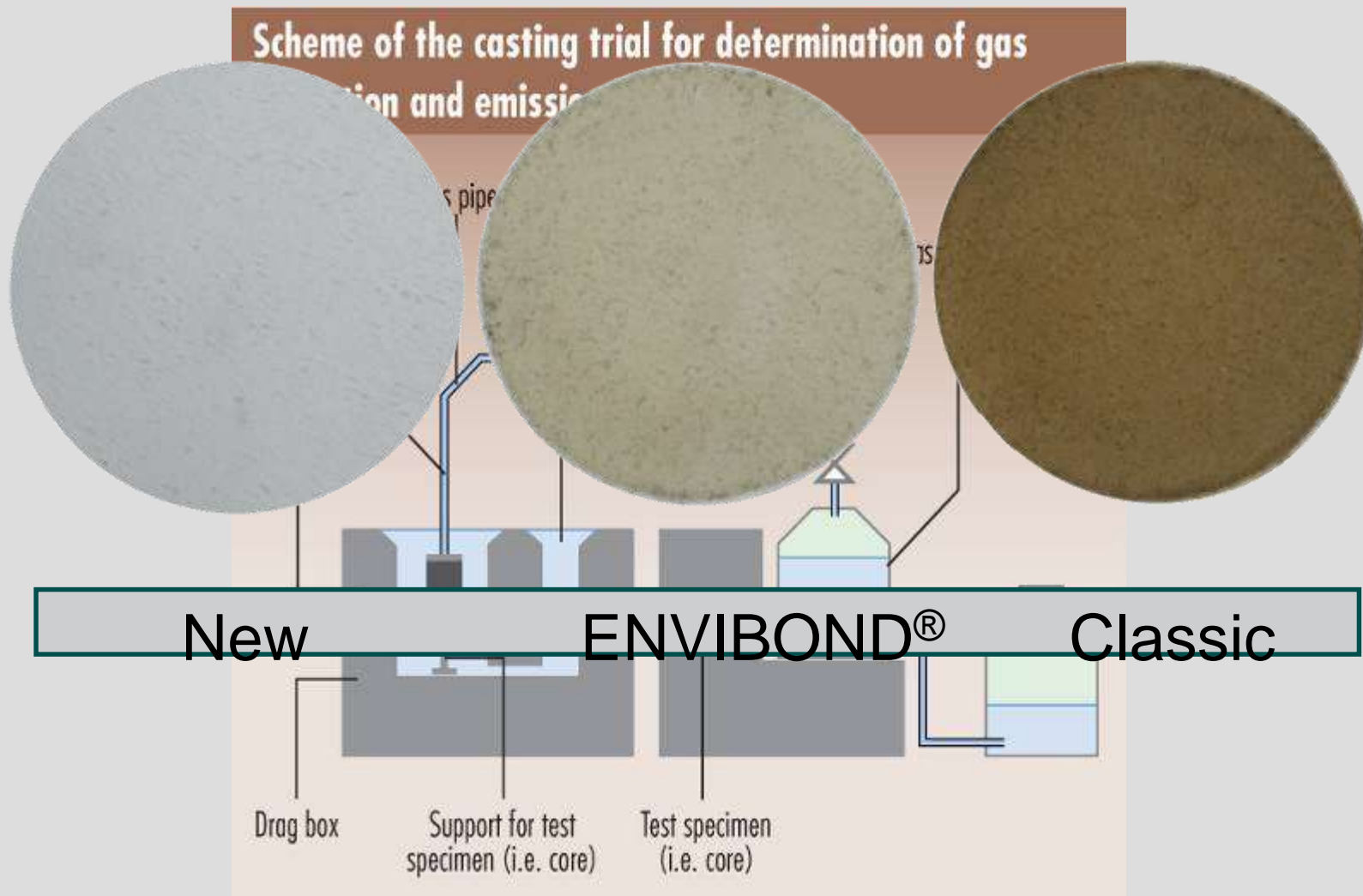
# Sources of Emissions

Emissions from  
core binders and  
additives

Emissions from  
organic moulding  
sand additives



# Practical results



# BENTONITE DIVISION : Philosophy

## M2M principle:

- “The drive is to come closer to the customer in order to better understand his needs and to develop more effective materials, this philosophy helps to achieve the sustainable development of nature’s scarce resources.”



# OUR MISSION

- Being able to respond to your requests for consistent products of high quality for the long term future.
- To understand your foundries process down to the smallest details.
- To ensure just in time deliveries.
- To follow your moulding line by our high services based on data exchanged :
  - Analysis (moulding sand, Sand system)
  - Comments
  - Individual advice (Regular visits/Training/Performance reviews)

Conclusion - To provide to you with the technical assistance required to enable you to achieve high productivity with a low reject rate.

**OUR WISH : TO BECOME YOUR PARTNER BY SUPPLYING  
HIGH QUALITY MOULDING SAND ADDITIVES**





THANK YOU FOR YOUR  
ATTENTION

