



QS-9000    ISO 9001    ISO 14001

# ZIRCINOC<sup>®</sup> INOCULANT



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- *More potent than many other foundry grade inoculants in grey and ductile irons*
- *Applicable over a wide range of foundry conditions*
- *Optimised chemical composition gives unique properties*
- *Fade resistant*
- *Easily soluble even at lower casting temperatures*
- *Suitable for late metal stream applications*

Zircinoc inoculant is a 75% ferrosilicon based alloy containing carefully controlled amounts of the active elements zirconium, calcium and aluminium.

This gives good control of chill in both grey and ductile irons and enhances the formation of a refined graphite morphology. Zircinoc inoculant is particularly effective in medium to high sulphur grey irons and finds extensive application in ductile irons. For grey irons of below 0.035% sulphur, refer to the Elkem brochure 'Foundrisil inoculant'.

Zircinoc inoculant is produced by Elkem who recognised the need for an inoculant which is of medium potency, not likely to promote dross, shrinkage or harmful inclusions and which is easily applied under the majority of casting conditions.

It has long been recognised that the Ca/Zr/Al combination is beneficial to inoculation in irons of high nitrogen potential (such as cupola charges of high steel scrap content) or heavily cored castings. The zirconium has the potential to combine with loose nitrogen dissolved in the iron to form a harmless zirconium nitride inclusion, thus reducing the tendency towards blowholes.

Zircinoc inoculant is produced to the specification:

Si:	73 - 78%
Ca:	2.0 - 2.5%
Zr:	1.3 - 1.8%
Al:	1.0 - 1.5%

## The Production of Zircinoc inoculant

Zircinoc inoculant is made at Elkem plants in Norway. The plants are ISO 9001 certified and ELKEM was the first ferroalloy producer in the world to gain this certification for ferroalloy manufacturing. The emphasis on quality control

ensures that Zircinoc inoculant has uniform chemistry, grain size and performance. Zircinoc inoculant, as most ferro-silicon based alloys, is produced in a submerged arc furnace, the thincast technique applied will ensure a rapid

uniform distribution of the various phases found in the product (see last page of this brochure). This will in turn also guarantee a homogeneous material in the final product, irrespective of the size gradings.

Zircinoc is a registered trademark owned by Elkem ASA.

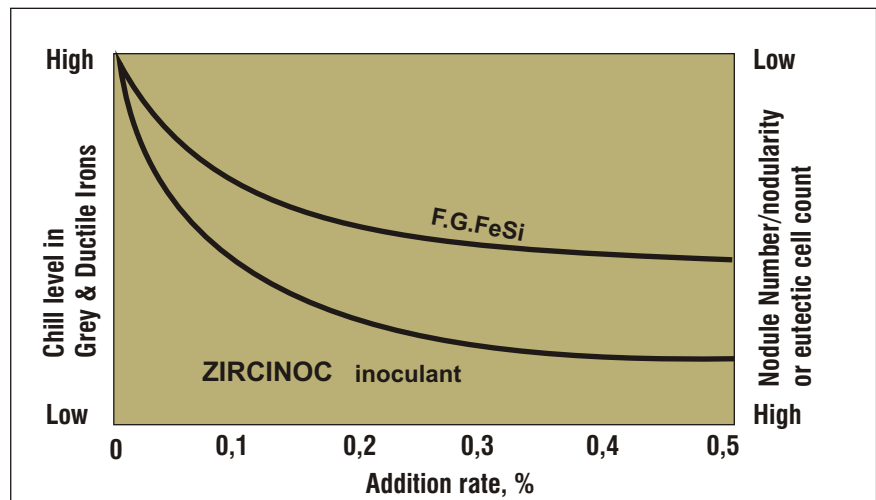
## Advantages of Zircinoc inoculant

### 1. Grey Iron.

Zircinoc inoculant is used in grey cast irons of above 0.035% base sulphur level. When used as a ladle addition, it is effective in minimising the natural chill forming tendencies of the iron and promoting a uniform structure throughout the casting. As the product contains mainly graphitising elements, good graphite growth is promoted.

The same is true of late metal stream additions where a specially graded 0.2 - 0.7mm Zircinoc inoculant is very effective at low addition levels. This is partly due to the crushing and sizing processes used at the plant which ensure that the product has a very low oxygen content and is free from slag or debris which can be present in less well prepared materials. Undersize material is removed to prevent dust, and these careful preparations lead to a rapid dissolution in the cast iron, making Zircinoc inoculant well suited to late stream applications.

This principle holds true for the ladle additions where the tendency to form slag in the ladle is very low compared to high Ca/Ba containing inoculants or F. G. FeSi used in excess. The nature of any small



*The chill removing tendencies of Zircinoc inoculant are illustrated above;*

skimming bar.

### 2. Ductile Iron.

Zircinoc inoculant has been proven to be particularly effective in ductile irons. The carbide stabilizing effects of magnesium added during the nodularisation process means that the iron requires a heavier addition of inoculant than grey iron and thus a clean, ready soluble inoculant is a great advantage, particularly at post nodularisation temperatures.

By creating sites for nucleation within the iron, Zircinoc inoculant

promote a moderately high number of graphite nodules whilst at the same time reducing the chill formation in thinner sections. Creating nodules of a more even size distribution and shape it is possible to obtain significant increases in mechanical properties, an essential feature of most ductile irons.

This makes Zircinoc inoculant well suited to as-cast ferritic ductile irons as well as general engineering castings.

## Special Properties of Zircinoc inoculant

In cast irons of high nitrogen potential, whether from high steel scrap charges, use of coke or from resin bonded cores, Zircinoc inoculant has the unique feature of being able to control at least some of the nitrogen which will dissolve in the cast iron. The only other element able to do this is titanium and the

this element make it's use undesirable.

By creating a harmless zirconium nitride inclusion, the nitrogen is changed from the dangerous dissolved form which may precipitate nitrogen blowholes. This can be further advantageous in

as-cast ductile irons where free nitrogen in the system can stabilise pearlite.

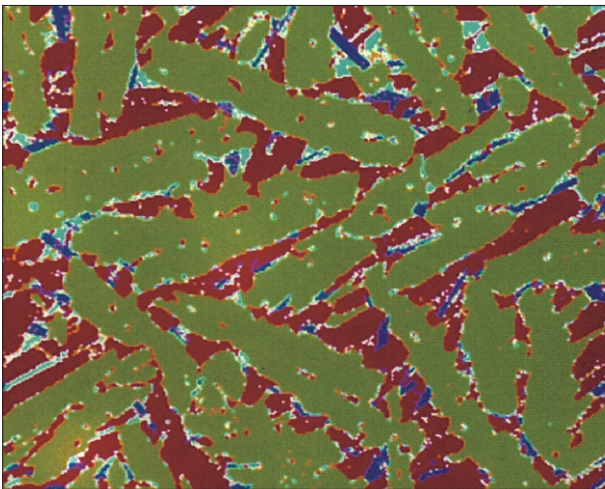
## Foundry Practice with Zircinoc inoculant

As with all inoculants, fade will occur when Zircinoc inoculant is used as a ladle addition. Whilst giving superior fade characteristics compared to F.G.FeSi, it is still recommended that the metal is cast

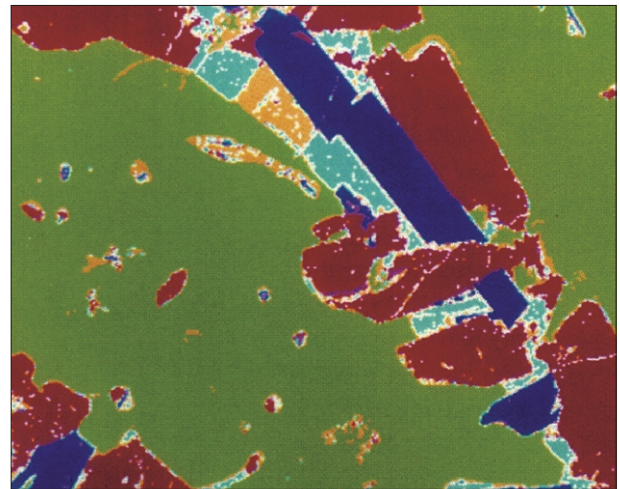
within 10 - 12 minutes after addition. Note that special foundry conditions, such as abnormally high temperatures, may require specialist advice on fade times.

Addition rates of 0.1 - 0.2% would normally be expected in grey irons as a ladle addition, 0.3 - 0.5% in ductile iron. As late stream practice, addition levels less than 0.1% and about 0.15% respectively could be expected to give optimum results.

X 50



X 200



SEM picture of Zircinoc inoculant showing even distribution of phases



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