

An advanced breaker core system with enhanced knock off properties for high pressure moulding applications

Introduction

It is common practice in high pressure greensand moulding, to place feeder sleeves directly on to the pattern plate, an application technique known as ram-up. This technique is normally applied either because the cope mould is inaccessible, or there is insufficient time to insert sleeves after moulding.

The use of high strength, highly exothermic sleeves in ram-up applications has expanded significantly since the late 1980's driven by the continued adoption of high pressure greensand moulding lines and a greater requirement for spot feeding. A particular problem in applications on the latest moulding machines is that the moulding pressure has increased to such an extent that the sleeves and/or breaker cores may be damaged by the moulding operation.

Traditional FEEDEX

Traditionally, shell sand breaker cores are used to provide a reduced contact area at the bottom of the sleeve, and produce a notch that allows the feeder to be knocked off rather than cut off. Problems arise when the moulding pressure damages or breaks the breaker core, or there is insufficient 'footprint' on the casting to be able to apply them. Figure 1 shows a standard FEEDEX sleeve with sand breaker core and Figure 2 shows an application where the breaker core has been damaged, and the effect on the resultant casting.



Figure 1 Feedex with standard silica breaker core

Figure 2 Damaged breaker core produces a casting that will require more effort to clean

Figure 3 shows a situation where the application of a traditional breaker core is made difficult because of the casting geometry. The sleeve is located above a boss, which is smaller than the breaker core itself.

In addition to the likelihood of damage to the breaker core, there is also a high probability of creating a shadow of poorly compacted sand underneath the sleeve. This will lead to a poor quality surface finish or scrapped castings.

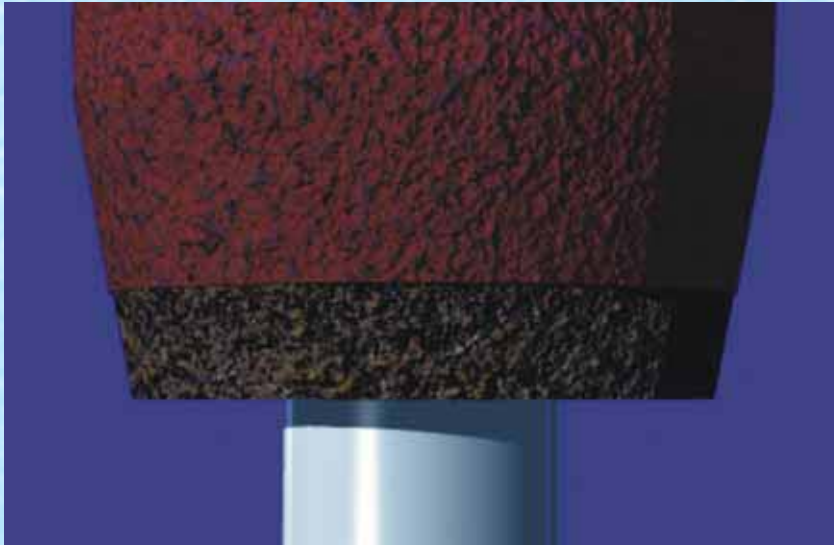


Figure 3 Sleeve located above a boss, which is smaller than the breaker core

In this situation it is possible to use a FEEDEX VS sleeve (figure 4) with locator core, positioned on a spring pin. However, there are some applications where the moulding pressure is still sufficient to damage or break the locator core.

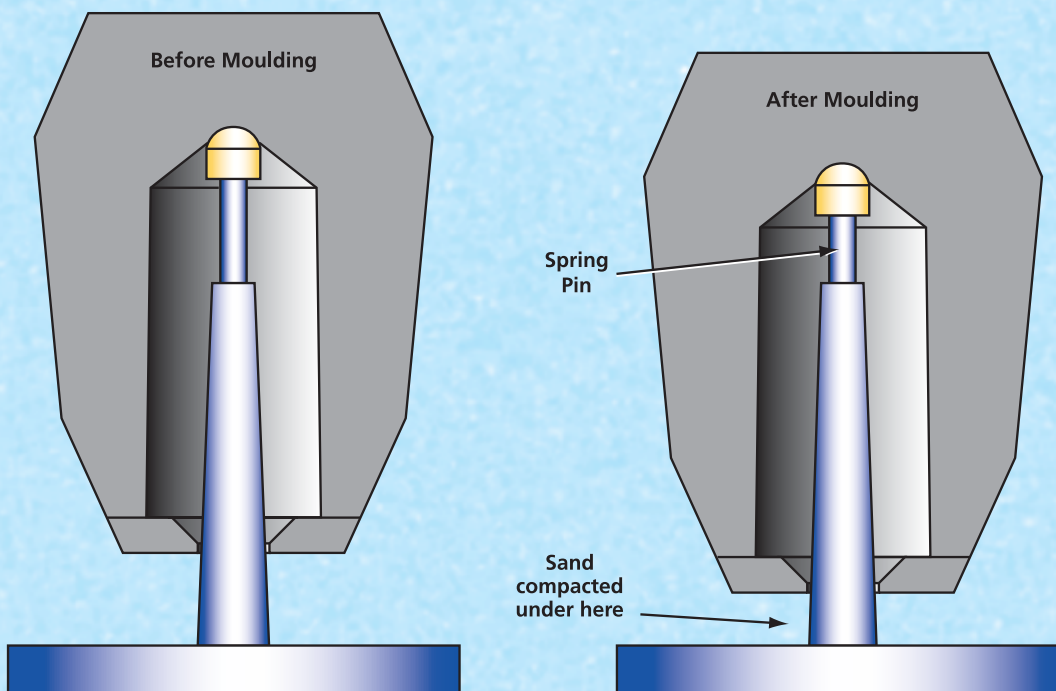


Figure 4 FEEDEX 'VS' system

FEEDEX K

Figure 5 shows a new product, FEEDEX K, which has been developed specifically to address such highly demanding applications

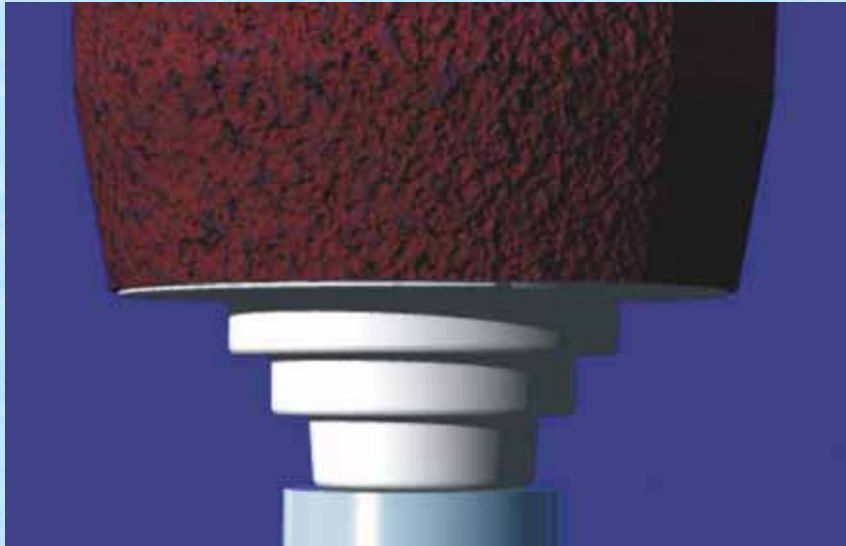


Figure 5 FEEDEX K sleeve on a small diameter boss

FEEDEX K employs a compressible metal breaker core that sits directly on the pattern plate, located on a fixed metal pin. The fixed pin is simple and cheap to manufacture, and is maintenance free.

During the ram up process, moulding sand flows around the core base and below the sleeve. As moulding pressure is applied, the core is designed to collapse down, gripping the sand and compacting it against the pattern plate (figure 6).

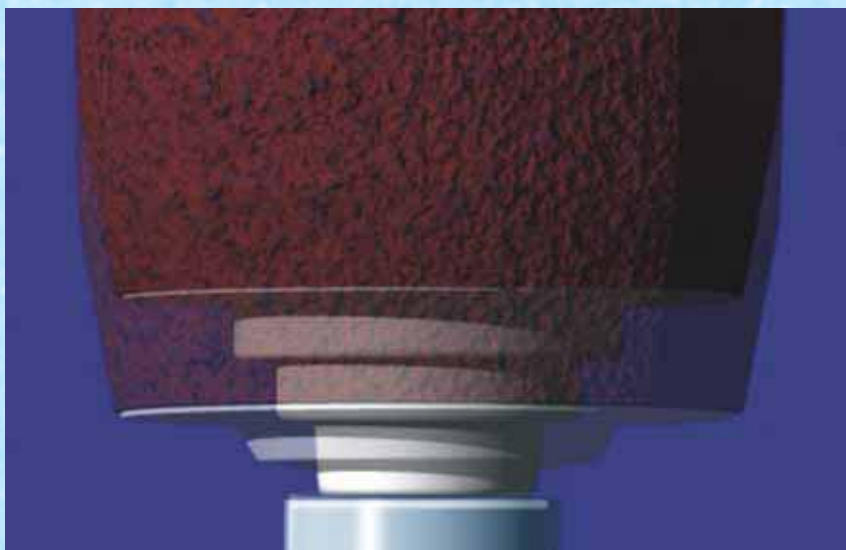


Figure 6 Compressible metal breaker core collapsing down

This action has two benefits, firstly to create a well compacted layer of sand that will give a good casting surface finish. Secondly to act as a cushion that decelerates the sleeve gently, absorbing the moulding pressure and protecting it against breakage.

FEDEX K can thus be used in applications where sleeves and breaker cores are prone to damage due to high moulding pressures and where there is a limited contact area (footprint) available on the casting surface.

The pin is designed to break through the top of the sleeve during moulding to accommodate the sleeve movement (figure 7).

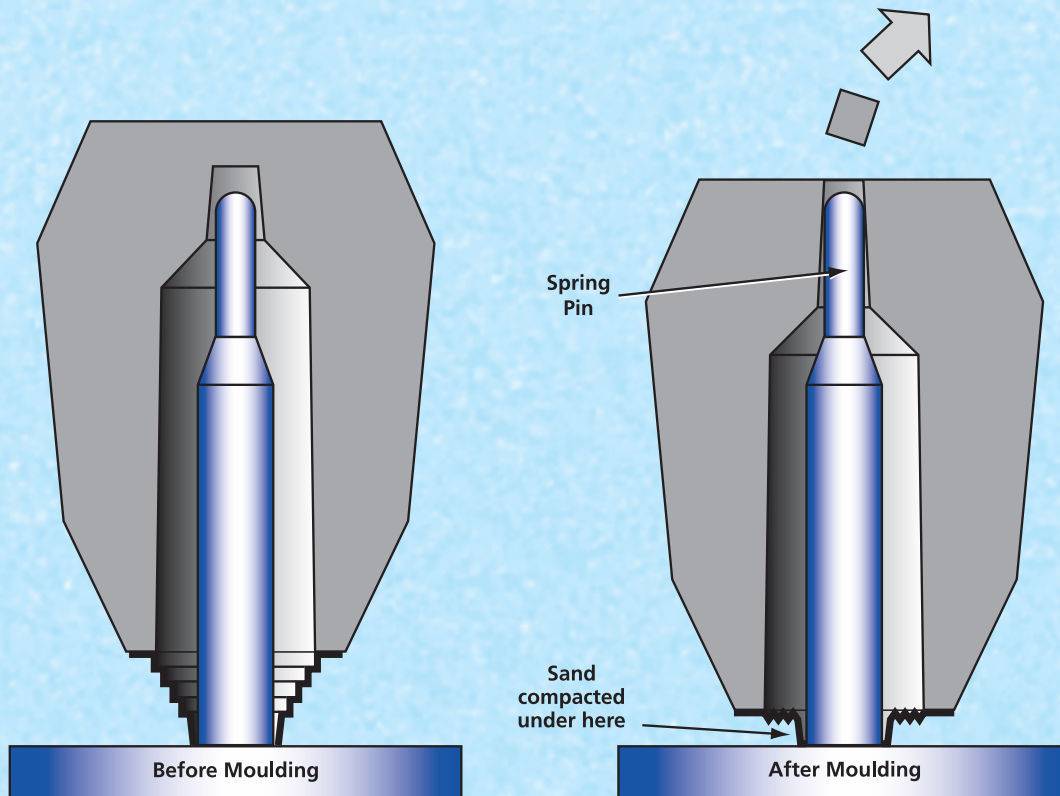


Figure 7 FEDEX K system

After ram up the only visible area of the core is a small flange immediately above the casting surface. This flange ensures that the core does not damage the pattern plate and also helps to initiate the fracture during knock off.

Figure 8 shows the minimal footprint area of the core on the casting. This allows application to castings or isolated sections that would otherwise be impossible to spot-feed using conventional sleeve and breaker core combinations.

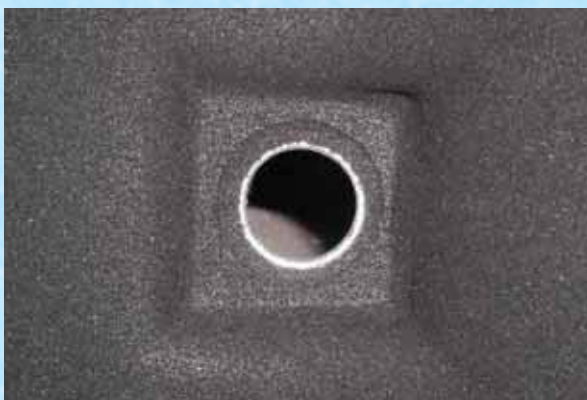


Figure 8 Core footprint

An additional advantage of the FEEDEX K concept is that unlike some competitive products there is no exothermic material in contact with the casting surface. This significantly reduces the risk of localised graphite degeneration and poor casting surface finish.

The typical Ductile Iron microstructure of a cross section through a FEEDEX K is shown in Figure 9. This confirms a good graphite structure right up to the boundary with the core.

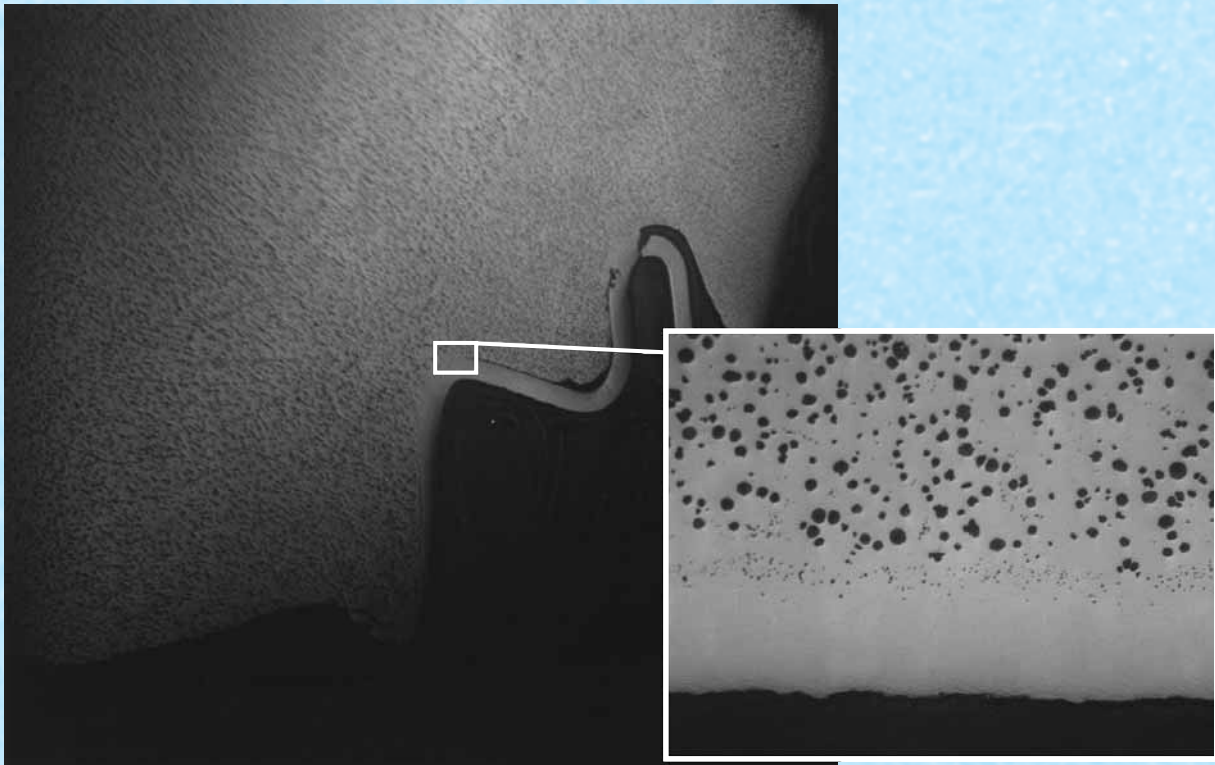
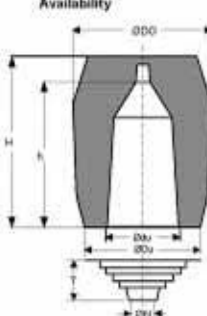


Figure 9 FEEDEX K has no significant effect on graphite structure

FEEDEX K sleeves are produced using the proven FEEDEX HD formulation, a high strength, highly exothermic material, the significant benefits of which are already well known to Foundrymen.

A range of sleeves is available with sleeve modulus ranging from 1.4 cm to 3.1cm
 More detailed information can be found by referring to the relevant product
 datasheet (figure 10).



Availability

Type	Mod (cm)
VSK 78/93	1
VSK 100/93	1
VSK 134/93	2
VSK 179/93	2
VSK 240/93	2
VSK 283/93	3


Ordering Instructions
 When ordering please specify FEEDEX* K - Feeder e.g. HD1 VSK 134/3

Locating Pins

Type
DZ VSK 78/93
DZ VSK 100/93
DZ VSK 134/93
DZ VSK 179/93
DZ VSK 240/93
DZ VSK 283/93

Locating Pins for FE Material. Tool Steel Dimensions in (mm)

Locating Pins of the Sleeves (see Table of the sleeve, ensure



Date: March 2006 Feeding Systems Product DataSheet

FEEDEX^{*}

K

Highly Exothermic Thin Walled Feeder Sleeves with Profiled Steel Breaker Core

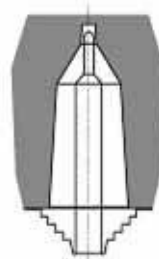
Application & Properties FEEDEX* K are self-containing exothermic feeder sleeves. They are ideally suited to high pressure, automatic greensand moulding lines, and are easily applied in conjunction with the appropriate locating pin.

FEEDEX* K sleeves are supplied with a specially designed steel breaker core, which allows spot feeding application to even the smallest casting contact areas. The core is designed to collapse, either partially or fully, during the moulding operation. This ensures excellent compaction of the sand and also reduces the moulding impact applied to the sleeve. Furthermore, the optimised neck design gives a clean and consistent knock-off, requiring little or no additional cleaning.

FEEDEX* is a low fluoride, highly exothermic and high compressive strength material, suitable for the production of all types of high quality iron castings.

The novel design of these reverse taper feeder sleeves has been developed with the aid of advanced simulation techniques.

- The thicker wall section in the upper (cap) part of the sleeve, produces an optimum superheat of the feeder metal furthest away from the casting
- The thinner wall section toward the base of the sleeve, is so designed to compensate for the thermal potential of the casting
- The chamfer on the cap of the sleeve reduces the mechanical impact on the unit during moulding, but has negligible influence upon the thermal modulus of the sleeve.



Storage Store all exothermic sleeves under dry conditions.

Health and Safety See Material Safety Data Sheet, copies of which are available on request.

Foseco (FB) Limited, Tamworth, Staffordshire, B78 3TL
 Tel: +44 (0)1827 250999 - Fax: +44 (0)1827 250995 - www.foseco.co.uk

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Figure 10 FEEDEX K datasheet

The thin steel plate used to produce the core superheats rapidly during the filling of the feeder and has been shown to have no significant impact on feed performance. The compressible core can be safely remelted with other feeder returns.

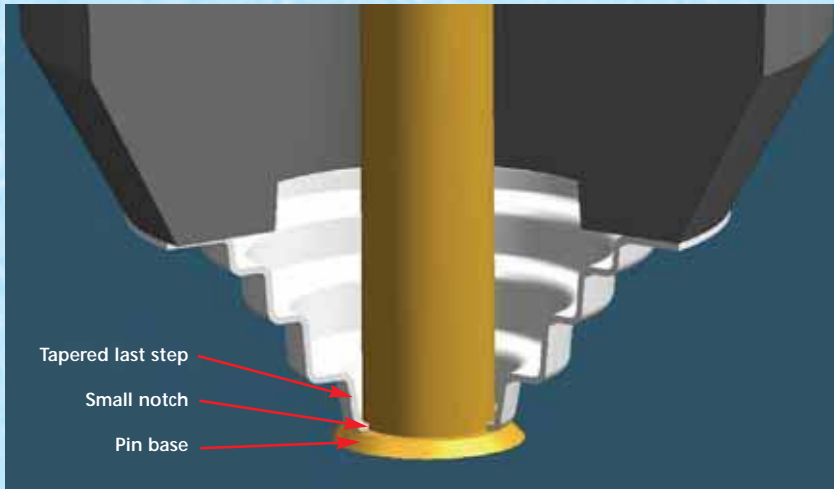


Figure 11 Increasing section of the riser neck

The small contact area between the base of the FEEDER K and the casting makes knock off easy, indeed it is sometimes the case that feeders become detached during shakeout or cooling.

The increasing section thickness of the riser neck (figure 11) ensures that the break off point is always at the base of the neck. Knock off is consistent and close to the casting surface, and frequently requiring no further cleaning (figures 12 and 13)

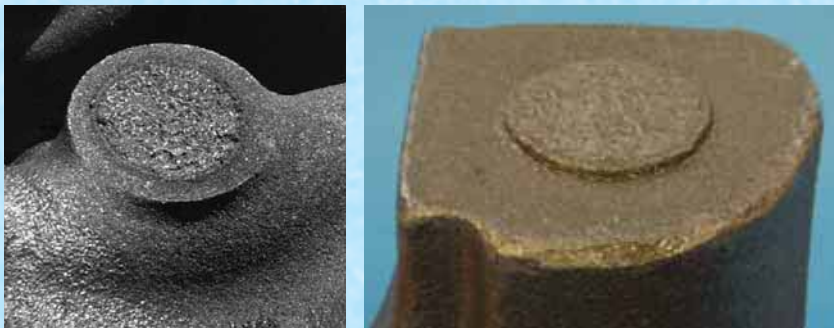


Figure 12 and 13 Examples of excellent 'knock-off' achieved using FEEDER K

Summary

The key benefits of FEEDER K are as follows;

- Gives good knock off close to the casting surface
- Has an extremely small footprint on the pattern
- Produces excellent sand compaction beneath the feeder
- Eliminates the need for spring pins
- Protects the sleeve from damage in even the highest pressure moulding applications

FEEDER K is a versatile product, which complements the already extensive range of FEEDER sleeves. It provides the Foundryman with a range of unique benefits, which help to reduce production costs and improve casting quality.

FEEDER K patents applied for.