ARBOCEL® Gels
in emulsion paints

ARBOCEL® - Fiber Gels

ARBOCEL® Fiber Gels are Colloidal Microcrystalline Celluloses (MCC).

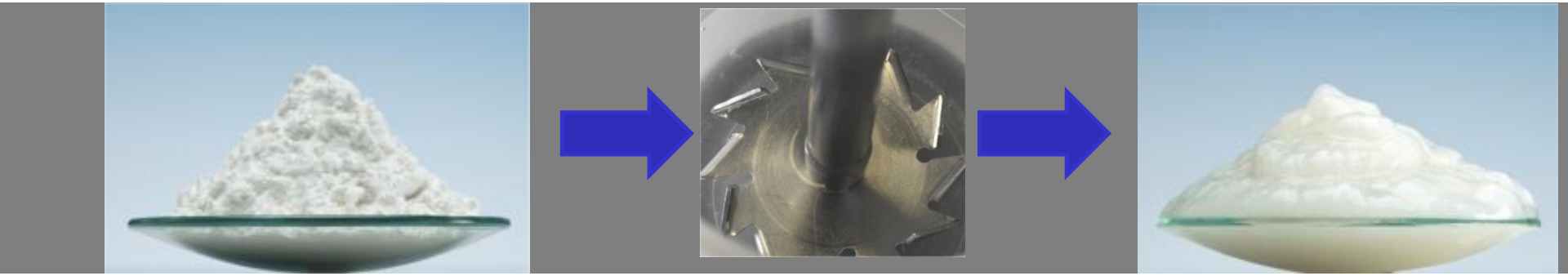
A new kind of additive in the field of construction chemical applications.

Properties of ARBOCEL® Fiber Gels

- based on natural raw material
- delivered in powder form (easy handling)
- thickening effect / rheology regulation
- stabilizer / avoid phase separation
- water binding effect
- synergy with other thickeners
- heat resistant
- thixotropic
- pH-stable in a wide range
- 3-dimensional framework (insoluble)

Important to know!

First step is always
the activation (mixing) of the gel in distilled water!
Then add the other components!

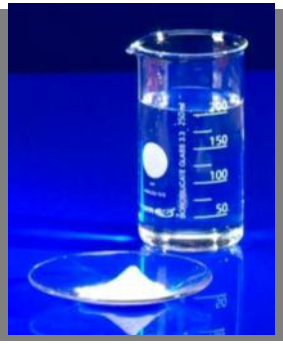


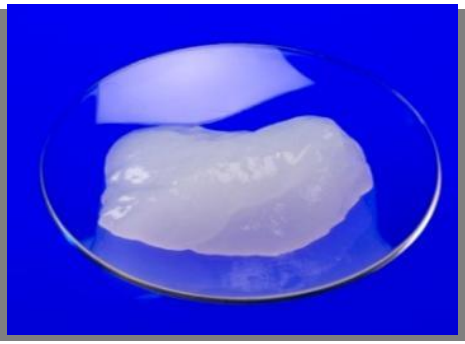
Activation of the Fiber Gel (acc. to quality control specification)

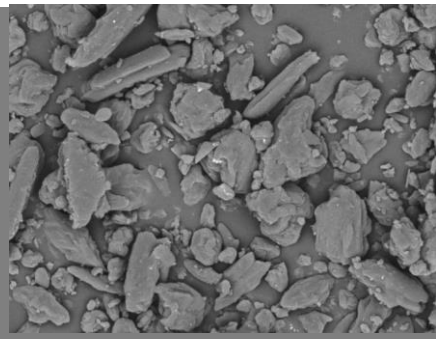
Water + ARBOCEL® Fiber Gel (powder form)

Activation of e.g. 2 % fiber gel in water with dissolver.

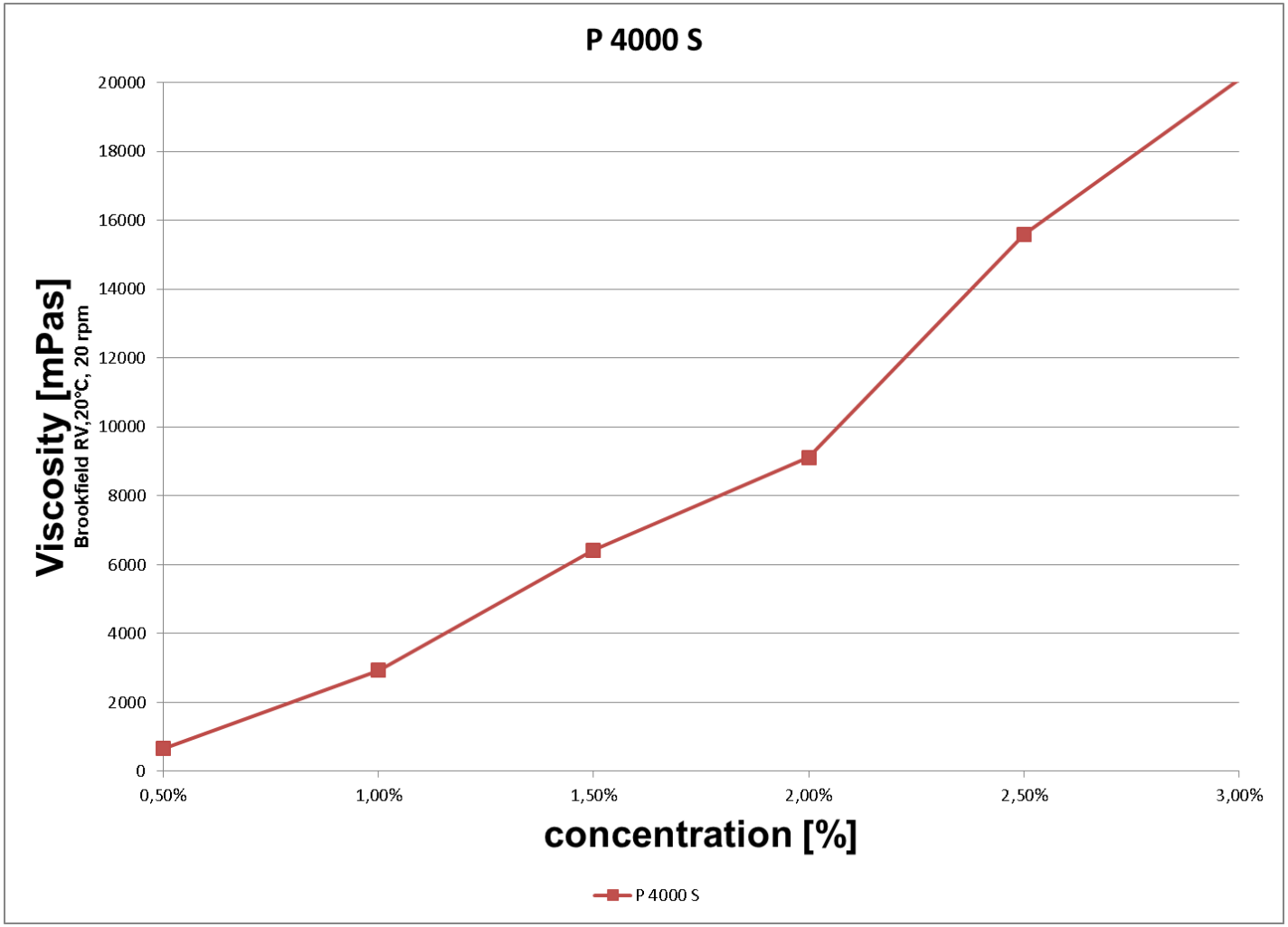
1. Add the powder slowly at low shear force to the water (e.g. with 1,1 m/sec).
2. Mixing for further 3 minutes at high shear force (e.g. with 7 m/sec).
3. Control viscosity of fiber gel: depending on the grade and dosage







Viscosity depends on concentration



Case study

Reformulation of an interior water based emulsion paint

Aim:
Optimization or improvement of the product quality.
Preferably coming along with a cost optimization.

Basis formulation – A 167

	Function	Standard	
		%	Part I (add PU-thickener after part III !)
Water		22	
Calgon N	dispersing agent	0.1	
Hydrobhob modified Hydroxyethylcellulose	HEC-thickener	0.5	
Ammonia 25 %	pH	0.1	
Texanol	coaleszens	0.5	
Dowanol DPnB	Solvent, film former	1	
Byk 038	defoamer	0.3	
Newtonian Polyurethan-Thickener	PU-thickener	0.3	
Ecodis P 50	wetting agent	0.3	
Mergal 723 K	conservation	0.2	
Tiona 595	pigment	18	Part II
Finntalc M 20 SL	filler	6	
Omyacarb Extra CL	filler	7	
Omyacarb GU 2	filler	6	
Mica TF	filler	4	
Omyacarb 10 AV	filler	8	
Water		3	Part III
Mowilith DM 2452 (vinylacetate-copolymer)	binder	20	
Agitan 282	defoamer	0.3	
Water		2.4	

PVC: 63,6 %

Remark for trials T 1 – T 4

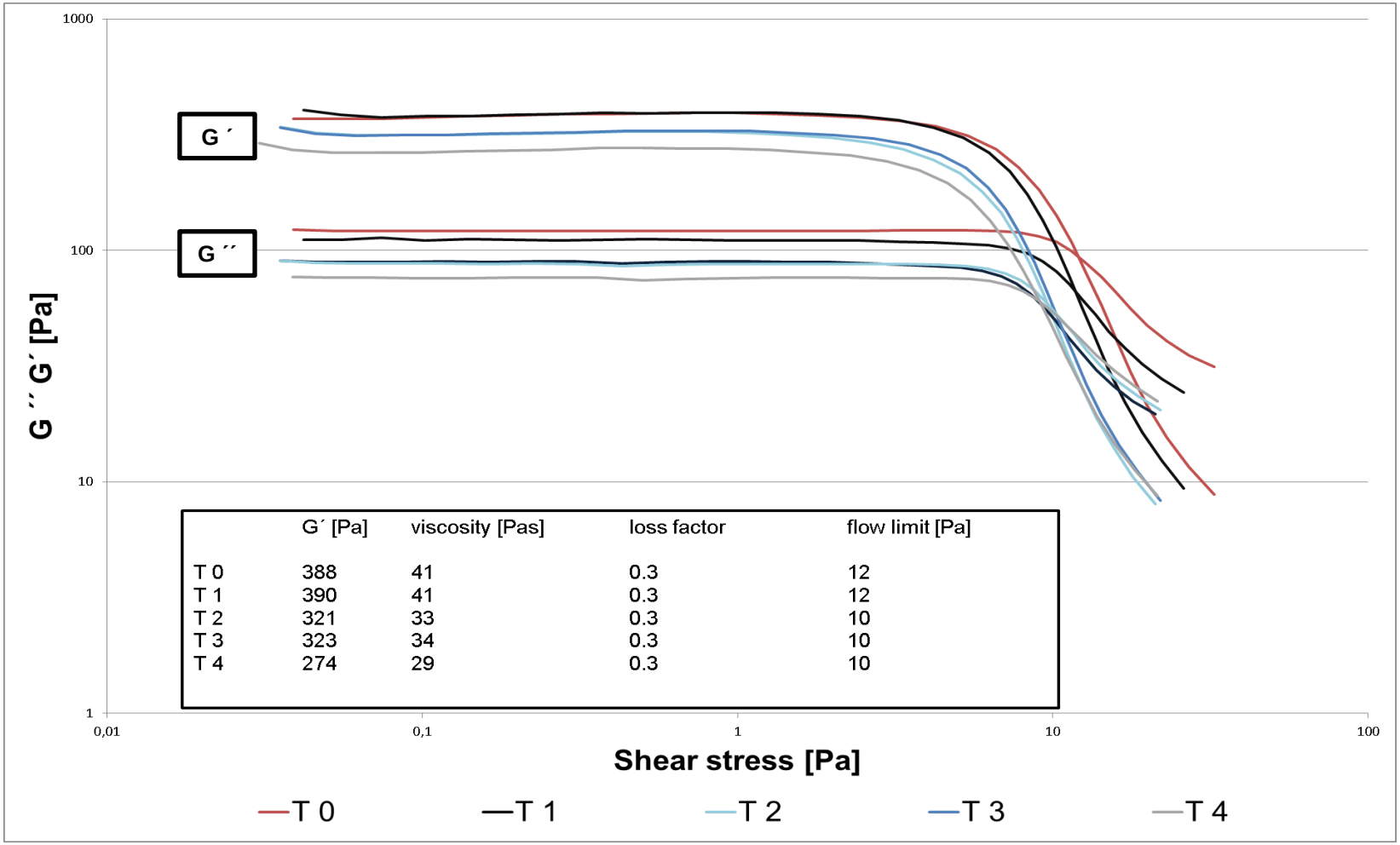
First step was the activation of the fiber gel!
0.3 % wt. of P 4000 S (dry powder) was added in distilled water and stirred (7 m/sec) for approx. 3 min.
Then the other ingredients were added in the order of the guiding formulation.

Overview - trials

1. Rheological properties, Brookfield-viscosity, ICI-viscosity
2. Opacity and contrast ratio DIN EN 13300
3. Wet scrub resistance DIN EN 11998
4. Sheen DIN EN 2813
5. Open time
6. Workability
7. Syneresis
8. Minimum of film formation building temperature (MFFT)

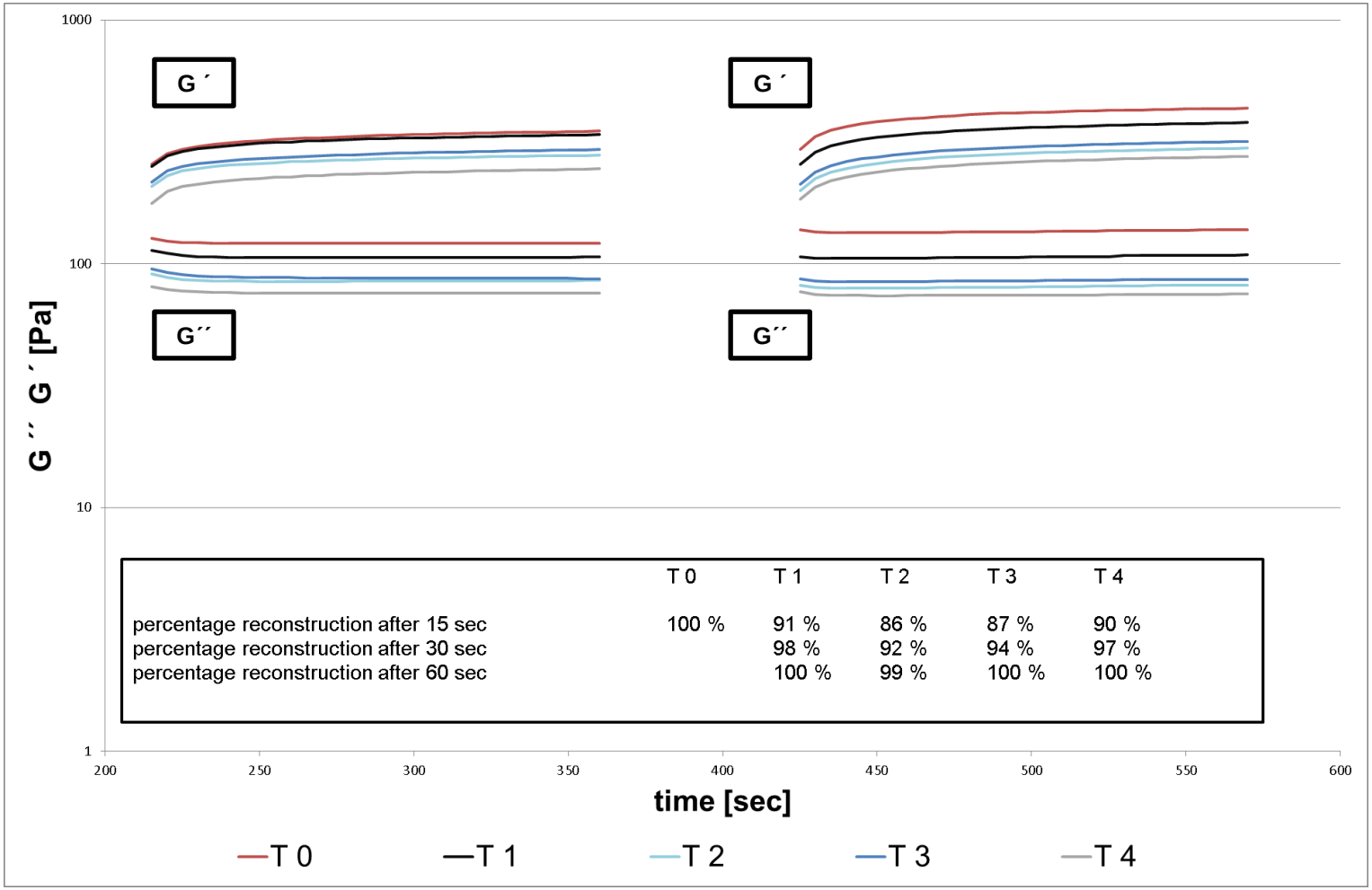
1. Rheological Properties and Viscosity

1. Amplitudensweep



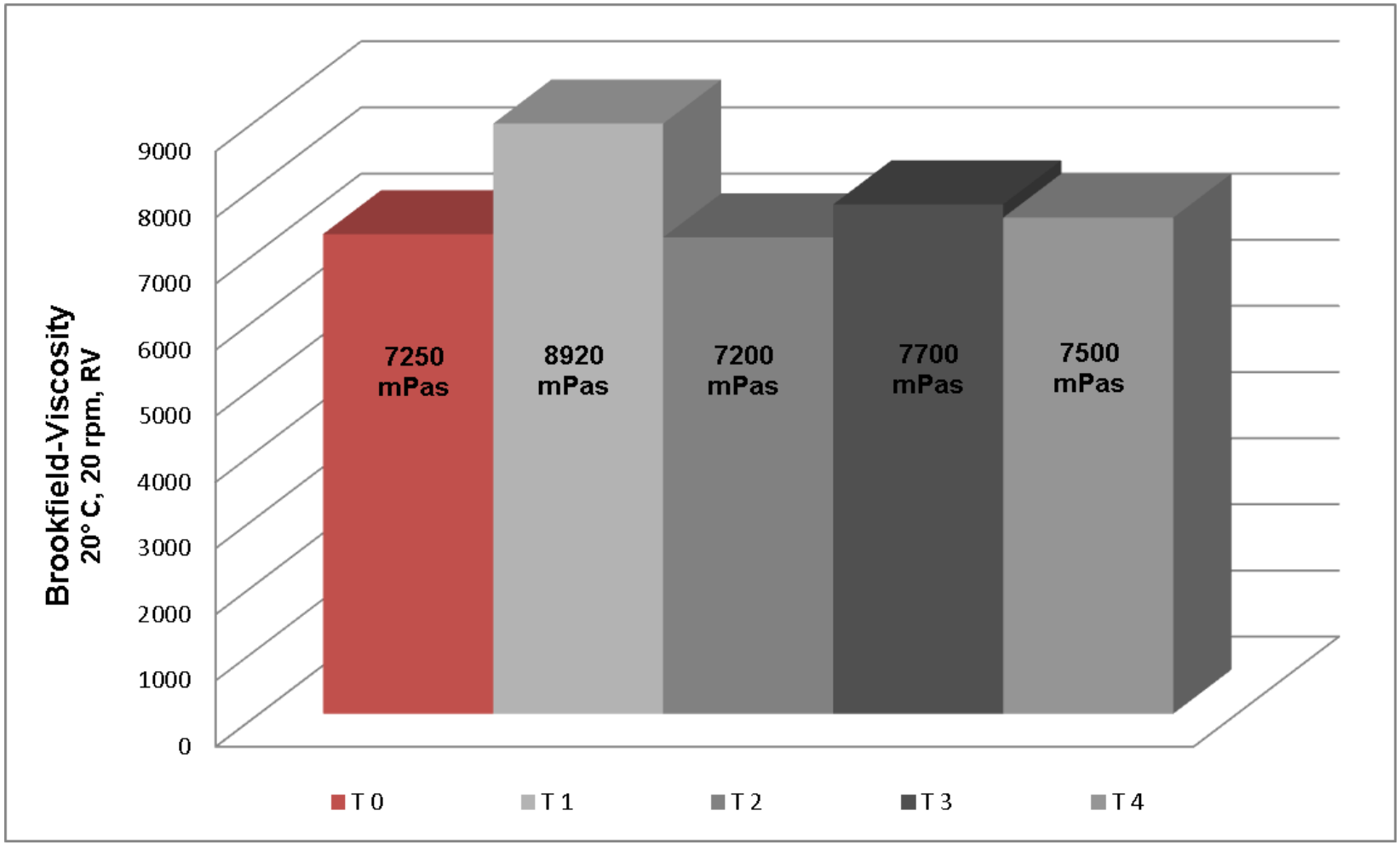
	G´ [Pa]	viscosity [Pas]	loss factor	flow limit [Pa]
T 0	388	41	0.3	12
T 1	390	41	0.3	12
T 2	321	33	0.3	10
T 3	323	34	0.3	10
T 4	274	29	0.3	10

1. Thixotropy

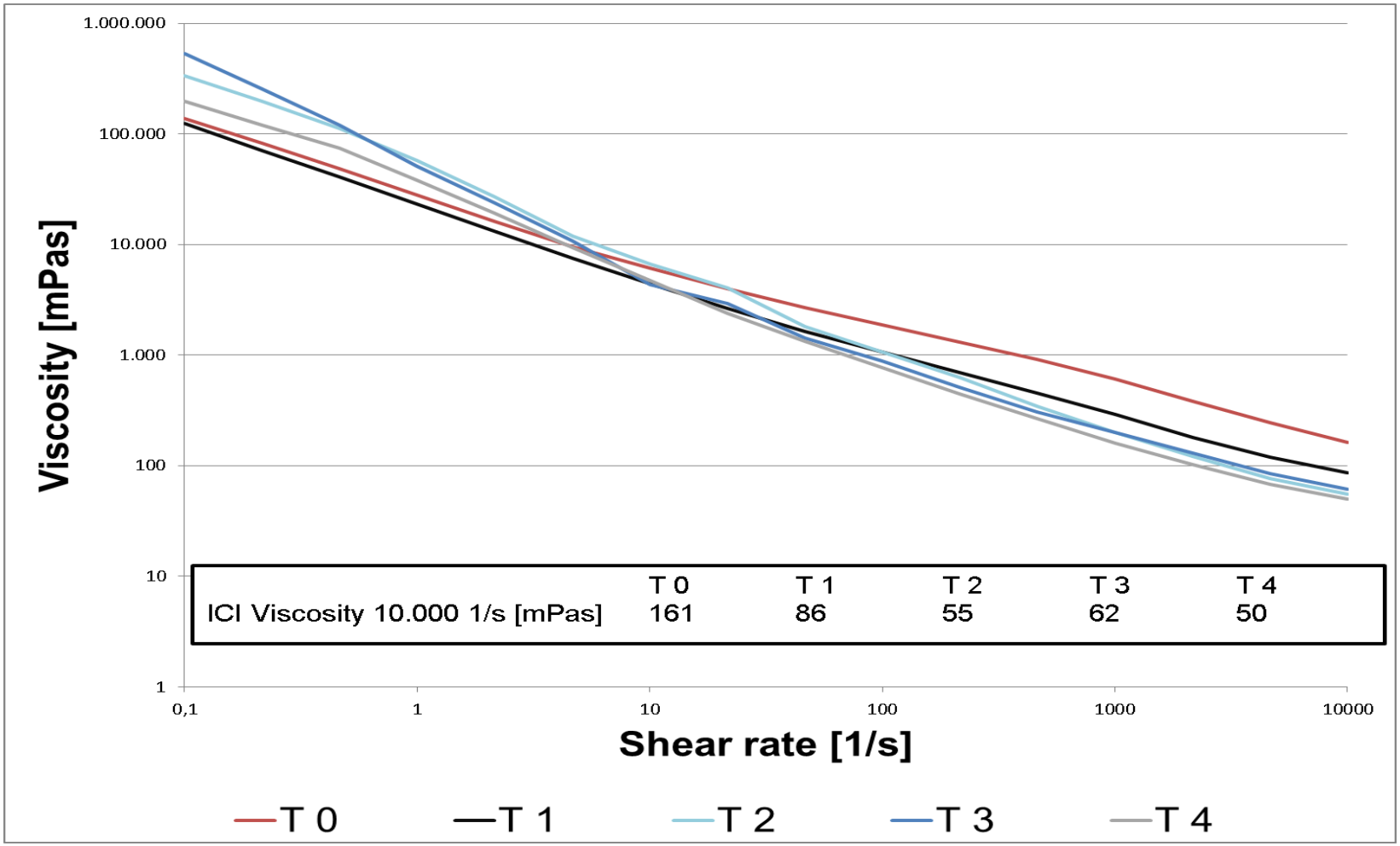


	T 0	T 1	T 2	T 3	T 4
percentage reconstruction after 15 sec	100 %	91 %	86 %	87 %	90 %
percentage reconstruction after 30 sec		98 %	92 %	94 %	97 %
percentage reconstruction after 60 sec		100 %	99 %	100 %	100 %

1. Brookfield-viscosity



1. ICI-viscosity



2. Opacity

2. Opacity and contrast ratio – DIN EN 13300

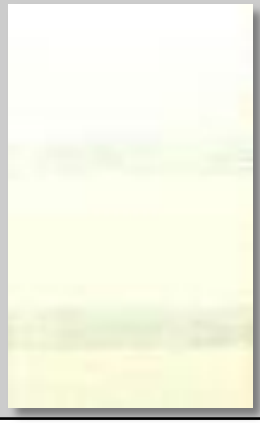
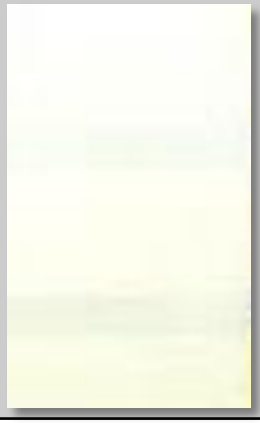
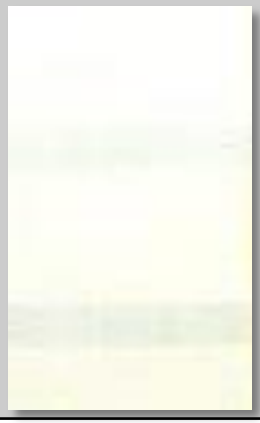
50 µm/150 µm	T 0	T 1	T 2	T 3	T 4
Rx white Ry white Rz white	84.4/85.5 86.2/87.4 101.3/102.1	84.7/85.1 89.7/90.1 94.1/94.2	85.3/85.7 90.3/90.8 94.6/94.8	85.2/86.0 90.3/91.1 94.5/95.2	85.3/85.7 90.3/90.8 94.7/95.0
Ry black	78.1/85.0	85.0/88.7	83.7/89.7	83.9/89.6	85.3/89.3
contrast ratio	90.6/97.3	94.8/98.4	92.7/98.8	92.9/98.4	94.5/98.3
Spreading rate	27.5/10.3	21.7/11.3	20.6/11.4	24.4/11.9	19.9/11.1
opacity at 8 m²/l class	**98.6 2**	**99.6 1**	**100.0 1**	**100.0 1**	**99.8 1**

Opacity is better with fiber gel !

class	opacity
1	≥ 99.5 %
2	≥ 98 % and < 99.5 %
3	≥ 95 % and < 98 %
4	< 95 %

2. Wet opacity

Description: apply paint on a white/black standard test card with automatically film applicator 150 µm. Put foil over wet film and measure with the color measurement system

150 µm	T 0	T 1	T 2	T 3	T 4
					
Y_b/Y_w	98.5	99.4	99.5	99.3	99.5

Wet opacity is better with fiber gel !

3. Wet scrub resistance

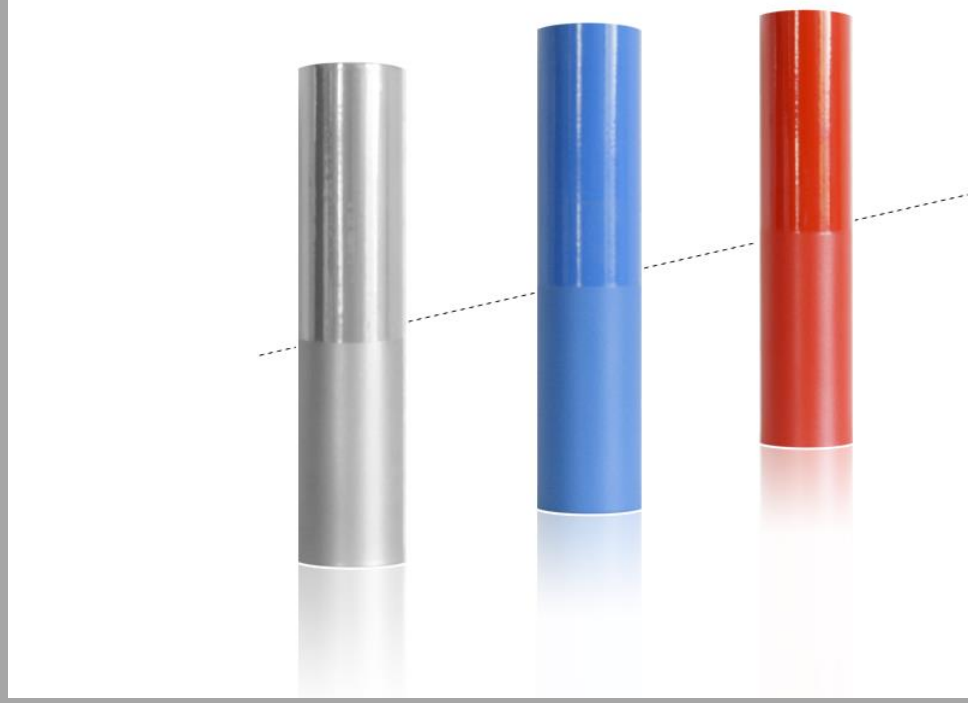
3. Wet scrub resistance – DIN ES ISO 11998

	T 0	T 1	T 2	T 3	T 4
wet scrub resistance µm	**4**	**4**	**4**	**4**	**4**
class	**1**	**1**	**1**	**1**	**1**

class	abrasion cycles
1	< 5 µm at 200 abrasion cycles
2	≥ 5 µm and < 20 µm at 200 abrasion cycles
3	≥ 20 µm and < 70 µm at 200 abrasion cycles
4	< 70 µm at 40 abrasion cycles
5	≥ 70 µm at 40 abrasion cycles

No difference between several formulation

4. sheen



4. sheen – DIN EN ISO 2813

	T 0	T 1	T 2	T 3	T 4
Sheen at 85°	**2.5**	**2.9**	**3.2**	**2.5**	**2.7**
classification	**blunt mat**	**blunt mat**	**blunt mat**	**blunt mat**	**blunt mat**

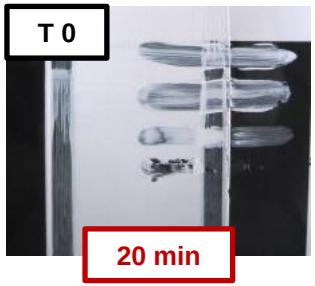
class	reflectometer
glossy	≥ 60 at 60°
middle glossy	< 60 at 60° ≥ 10 at 85°
mat	< 10 at 85°
blunt mat	< 5 at 85°

No significant difference between several formulation

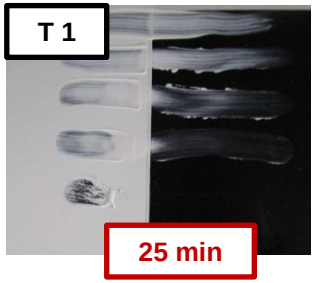
5. Open time

5. open time – JRS test method

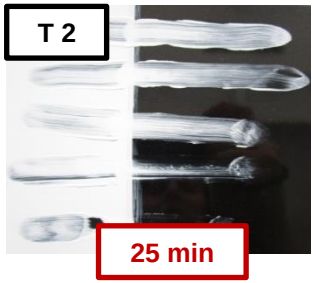
A 100 µm thick paint film with a film applicator is applied to a test card. After every 5 minutes rub the paint with your finger.



5 min
10 min
15 min
20 min

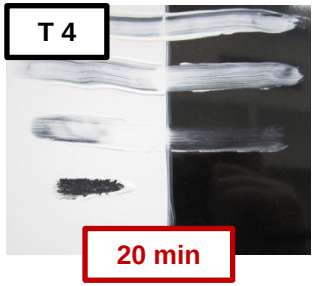


5 min
10 min
15 min
20 min
25 min



5 min
10 min
15 min
20 min
25 min

5 min
10 min
15 min
20 min
25 min
30 min



5 min
10 min
15 min
20 min

Better open time or rather equal open time even though solvent based additives were reduced which are mainly responsible for open time !!!

6. Workability

6. Workability and spattering

Apply the paint with a roller on a wall paper and evaluate workability and scattering.

	T 0	T 1	T 2	T 3	T 4
workability	good	good	good	good	good
spattering	no spatter	no spatter	no spatter	no spatter	no spatter

Easy to apply with the roller. No Spattering!

7. Syneresis

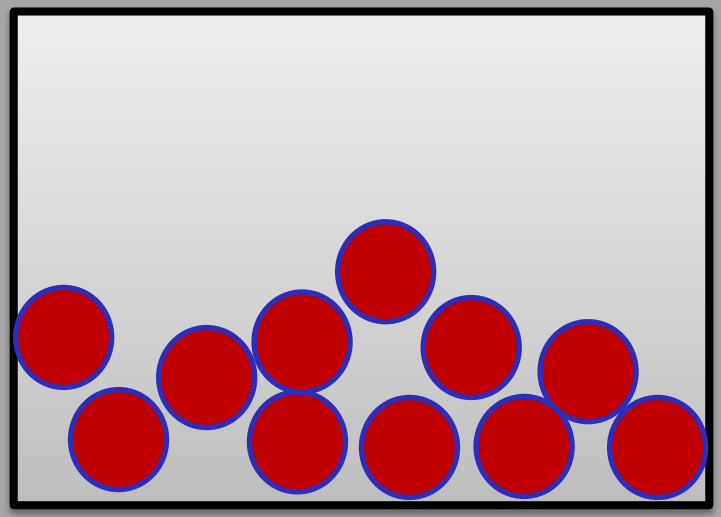
7. syneresis

Method: storage the paint in glass bottles for 2 months.
After 2 months evaluate syneresis effect

	T 0	T 1	T 2	T 3	T 4
syneresis	no	no	no	no	no
					

Very high stabilization effect and no syneresis!

8. Minimum Film Formation Temperature (MFFT)



8. Minimum Film Formation Temperature

According DIN ISO 2115:2001-04

	T 0	T 1	T 2	T 3	T 4
MFFT [°C]	2	2	2	2	2

No negative influence on MFFT !

Overview - Results

	T 0 standard	T 1 - 0.3 % PU/-0.15 % HEC/ + 0.3 % P 4000 S	T 2 - 0.3 % PU/- 0.2 %HEC/- 0.3 % Texanol/ + 0.3 % P 4000 S	T 3 - 0.3 %PU/-0.2 % HEC/- 0.2 % Dowanol + 0.3 % P 4000 S	T 4 - 0.3 %PU/-0.2 % HEC/- 0.3 % Texanol/-0.2 % Dowanol/ + 0.3 % P 4000 S
Brookfield Viscosity ICI-viscosity	7250 mPas 161 mPas	8920 mPas 86 mPas	7200 mPas 55 mPas	7700 mPas 62 mPas	7500 mPas 50 mPas
Opacity at 8 ²/l	98.6 class 2	99.6 class 1	100.0 class 1	100.0 class 1	99.8 class 1
wet scrub resistance	4 class 1	4 class 1	4 class 1	4 class 1	4 class 1
Sheen	2.5 blunt mat	2.8 blunt mat	3.0 blunt mat	2.7 blunt mat	2.8 blunt mat
open time	20 min	25 min	25 min	30 min	20 min
workability spattering, wet opacity	good no 98.5	good no 99.4	good no 99.5	good no 99.3	good no 99.5
syneresis	no	no	no	no	no
MFFT	2 °C	2 °C	2 °C	2 °C	2 °C
cost reduction*	-	approx. 0.6 %	approx. 13 %	approx. 11 %	approx. 19 %

*** Cost calculation only based on additives concerned by reformulation**

Stand: 06/2015

Trials and price calculation

Please see separated Excel spreadsheet

Conclusion

- To replace 100 % PU-Thickener and 40 % of HEC was possible
- Reduction of Texanol approx. 60 %
- Reduction of Dowanol DPnB approx. 20 %

→ positive influence for open time

- using ARBOCEL P 4000 S → very good opacity

  (standard class 2, with P 4000 S class 1)
- no syneresis effect
- cost reduction was possible

What can we furthermore do to support you?

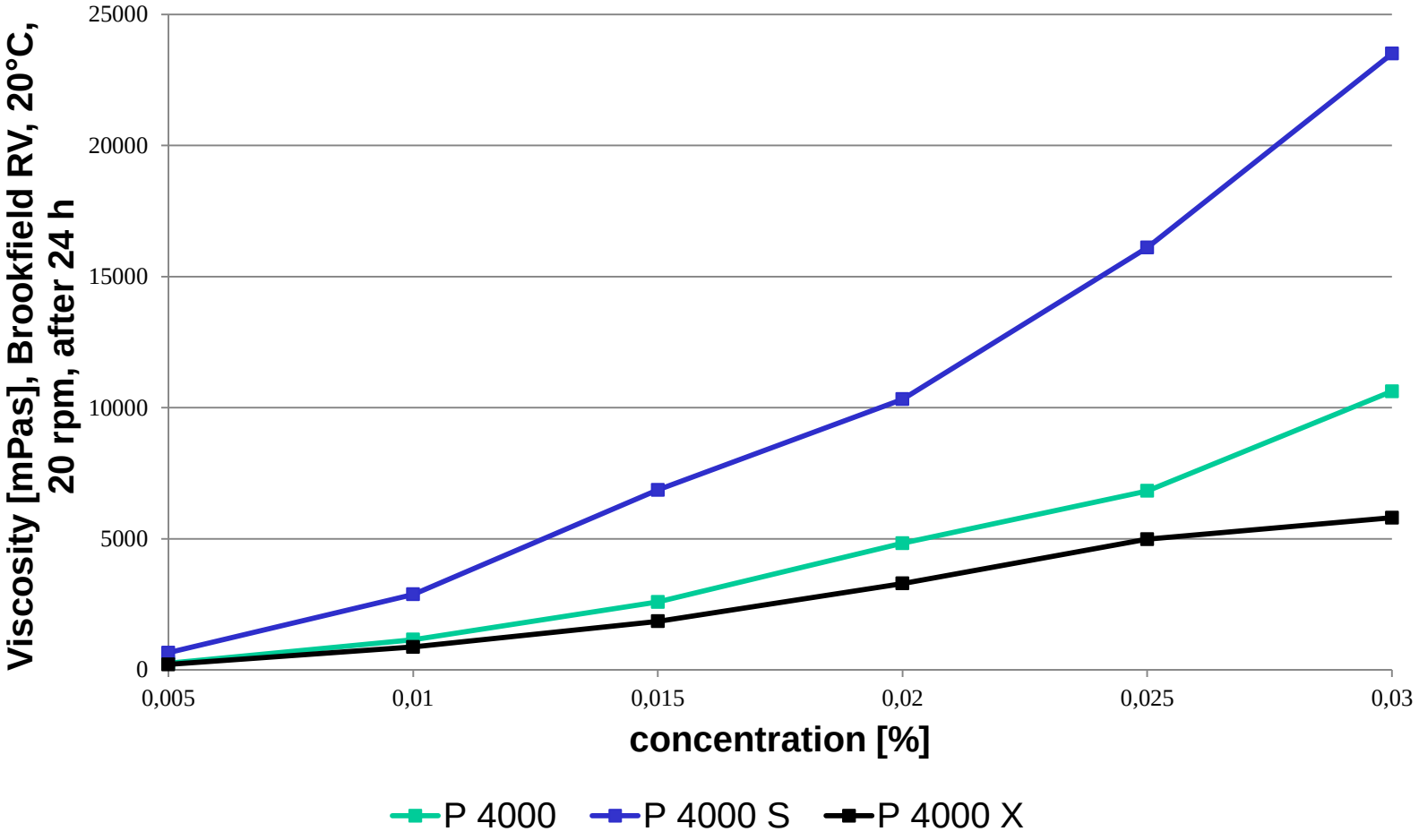
Which tests are important for you?

Available Fiber Gel grades

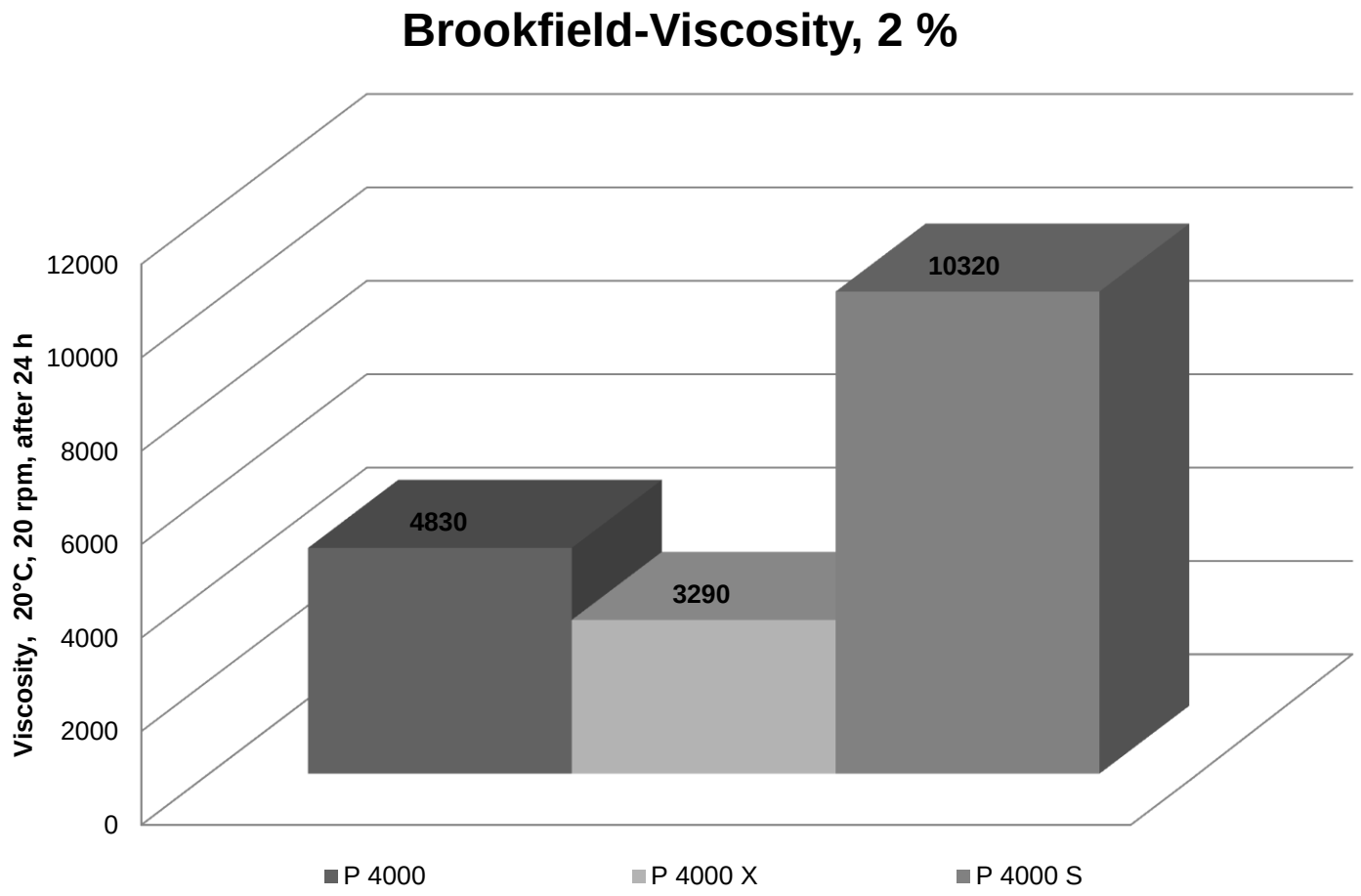
1. ARBOCEL® P 4000
2. ARBOCEL® P 4000 X
3. ARBOCEL® P 4000 S

Main differences are in viscosity and post-thickening behavior. For details contact technical support.

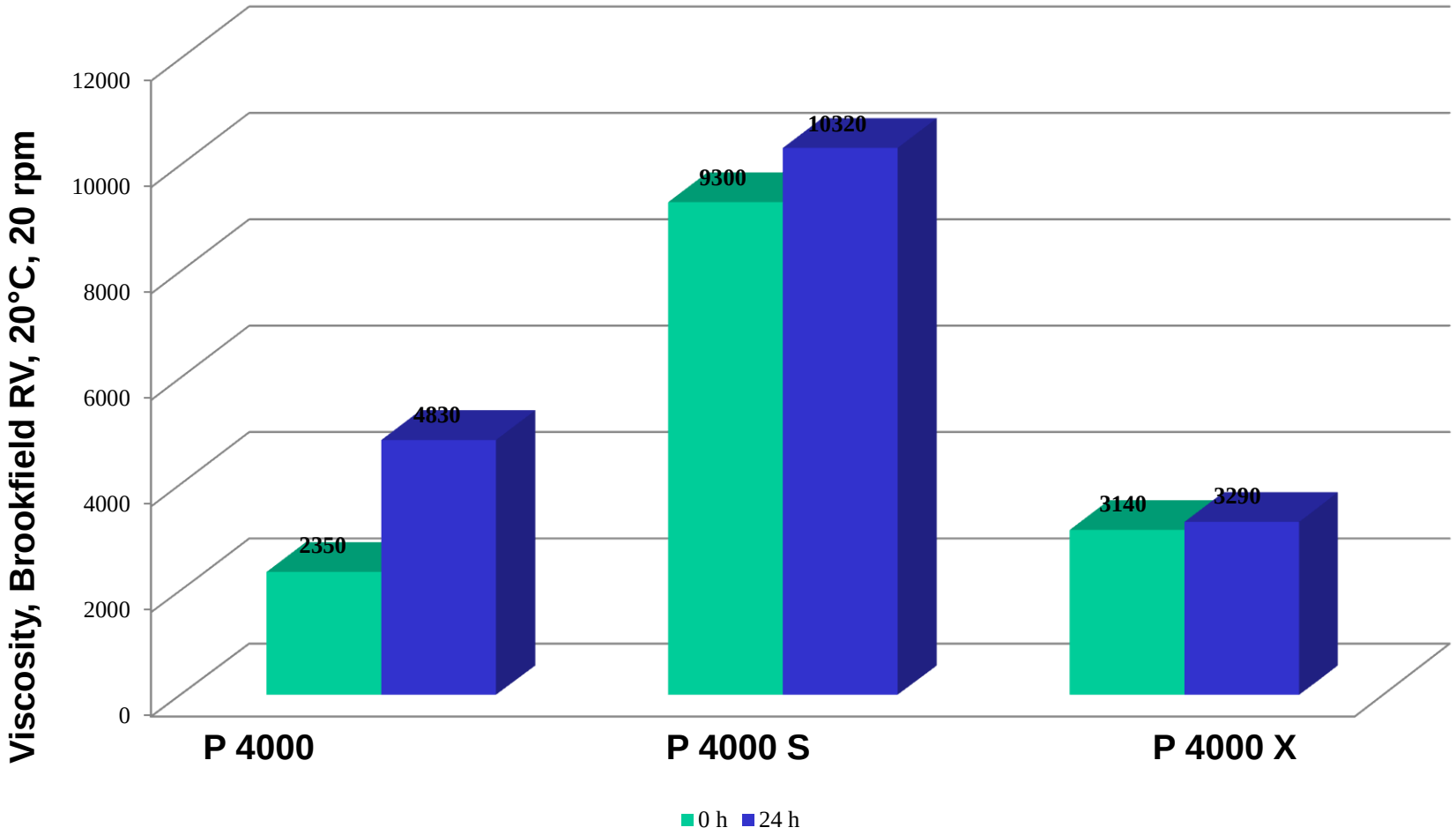
Available Fiber Gel grades



Available Fiber Gel grades



Available Fiber Gel grades



J. RETTENMAIER & SÖHNE GMBH+CO.KG
Fibres designed by Nature
Holzmühle 1
D-73494 Rosenberg
BU Industry • industrie@jrs.de

Stand: 06/2015