

New Additive Packages for PIR Insulation Panels Manufacturing

Evonik Nutrition & Care
Comfort & Insulation

**La Conferenza Nazionale
Poliuretano Espanso Rigido**

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Agenda

1. Introduction

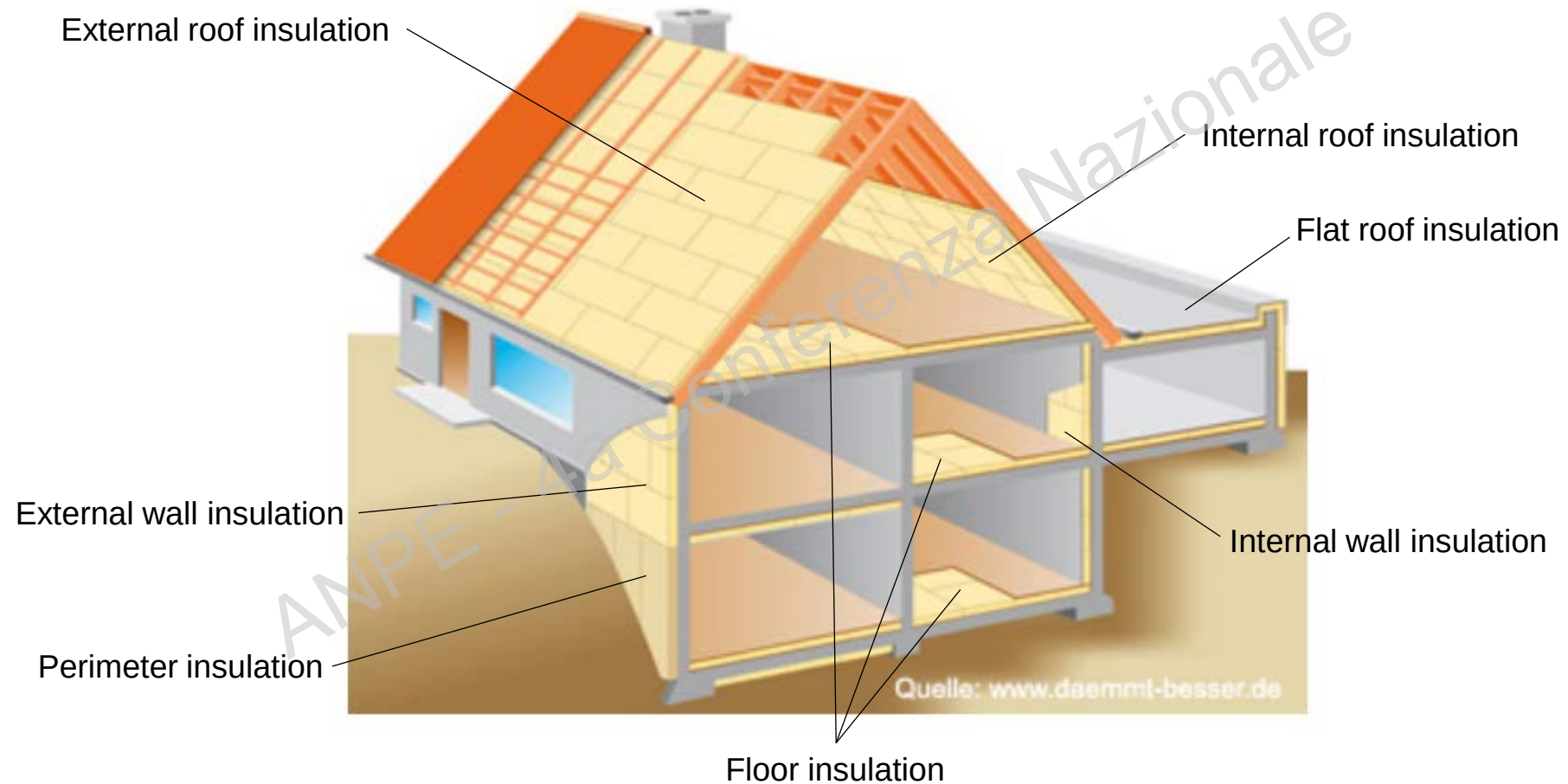
2. Experimentals and Results

3. Summary

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Flex Face Panel Applications

- Improved Energy Efficiency of Buildings



Why Octoate Free Trimerization Catalysts?

- Potassium octoate catalysts are derived from 2-Ethylhexanoic acid (2-EHA) inheriting most of the classifications and labels.
- Catalysts based on 2-EHA are classified as:
 - H302 - Harmful if swallowed
 - H315 - Causes skin irritation
 - H318 - Causes serious eye damage
 - H361 - Suspected of damaging fertility or the unborn child
- Especially the H361 statement caused a lot of concern in the PIR industry and many customers asking for octoate free replacements
- The objective is to develop an octoate free catalyst which performs similar or better compared to KOct containing grades.



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Generic PIR formulation

Experimental set up to evaluate the influence of additives

Component	Parts
Polyester polyol (PA-based)	100
TCP	15
Trimerization catalyst	variable
Polycat 5	“constant”
Water	variable
Surfactant	2
c/i-Pentane (70/30)	variable
MDI	variable

All formulations have a gel time of 30 +/- 1 sec

2 versions : with/without Octoate

Dosages: 0.5, 1.0 and 2.0 pphp

Free rise density: ~35 kg/m³

Index of 300, 400 and 500

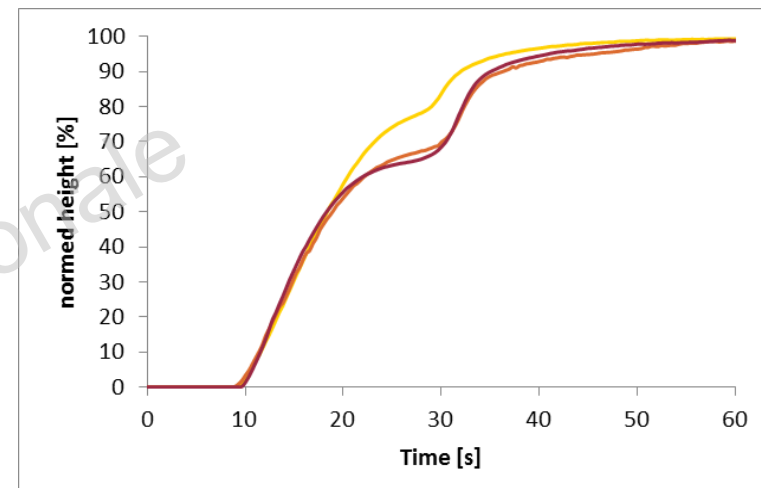
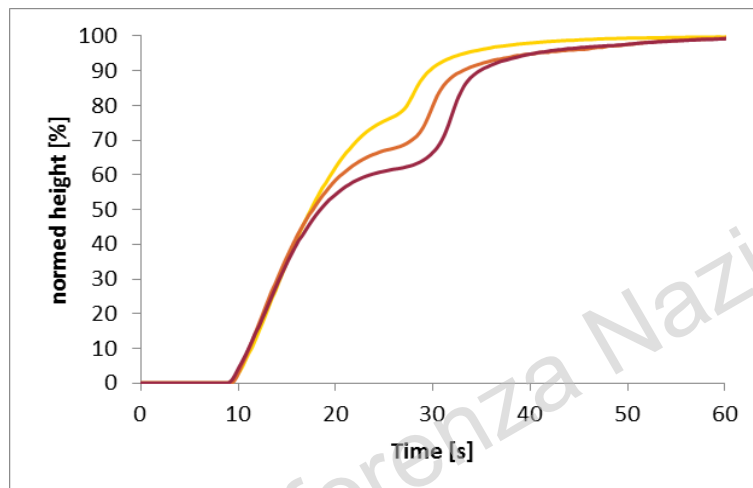
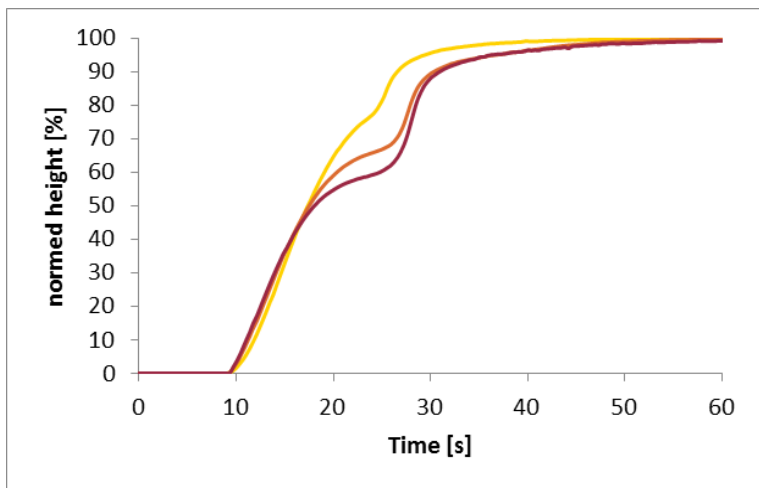
Products and Evaluation Technique

- 2 Trimerisation catalyst packages
 - Potassium octoate (2-EHA) based
 - New trimersation catalyst: DABCO® TMR 16
 - Both packages have been used with Polycat® 5 as co catalyst
- To understand the latitude of these catalyst we studied:
 - Index sensitivity by varying the index from 300 over 400 to 500
 - Water sensitivity by utilizing water levels of 0.5, 1.0 and 2.0 pphp
- Polycat 5 concentration has been kept constant in the entire formulation
- Density was adjusted by adopting the pentane levels
- Gel time has been adjusted with the trimer catalyst
- Rise profiles are presented in the following graphs

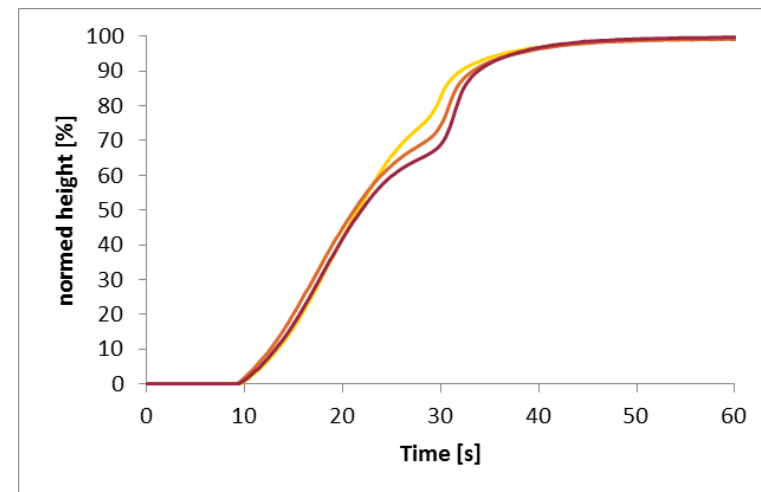
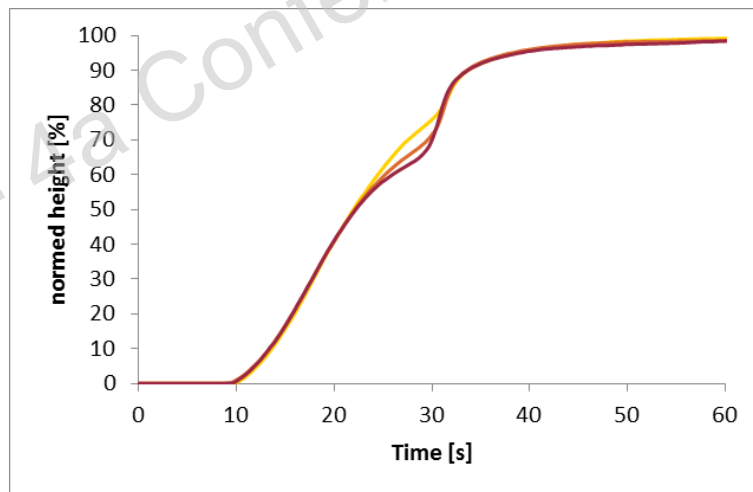
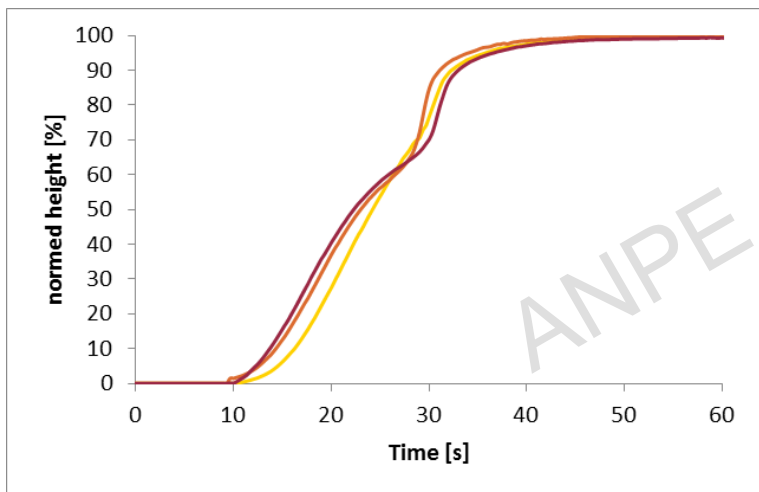
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Evaluation of Index Sensitivity

Potassium Octoate



DABCO TMR 16



0.5 Water

1.0 Water

2.0 Water

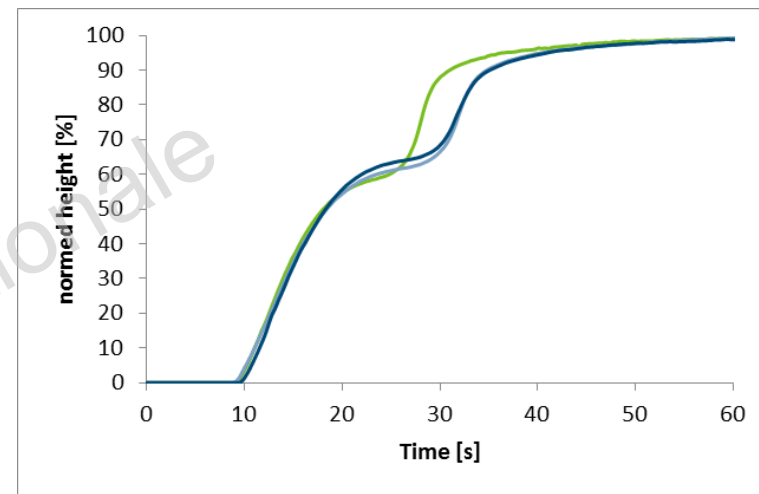
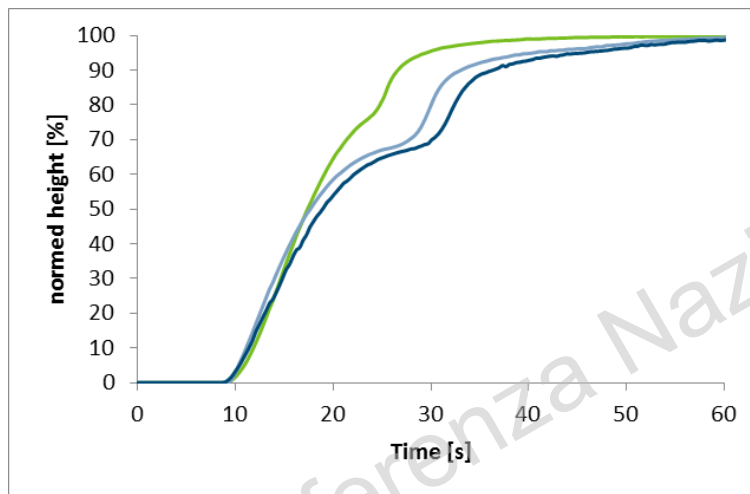
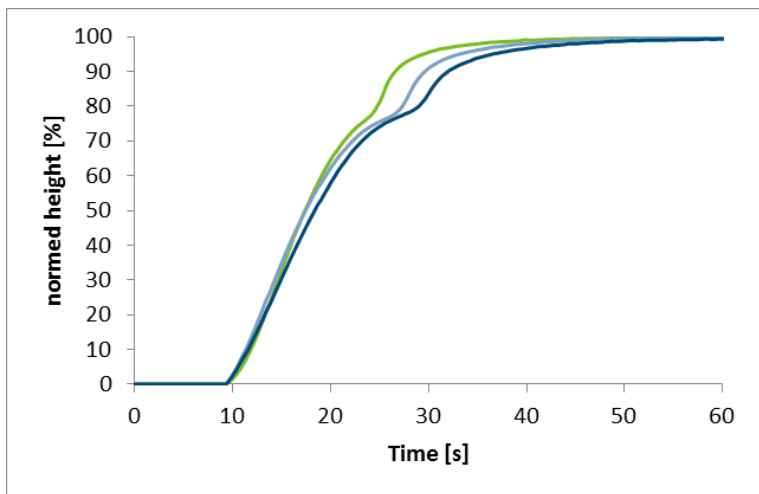
Index 300

Index 400

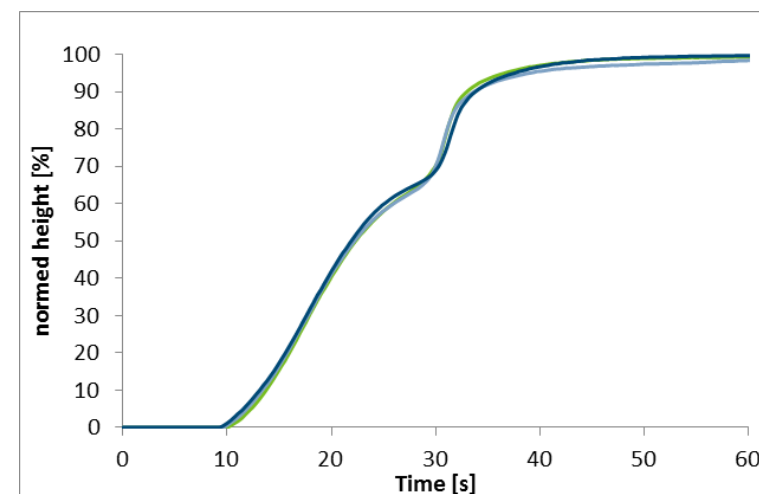
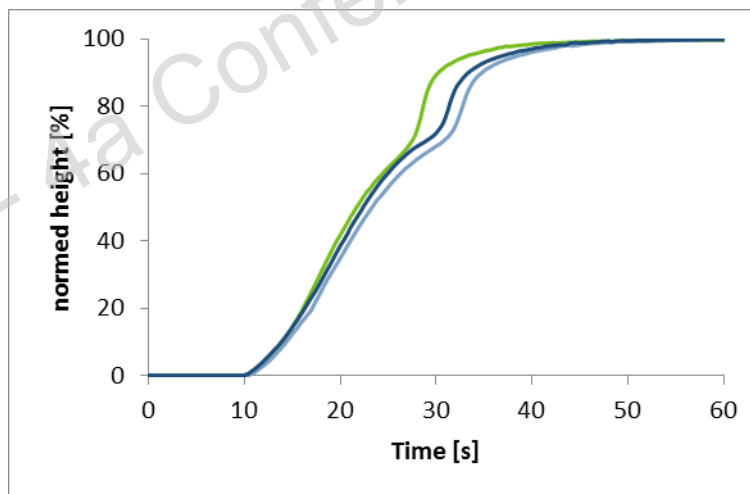
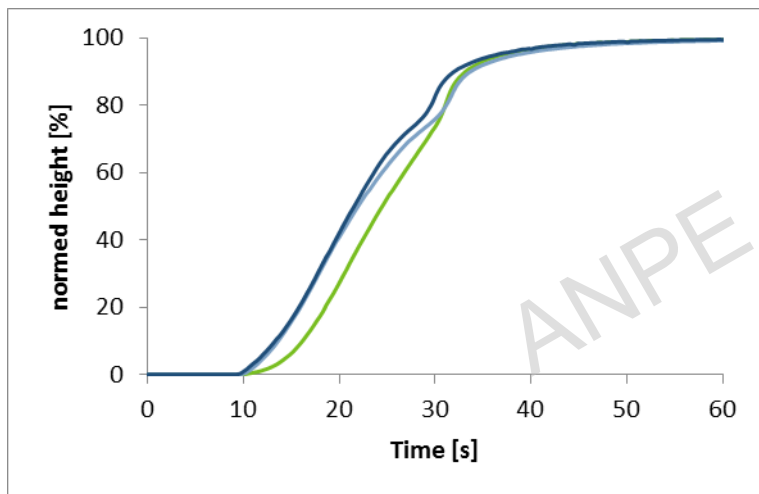
Index 500

Evaluation of Water Sensitivity

Potassium Octoate



DABCO TMR 16



Index 300

Index 400

Index 500

— 0.5 H₂O

— 1.0 H₂O

— 2.0 H₂O

Discussion – Index and Water Sensitivity

- K-Octoate causes a strong PIR kick resulting in difficult processing
- K-Octoate demonstrates strong front end activity
- Reaction profiles with DABCO TMR 16 are much smoother
- The water and index sensitivity of potassium octoate is significantly higher compared to DABCO TMR 16 which provides for significant wider latitude.
- DABCO TMR 16 performs superior at all indices and water levels
- DABCO TMR 16 provides a good alternative to octoate based catalysts with excellent processing properties

Formulation for Surfactant Screening

Component	Parts
Polyester polyol (PA-based)	100.0
TCPP	15.0
Trimersation Catalyst	4.1
Polycat 5	0.9
Water	1.0
Surfactant	2.0
c/i-Pentane (70/30)	22.0
MDI - for Index 400	

Octoate and DABCO TMR 16 at same dosage level !

Name	Type
TEGOSTAB® B 84504	“high siliconophilicity”
TEGOSTAB B 84505	“medium siliconophilicity”
TEGOSTAB B 84506	“high siliconophilicity”
TEGOSTAB B 84507	“high siliconophilicity”
TEGOSTAB B 84508	“high siliconophilicity”
TEGOSTAB B 84510	“medium siliconophilicity”
TEGOSTAB B 84511	“high siliconophilicity”

Handmix-Foaming in panel mold of 50x25x5 cm

Mold temperature: 65°C

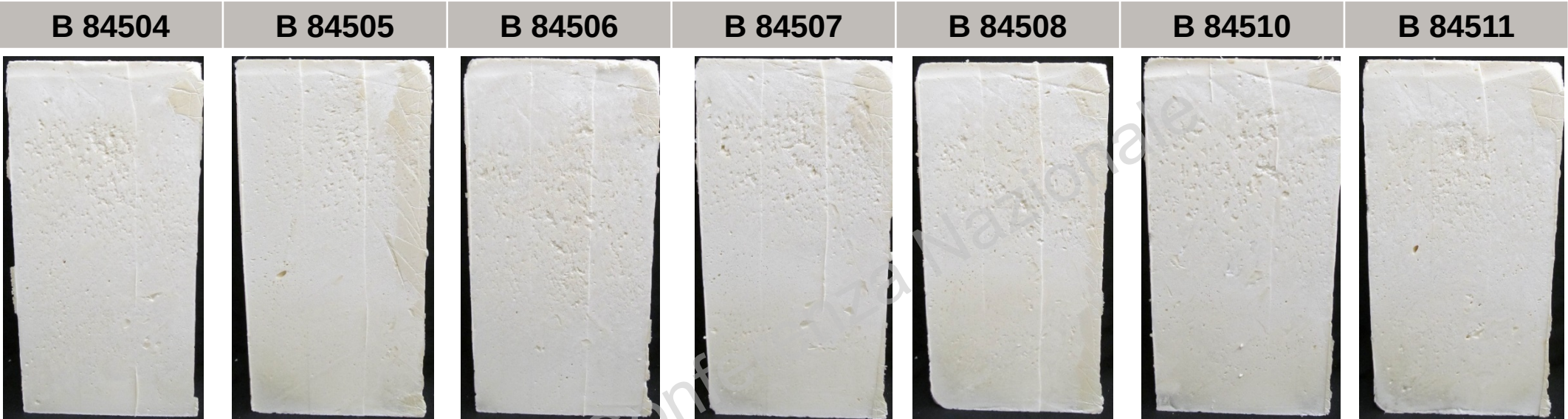
Results of Surfactant Screening

	Potassium Octoate		DABCO TMR 16	
Surfactant	Top side	Bottom side	Top side	Bottom side
B 84504	6	6	5.5	6.5
B 84505	6.5	7.5	6	8
B 84506	6	6	5.5	7
B 84507	5.5	6	6	8
B 84508	5	6.5	7	8
B 84510	5.5	6	6.5	8
B 84511	6.5	7.5	7	8.5

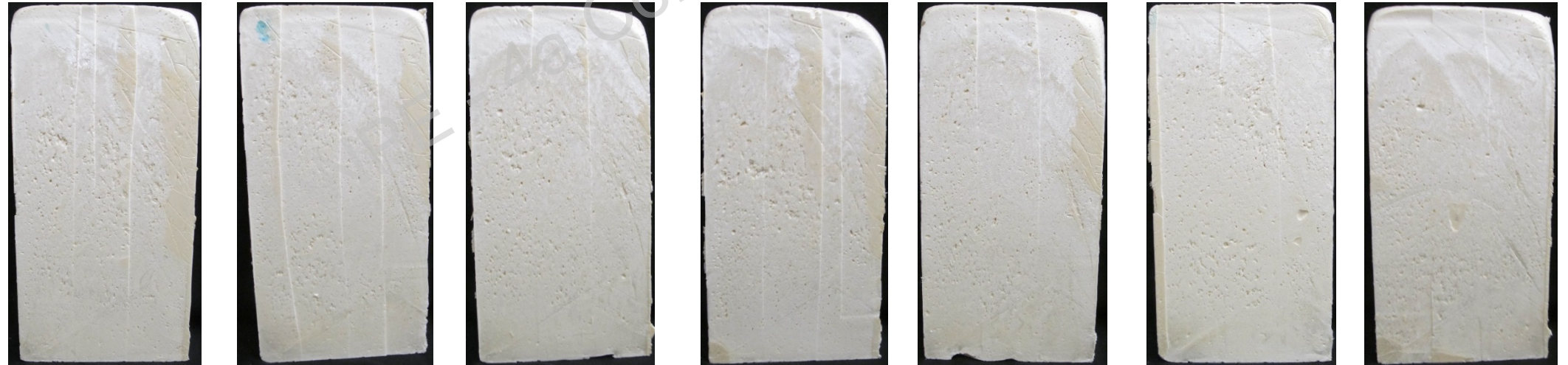
- Overall higher level than with octoate based trimer catalyst!
- Best surface ratings with B 84508, B 84510 and B 84511

Different Trimer Catalyst: Foam Pictures – Top Sides

Potassium Octoate



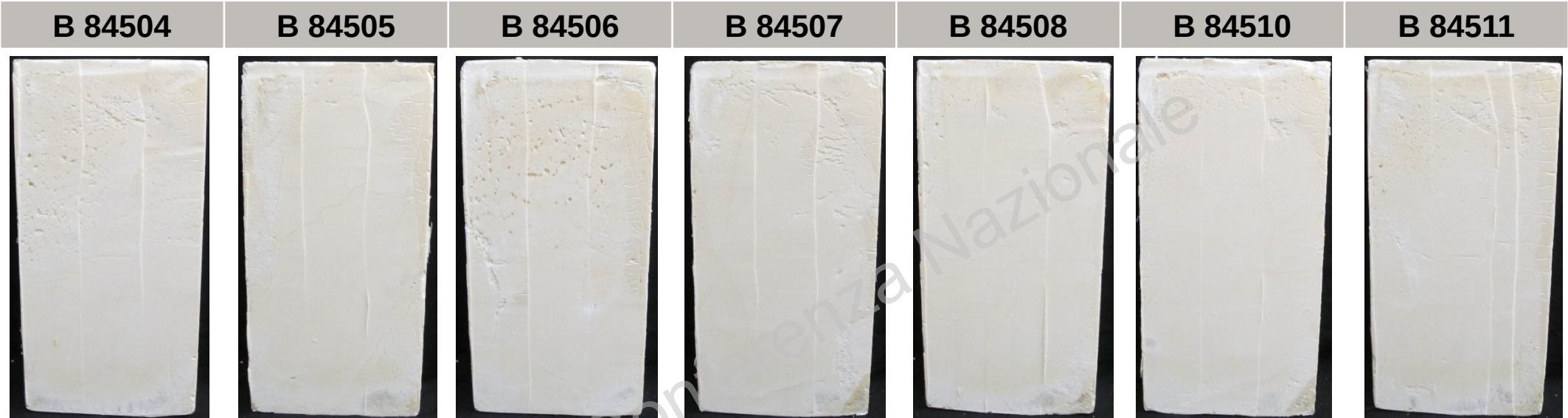
DABCO TMR 16



Top sides best with with B 84505, B 84508, B 84511

Different Trimer Catalyst: Foam Pictures – Bottom

Potassium Octoate



DABCO TMR 16



Top sides best with with B 84508, B 84510, B 84511

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Summary – Catalysts and Surfactants to Provide Superior Performance

An Octoate-free trimerization catalyst with superior processing has been developed

Tailored solutions in Si-Surfactants give additional benefits

Catalysts

- DABCO TMR 16 trimerization catalyst
 - smoothens the rise profile
 - shows less sensitivity to water
 - is less influenced by index variations
 - resulted in better surface qualities
 - similar use levels as octoates
- DABCO TMR 16 is an octoate free solution

Surfactants

- Additional adoption of Si-Surfactant could further improve the foam quality
- Still operational tasks to be managed in foam production

Tailored
solutions for
best results



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