



The FOSECO Pro Module for MAGMASOFT®

FOSECO and MAGMASOFT®, both leaders in their respective markets, formed a strategic alliance in December 2002. The aim of the alliance is to provide our global foundry customers with an improved range of quality products and service offerings.

Under the agreement, FOSECO will, through the exclusive use of MAGMASOFT® worldwide, meet increasing customer demand for simulation support.

MAGMA will develop and support special software modules that will enable MAGMA users to more accurately model FOSECO products, thus helping to optimise the casting process initially through gating and risering system design.

Introduction

The Foseco Pro Module is a parametric 3D library of FOSECO sleeve and filter products, combined with a proprietary database of sleeve material thermo-physical datasets and filter pressure drop data. The FOSECO Pro module supports the foundryman in his engineering work using casting process simulation with MAGMASOFT® for a best practice of gating and risering of castings.

Modelling of FOSECO products in 3D has been fully integrated into the MAGMASOFT® solid modeller programme. The FOSECO Pro Module interfaces are accessed through new entries on the database menu in the MAGMASOFT® solid modeller namely, "FOSECO Sleeve Database" and "FOSECO Filter Database".



Figure 1

Key functionality

With the new integrated functionality, modelling of FOSECO sleeve and filter products in MAGMASOFT® has been greatly simplified. By selecting the relevant database in the MAGMASOFT® pre-processor, the user can navigate a library of FOSECO Products, or use the search function to list only sleeves of a required size or modulus. Options tabs offer the flexibility to attach various optional breaker cores types, to specify filter types within a direct pouring unit or to include hot topping on an open riser. Once a user confirms their selection of sleeve or filter, it is rendered as a 3D model automatically. Because the models are fully parametric, the user can easily edit his selection or change the size or configuration of the product selected.

Modelling thermal behaviour

A further important advantage with the FOSECO Pro Module is the automatic default assignment of product properties. Once the sleeve and/or filter geometry is created in the pre-processor, the appropriate sleeve material data and filter pressure drop data are automatically assigned to their respective geometries. Using the FOSECO Pro Module, the user no longer has to individually input the product definitions during the simulation setup for sleeves and filters. By automating this step of the simulation setup, the user is assured that the FOSECO sleeves thermal dataset have been correctly assigned and that the appropriate pressure drop characteristics have been applied to the filters.

The FOSECO Pro Module's combined functionality of 3D library and automatic thermal data assignment enables the user to accurately represent the precise geometry as well as modelling the specific product performance characteristics for FOSECO feeding and filtration system products. Correct use of MAGMASOFT® and the FOSECO Pro Module will ensure that the user is accurately and confidently modelling the performance of specific FOSECO products.

FOSECO Pro Module sleeve interface

The FOSECO product library is sorted into product groups depending on their suitability for application in Steel, Iron or Aluminum. Once the alloy type has been selected, a list of products and their available sizes appears.

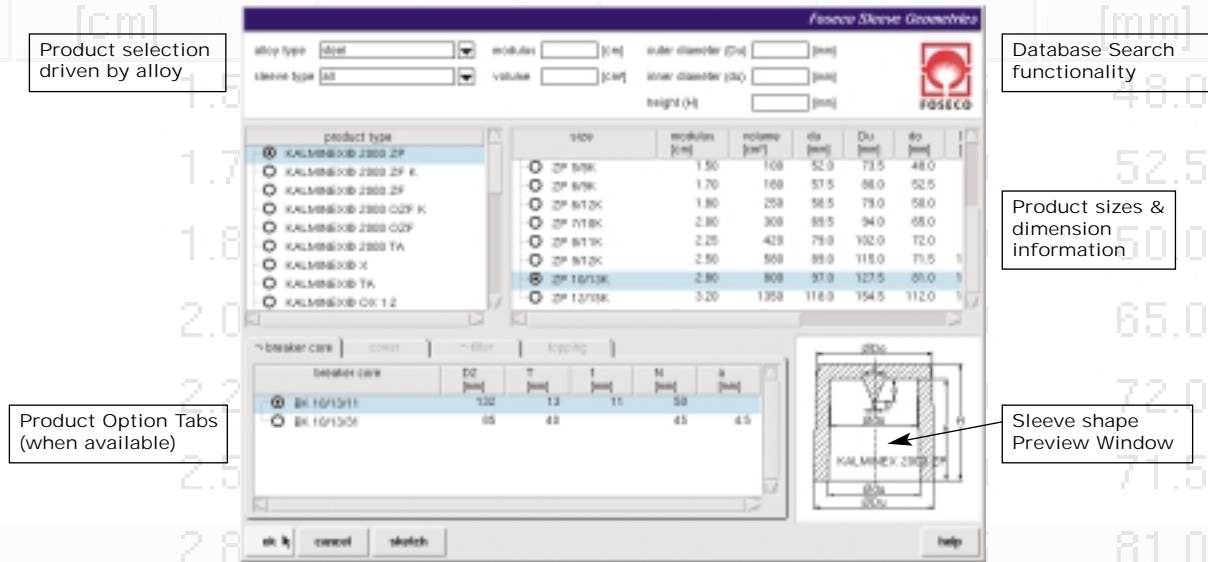


Figure 2 Sleeve Interface in pre-processor

When the final sleeve configuration has been confirmed, the sleeve is modelled as a parametric macro, combining all the chosen sleeve elements, (sleeve, feeder metal, breaker core, breaker core metal, filter etc), directly in the MAGMASOFT® pre-processor.

Thermo-physical properties and Heat Transfer Coefficients (HTC)

The thermo-physical properties of the feeding system products used in the FOSECO Pro Module were developed by direct laboratory analysis. Individual tests were run to establish the temperature dependent properties of each sleeve recipe type. These datasets are important to accurately describe how heat is generated by, and how heat is conducted through the sleeve. This data is automatically assigned to the sleeve geometry in the simulation setup.

Included as part of the FOSECO database are heat transfer coefficient data specific to FOSECO feeding systems products. These datasets are important to accurately describe the heat transfer between metal and sleeve, and between sleeve and mould. Although these are not automatically assigned to FOSECO products in the simulation setup, this functionality, similar to the material property assignment, will be added in a future release.

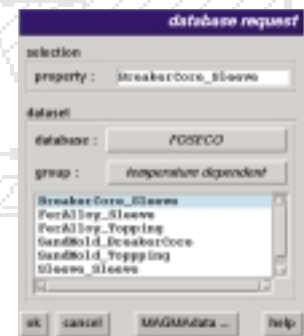


Figure 3 HTCs

alloy type modulus [c
 sleeve type volume [c

FOSECO has conducted extensive tests to ensure the thermal datasets in MAGMASOFT® accurately model the thermal behaviour of the sleeves in the mould. Both predicted Feeding results and thermocouple measurements have been compared to actual castings, and these have been shown to be consistently accurate.

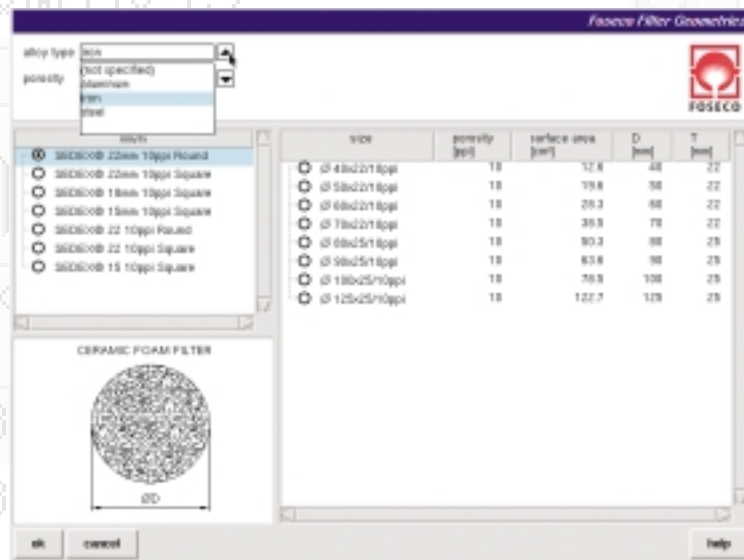
The combination of MAGMASOFT®'s first-principles based analysis and the accuracy of the FOSECO material data, allows for realistic modelling of casting cooling. By improving the prediction of heat transfer from the metal, through the sleeve and into the mould, the software accurately models the solidification of the casting.

Regional database development

At present, sleeve and thermal performance databases already exist for products available in North American and European markets. The intention at FOSECO is to eventually provide region specific databases for all market areas. This work will continue during 2005, with the development of several additional regional databases planned.

FOSECO Pro Module Filter interface

The Filter interface is similar in style to the sleeve database. The development of additional features and functionality is currently in the planning stages. Available filter types are displayed depending on their suitability for the selected alloy.



Product selection driven by alloy

Product sizes & dimension information

Filter type Preview Window

Figure 4 Filter Interface

Once the filter selection has been confirmed, it is modelled as a parametric macro in the MAGMASOFT® pre-processor. The filter pressure drop data is automatically assigned to the filter modelled. If the user decides to rotate the filter from its default position, the programme automatically detects the new orientation and adjusts the 'filter direction' parameter accordingly, relieving the user from having to check and modify that parameter.



outer diameter (Du) [mm]

inner diameter (du) [mm]

height (h) [mm]

Filter flow data development

The filter data provided in the FOSECO Pro Module was derived by direct testing of FOSECO filtration products. As part of the validation of the data, MAGMASOFT® fluid flow predictions have been compared to the X-ray filling of actual castings. Several technical papers have been written to show the excellent agreement between the predictions and reality.

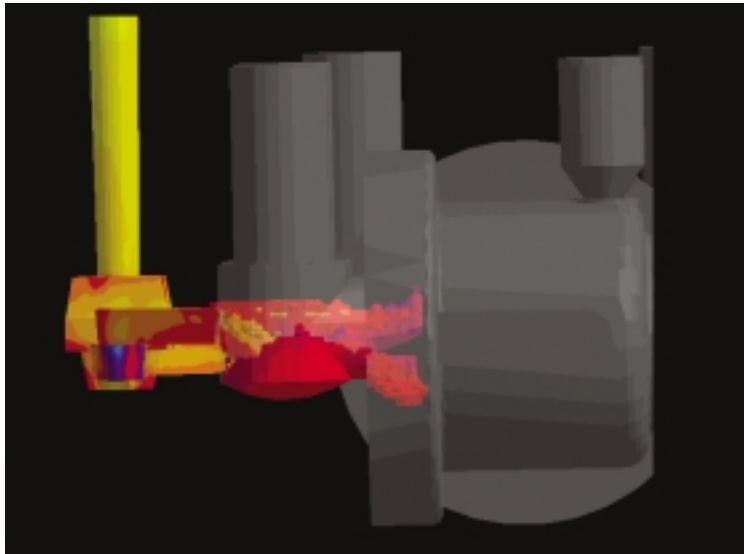


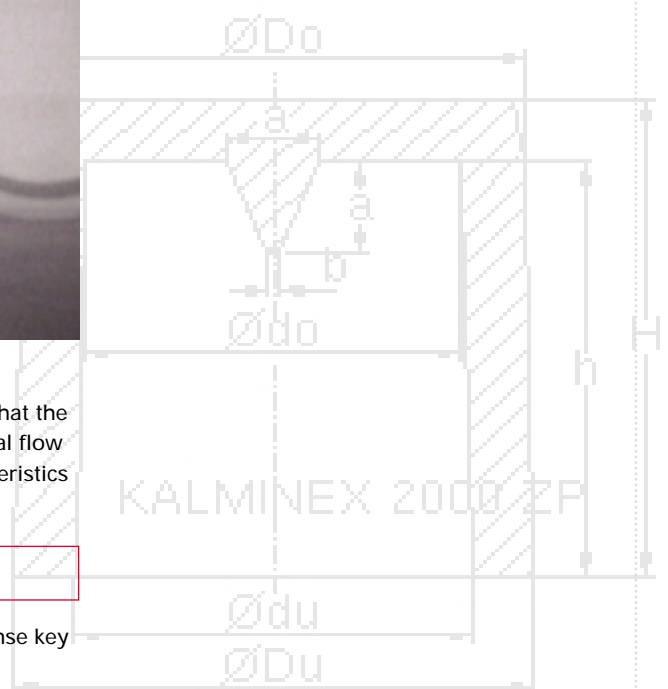
Figure 5 Filling simulation, X-ray comparison

When using the FOSECO Pro Module, the user can be confident that the programme will accurately predict the casting fill time and internal flow characteristics by accurately modelling the pressure drop characteristics of the filtration system.

Accessing the FOSECO Pro Module

Access to the FOSECO Pro Module is controlled via a special license key in MAGMASOFT®. Please contact your local FOSECO Sales Representative for more information.

	Du [mm]	do [mm]	
0	73.5	48.0	
5	80.0	52.5	
5	79.0	50.0	
5	94.0	65.0	
0	102.0	72.0	
0	115.0	71.5	1
0	127.5	81.0	1
0	154.5	112.0	1





alloy type

steel

modulus

sleeve type

all

volume

Summary

The FOSECO Pro Module is a special module exclusively for the MAGMASOFT® casting process simulation programme, accessible only via a special MAGMA license key. The main features of this software, jointly developed by FOSECO and MAGMA, include:

- ❑ Special FOSECO interfaces embedded in the MAGMASOFT® Pre-processor.
- ❑ Parametric 3D libraries of standard FOSECO feeding system and filtration products, by region.
- ❑ "One-click" product selection and definition.
- ❑ FOSECO sleeve material thermo-physical database
- ❑ FOSECO filter pressure drop datasets.
- ❑ Database of heat transfer coefficients specific to FOSECO feeding system products.
- ❑ Sleeve material and Filter properties are automatically assigned simplifying simulation setup.

FOSECO and MAGMA jointly tested the FOSECO Pro Module to ensure the highest accuracy possible. FOSECO has conducted extensive tests on a variety of difference casting shapes, sizes and alloys, comparing the simulated results to the actual castings.

The combination of accurate geometries, material data, heat transfer coefficients and filter pressure drop data will provide users with the most accurate filling and solidification results currently possible.

The FOSECO Pro Module is an example of how the alliance between FOSECO and MAGMA is bringing practical, verified and validated tools to the foundryman.

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Figure 6 Pro Module CD cover

The FOSECO Pro Module offers MAGMASOFT® users the following advantages.

- ❑ Eliminates uncertainty with respect to any product design attributes and performance.
- ❑ Predefined material and filter properties simplifies simulation setup.
- ❑ Fully parametric sleeve and filter models simplifies modification of sleeve size or type.
- ❑ Assists efforts to optimize methods using different sleeve types.
- ❑ Allows the user to focus on other casting process related inputs

D2
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13

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sketch