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# Sustainable Success with Innovations



**ASK**CHEMICALS  
We advance your casting





# ASK Chemicals – Sustainable Success with Systematic Innovations

Today, high-quality foundry products are the key to a more ecological and economical use of resources. Thanks to innovative casting methods, it is now possible to produce engine blocks, cylinder heads and hydraulic components using light alloy, which saves weight and thereby makes a significant contribution to reducing environmental pollution.

The manufacturing processes in the foundries themselves, however, are often still very energy-intensive and frequently release a considerable amount of emissions. This is why ASK Chemicals continues to develop new and optimized products and methods that help to significantly improve the ecology and economy of the foundry processes.

This booklet provides an overview of current product developments at ASK Chemicals and their applications, focusing on the following topics:

- INOTEC™ – The fourth generation of inorganic binders
- ECOCURE™ SL – The new cold box binding agent
- EXACTCAST™ OPTIMA – The new generation of risers
- ISOSEAL™ 2011 – Efficient sand additive with dual effect
- ECOPART™ 756 – Environmentally friendly release agent for core and mold manufacture
- Comprehensive simulation methods for sustainable casting
- MAGNASET™ – A new generation of furan resins

**Let yourself be inspired by the diverse possibilities!**



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## INOTEC™<sub>–</sub> The Fourth Generation

With the development of the 4<sup>th</sup> INOTEC™ generation for light metal casting and the new TC 4000 and WJ 4000 product lines, research in the area of inorganic binders has reached its current high.

The use of the 4<sup>th</sup> generation of binders introduces further benefits to complement the advantages that have already been achieved through the use of the INOTEC™ system. These include odorless core production, odor-reduced casting, significantly less cleaning of machines and tools and the resulting higher output quantity and productivity, as well as advantages in terms of casting (faster solidification enabled by lowering ingot mold temperatures).

With the newly developed INOTEC™ TC 4000 promoter, even areas that are highly susceptible to penetration (e.g. the gate region) can be achieved in a process-consistent manner and without additional coating of the cores. This system is 100% inorganic and leaves no condensate deposits in the casting tools at all. In addition, there is no formation of smoke during the casting process. Cast pieces that were produced using conventional methods, such as cold box, exhibited a significantly inferior surface in comparison, which means that INOTEC™ is much more than just an alternative. Removing the cores of cast pieces is often quite a challenge in the area of water jackets, especially if the core removal system has only a few degrees of freedom. The development of a special promoter significantly improved this process. With the INOTEC™ WJ 4000 promoter, even complex and filigree water jacket cores can be produced and removed safely from the component after casting.

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## **ECOCURE™ SL – New Solventless System for Aluminum Casting**

**Due to the numerous factors involved, it is impossible to predict the emissions during the casting, cooling and shake-out process.**

A general rule of thumb says that part of the organic material is burned, while the other part is decomposed and converted by pyrolysis. Extremely harmful emissions, such as benzene, toluol, xylene (BTX), nitrogen oxide (NOx) or other hazardous air pollutants (HAPs) can develop during this thermal decomposition. The remaining binding agent is converted to tar or coal that can condense again in the sand or on the surface of the chill molds (ingot mold, die-casting mold).

The new solventless technology for binding agents contains VOC-free solvents that use high-quality chemicals with narrow distillation cuts. In the formulations of the latest generation, the known plant esters are replaced by these solvents and offer users the unique possibility of reducing a part of the emissions.

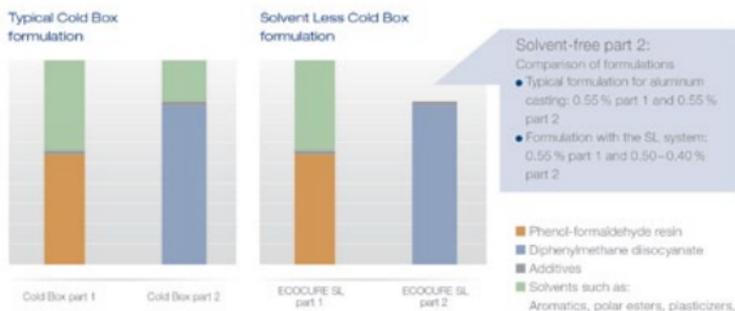
While conducting fundamental investigations, the ASK Chemicals research team came to the conclusion that maintaining the highest possible ratio of oxygen to the organic material is the only way to significantly reduce emissions during the casting, cooling and shake-out process.

The oxygen content in the casting and molding systems is mainly determined by the configuration of the casting and compression molding process. Reducing the organic material content is thus the only way for the binding agent developers to influence this ratio.

# Solvent Less

A standard cold box system can be described as a three-part system: Component 1 is comprised of around 55% phenolic resin and 45% solvents, component 2 is mainly comprised of polyisocyanate derivatives and 15% to 30% solvents. The tertiary amine catalyst, which initiates the reaction, forms component 3. Both component 1 and component 2 of the binding agent can contain special additives that are used to optimize special features or casting properties.

The polyurethane reaction, which gave the cold box PU process its name, consists of phenolic hydroxyl groups in component 1, which react with the NCO (isocyanate groups) in component 2.



The solvents and additives are thus not components of the basic chemical structure in this process. In the new low-solvent system (SL system), component 2 was specifically designed to be just as effective as a normal 2-component system, but without using solvents.



The solvent-free formulation for component 2, which has been registered for patenting, contains a special polyisocyanate component. In addition, selected additives that interact exactly with the adapted component 1 were added. This unique combination makes it possible to achieve a reduction of up to 20% of the total amount of binding agents.

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Ultimately, the new SL system reduces the organic material content as compared to conventional solvent systems with high-boiling esters. This means that more polymers are burned during the casting process and that pyrolysis products are reduced.

### **Improved performance features**

The general stability profile is higher than that of ordinary cold box systems. Moreover, the resistance to moisture was optimized without affecting the lifespan of the sand. If there are numerous core geometries, it is also possible to reduce the amount of amine or the cycle time. These properties are important for meeting the current requirements of foundries with regard to the continually growing demand for new casting mold designs and the increasingly demanding customer requirements.

Furthermore, the SL system exhibits an outstanding core removal capability. It is absolutely comprehensible that it is possible to have more energy available for breaking up the bonds between binding agents with less organic material and the same amount of oxygen during casting. This additional advantage was confirmed in test castings, while maintaining excellent accuracy of shape at the same time.

So far, the SL system is being recommended for aluminum casting in particular. At present, the R&D teams at ASK Chemicals are already working intensively on transferring the technology to iron casting.

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## High-Performance Feeding Technology with EXACTCAST™ OPTIMA



Over the years, risers for use in foundries have seen many significant improvements. However, an efficient combination of existing technologies has been achieved only in the most recent developments. A completely new generation of risers has thus emerged.

EXACTCAST™ OPTIMA by ASK Chemicals offers all the advantages of the successful click-clack riser with a loose integrated metal grommet. The break edge technology helps to reduce cleaning costs and enables a very small attachment area in order to position the riser on complicated casting geometries. The use of loose integrated metal grommets makes the riser extremely easy to handle for the foundry employees.

In addition, the volume can be varied in several ways, which ensures numerous application options. And, last but not least, the production method and the sealing lid contribute greatly to reducing the overall cost of the riser system considerably, while offering the advantage of light risers with high process reliability and efficient feeding as part of the casting process at the same time.

A strong combination that is both efficient and attractive for foundries.



EXACTCAST™ OPTIMA by ASK Chemicals – the combination of three successful patents.

## Technology for sustainability and good health

The fluorine-free version of the EXACTCAST™ OPTIMA contributes especially to sustainable production. Besides reducing surface defects and graphite degeneration, the lower disposal costs incurred also enable large savings. The use of fluorine-free risers also significantly reduces the fluorine content in the return and waste sand, so that its disposal at a waste disposal site without extensive additional costs is acceptable. A further positive effect: Since carcinogenic fibers are avoided, there are no harmful substances in the work environment of the foundry employees.

All in all, the application of high-tech fluorine-free risers achieves enormous economic advantages and efficient progress in terms of sustainable production at the same time.

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## Reduced Veining and Clean Casting Surfaces Even Without Fireproof Coating

The use of sand additives for inhibiting veining defects is very common in the area of cold box application. Sand additives in combination with fireproof coatings that improve the surface quality and reduce or prevent penetration of the metal are usually used for this purpose. This common practice enables high-quality cast parts to be produced, with the known disadvantage of a greater amount of effort in the process chain.

ASK Chemicals has now developed a new product that combines the positive effects of additives and coatings in a single product. ISOSEAL™ 2011 mainly consists of low-density alumina silicate ceramics (LDASC) and a small quantity of flux. The tests conducted have shown in a reproducible manner that this material possesses unique expansion and shrinkage properties that, on the one hand, prevent veining and, on the other hand, result in outstanding surfaces of the cast parts, even when uncoated (Fig. 1).





A series of cast parts for the automotive industry, such as brake disks, brake cylinders and steering knuckles, were produced without coating

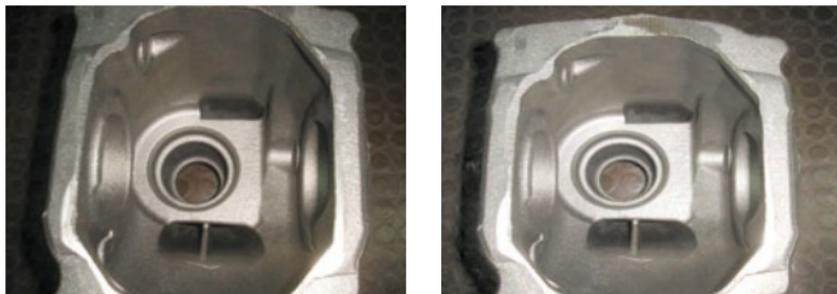


Fig. 2: Differential housing: Comparison between a coated core with no additive (left image) and the new ESA 2011 additive, uncoated (right image).

the cores and the results were good (Fig. 2). Thus, both qualitative and economic reasons advocate its use. In this way, ISOSEAL™ 2011 provides foundries with key technical and economic competitive advantages.

“With efficient new developments such as these, we are helping our customers safeguard their production in the long term, both ecologically and economically,” commented Ismail Yilmaz, product manager for additives, explaining this research success.

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## Specific Release Agents Increase Productivity in Core Manufacture



The use of specific release agents designed for use in core and mold manufacture increases product quality and productivity in foundries. With the new ECOPART™ 756 release agent, which has been specially developed for use in gas curing processes, ASK Chemicals is providing another efficient element for this process.

The ECOPART™ 756 release agent, which consists of special silicones and additives dissolved in hydrocarbons, is suitable for all gas curing processes. However, the material's efficiency is most noticeable in the cold box method.

This is particularly the case for the production of complicated cores whose contours tend towards strong application at the point of entry. The material's special composition significantly reduces the amount of cleaning needed for the core boxes. In addition, the release agent has a long lifespan and therefore reduces frequent application cycles. It is flexible in that it can be applied by brush, cloth or spraying device, depending on the equipment of the core-molding plant.

Production delays can be avoided due to an extremely short flash-off time. The core boxes are immediately available for further use.

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Through the combination of these advantages, ECOPART™ 756 verifiably achieves a significant productivity increase in core molding.

The new release agent also affects the surface quality of the cores, because the build-up of resin and sand – especially under the point of entry – is significantly delayed, which optimizes the quality of the cast products.



ECOPART™ has a high releasing effect, a long lifespan on the core box as well as box-cleaning properties, without having a negative effect on the core surface.

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## Sustainable Casting through Simulation

ASK Chemicals offers not only a diverse product portfolio but also extensive expertise in the simulation of casting processes. Applying casting process simulation at an early time contributes significantly to sustainability in foundries. Ultra-modern casting process simulations generate the modeling and adjustment of dynamic processes, and efficient changes to them, both in the planning stage and during operation directly on-screen.

This is where the simulation area of ASK Chemicals comes in. It is designed for all process-oriented foundries and delivers tailored concepts that provide ecological and economic solutions for foundries. Using state-of-the-art computer technology, the application technology analyzes and simulates processes such as core shooting, core gassing and dehydration, along with mold filling and solidification in the organic manufacturing method for the customer.

The shooting, hardening and water ejection in the new inorganic core production methods is also simulated by computer at ASK Chemicals. The deep understanding of foundry processes that ASK Chemicals has offers a wealth of advantages.

From now on, the geometries and physical data of the ASK Chemicals riser systems can also be included in simulations with the new 5.2 version of the Magma-Soft simulation software.

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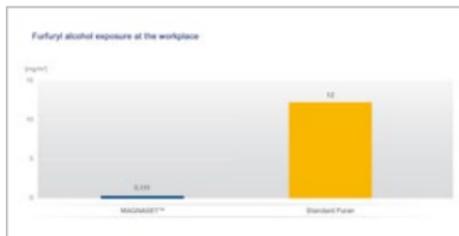
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## MAGNASET™ –

# A New Generation of Furan Resins

Furan resins with a furfuryl alcohol content of over 25% (as a monomer) are classified as toxic according to the CLP Regulation, which is valid throughout the EU. This has significant consequences for warehousing and the handling of these products. We are thus left with the choice of either continuing to work with standard furan resins or switching to alternative systems.

ASK Chemicals has succeeded in developing a new generation of furan resins, whose performance is largely comparable to that of standard furan resins, and that avoids the risks of a system conversion right from the start. MAGNASET™ binders are not toxic, they lower furfuryl alcohol emissions at the workplace, have very good sand-related properties and produce excellent casting surfaces. Similar to standard furan resins, the area of application is determined by the composition and the chemical characteristics.



MAGNASET™ prevents high emissions at the workplace

Ultimately, the new resin qualities with less than 25% furfuryl alcohol as a monomer can be adapted to existing processing parameters fairly straightforwardly and used without making changes to the furan resin technology.

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