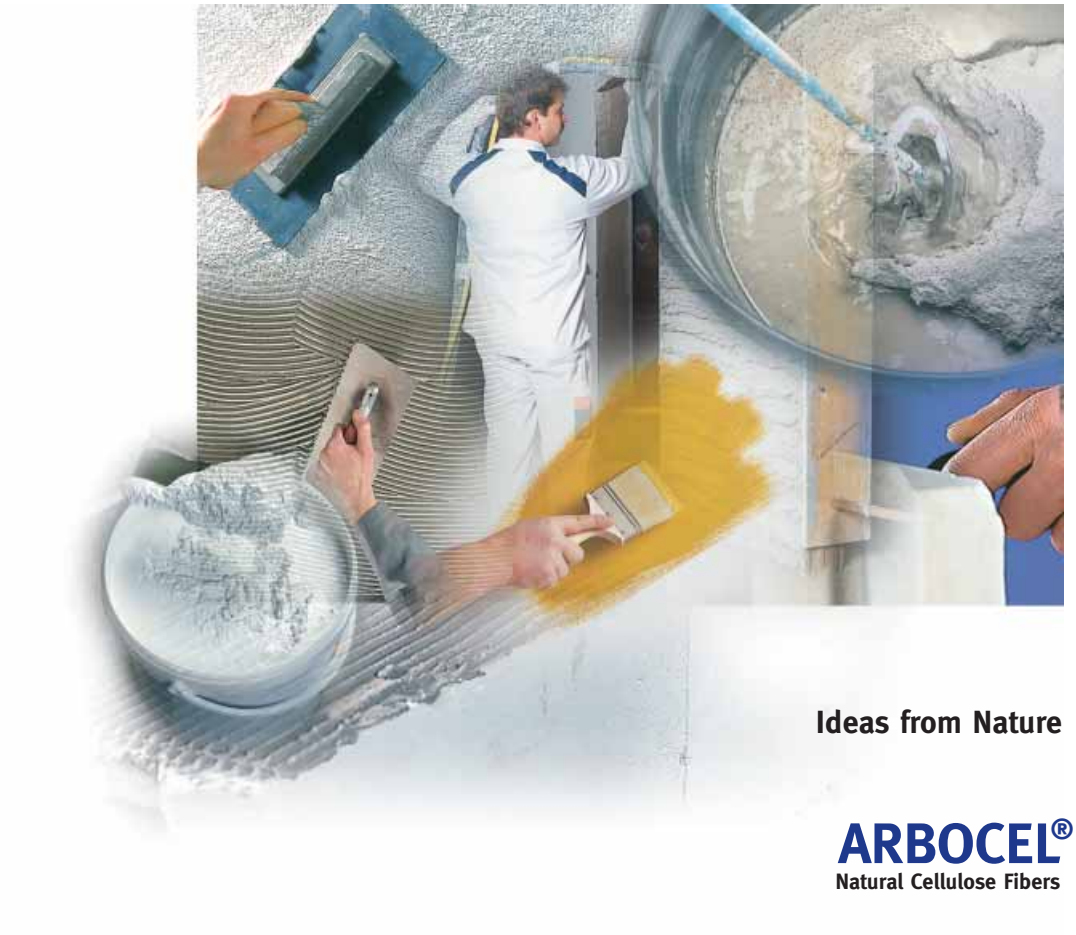
Fibers for Construction Chemical Products

8/2011



Ideas from Nature

ARBOCEL®
Natural Cellulose Fibers

LIGNOCEL®
Wood Fiber Materials

SYLOTHIX®
Polyethylene Fibers

ARBOTHIX®
Polyethylene Fibers

J. RETTENMAIER & SÖHNE GMBH+CO.KG

JRS Fibers designed by Nature

ARBOCEL®

Natural Cellulose Fibers

Contents

A. General Information

A.1 Applications in Construction Chemistry
A.2 JRS Product Range
A.3 JRS Products for Construction Chemistry
A.4 Competence in Construction Chemistry
A.5 What is **ARBOCEL®** ?
A.6 Comparison of Cellulose Ethers versus **ARBOCEL®**
A.7 Properties of **ARBOCEL®** Cellulose Fibers

B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

B.1 Why is **ARBOCEL®** Used?
B.2 Recommended JRS Qualities
B.3 **ARBOCEL®** Selection Criteria
B.4 General Correlation: fiber length / effectiveness / mixing behavior

C. Mineral / Dry Systems

C.1 **ARBOCEL®** Grades Used
C.2 Blending Instructions for Dry Mixtures
C.3 Guidance Notes
C.4 Metering and Transport Options
C.5 Applications / Quantities Used
- C.5.1 Powder adhesives (cement tile adhesives)
- C.5.2 Stuccos / Plasters
- C.5.3 Adhesive and reinforcing compounds
- C.5.4 Joint fillers for plasterboards
- C.5.5 Filler compounds and joint fillers
- C.5.6 Pastes for heavy wallpapers
- C.5.7 Construction adhesives
- C.5.8 Extruded spacers for steel mats in Concrete construction
- C.5.9 Extruded cement profiles
- C.5.10 Skim coats

D. Emulsion-Bound Systems / Paste Systems

D.1 **ARBOCEL®** Grades Used
D.2 Mixing Notes
D.3 Guidance Notes
D.4 Applications / Quantities Used
- D.4.1 Synthetic resin coatings
- D.4.2 Joint fillers for plasterboards
- D.4.3 Emulsion tile adhesives
- D.4.4 Emulsion filler / joint filler compounds
- D.4.5 Emulsion paints

E. Bituminous Systems

E.1 **ARBOCEL®** Grades Used
E.2 Guidance Notes
E.3 Applications / Quantities
- E.3.1 Vibration dampening pads
- E.3.2 Expansion bands
- E.3.3 Filler compounds / putty
- E.3.4 Medium and high-viscosity spray and brush-applied compounds
- E.3.5 Roof coatings (with or without aluminum)

F. LIGNOCEL®

F.1 Application
F.2 Smoothing Compounds
F.3 Magnesite-bound Flooring Compounds

G. SYLOTHIX® / ARBOTHIX®

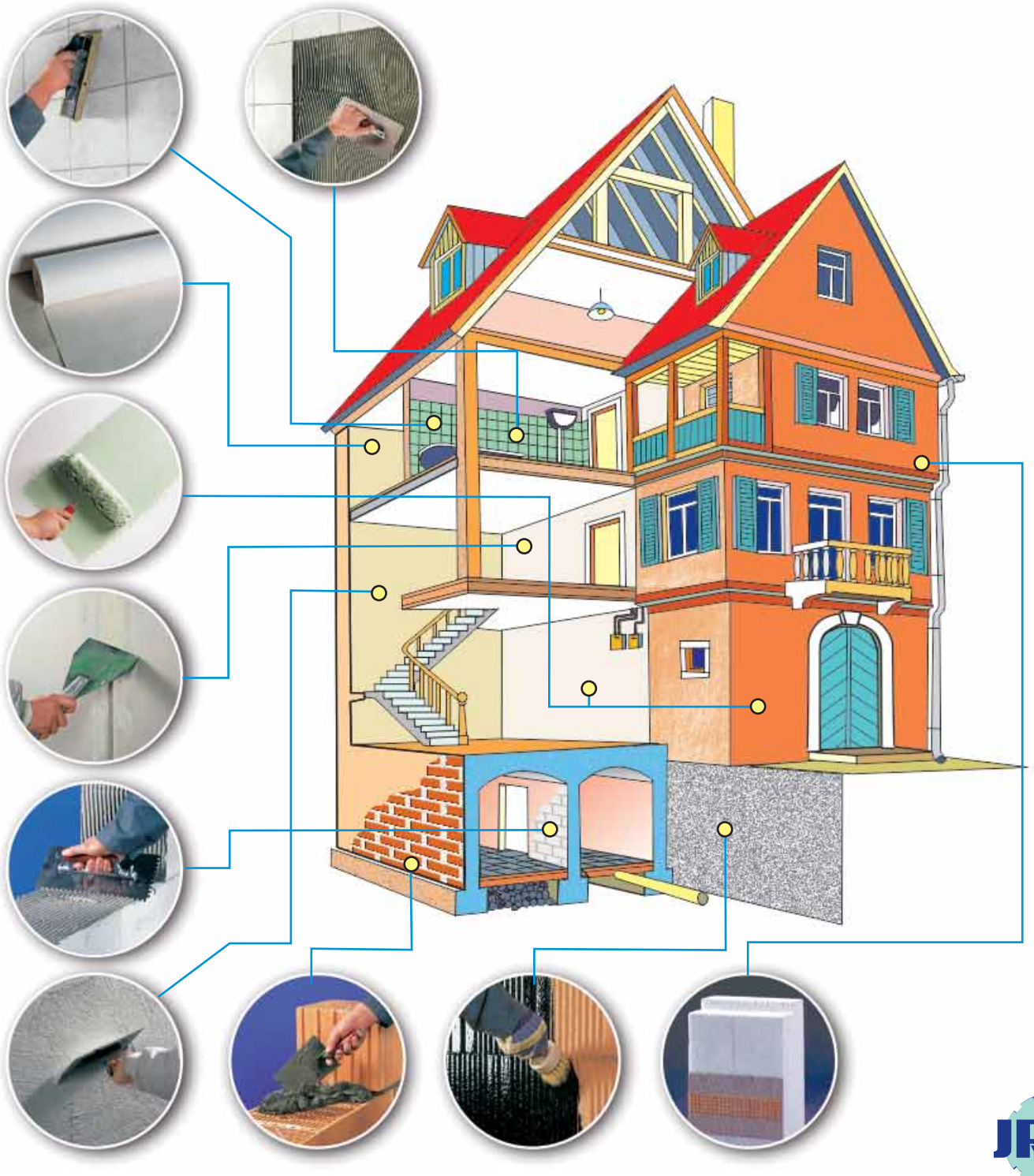
G.1 Stabilizer for Viscous Systems
G.2 Type Chart
G.3 Guidance Notes

Warranty

The information in this pamphlet is based on our current knowledge and experience. This information does not absolve the user for the to make his own tests and experiments. Nor does it imply any binding assurance of specific properties or suitability for specific applications. Intellectual property rights are to be observed.

A. General Information

A.1 Applications in Construction Chemistry

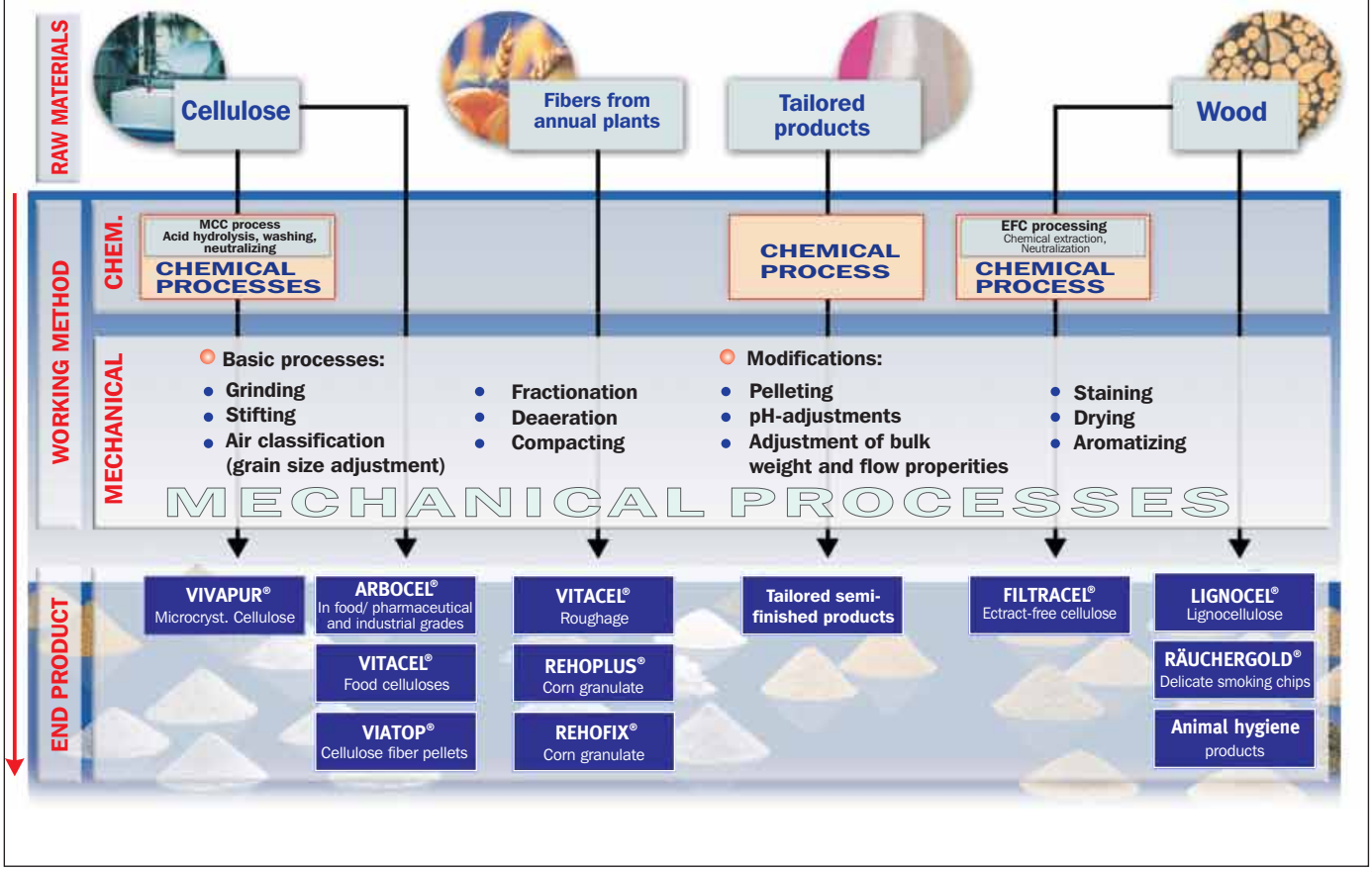


ARBOCEL®
Natural Cellulose Fibers

A. General Information

A.2 JRS Product Range

JRS Group headquarters plant Rosenberg - one of 21 production sites worldwide



ARBOCEL®

Natural Cellulose Fibers

A. General Information

A.3 JRS Products for Construction Chemistry

Cellulose fibers

ARBOCEL®

Main Application

- Stuccos / plasters
- Tile adhesives
- Joint fillers for plasterboards
- Adhesive and reinforcing compounds for composite thermal insulation systems
- Joint fillers / filler compounds
- Emulsion paints, etc.
- Bituminous products

PE-fibrides

ARBOTHIX®

SYLOTHIX®

- Epoxy-resin-bound floors
- One- and two-component adhesives and sealants, etc.

Wood fibers

LIGNOCEL®

- Magnesite-bound flooring compounds
- Smoothing compounds, etc.

ARBOCEL®
Natural Cellulose Fibers

A. General Information

A.4 Competence in Construction Chemistry

Development / Application Technology

Our aim is to be responsive to market demands and develop innovative products that excel in your applications.

Process Technology / Production

We know that for you, conveyor technology, mixer technology and metering equipment are important components to ensure smooth production.

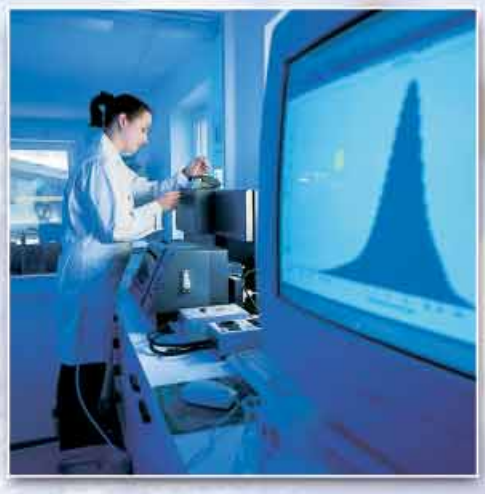
To ensure that our JRS products function optimally in your production plant, our Technical Department will support you in all matters relating to conveyor, mixing technology and metering.

On request, JRS can also supply silos and hoppers with suitable discharge equipment.

Experience / Expertise

JRS has been supplying innovative **ARBOCEL®** cellulose fibers to manufacturers of construction chemical products worldwide for over 30 years.
Make use of our success and experience.

We are looking forward to helping you with your technical requests.

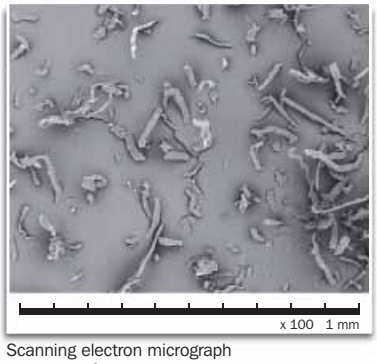


ARBOCEL®
Natural Cellulose Fibers

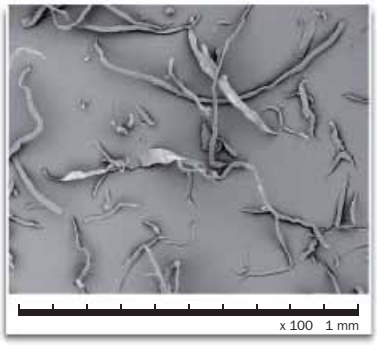
A. General Information

A.5 What is ARBOCEL® ?

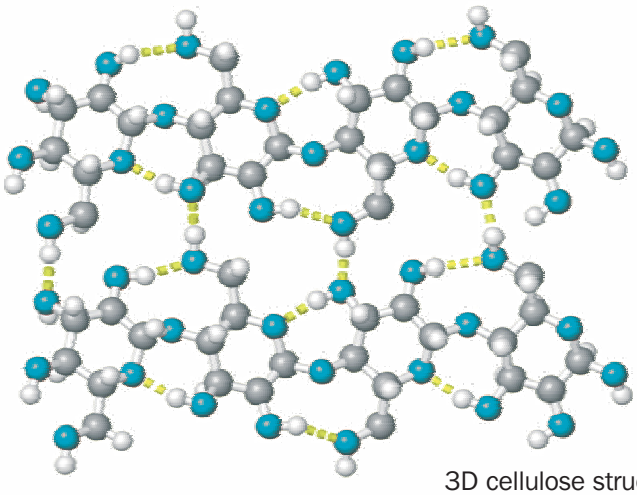
- **ARBOCEL®** is a powdery to fibrous cellulose additive for use in construction chemicals products.
- **ARBOCEL®** additives are produced from cellulose. A whole range of renewable raw materials is available for producing cellulose.
- **ARBOCEL®** are water-insoluble celluloses left in their natural state (not comparable to water-soluble cellulose ethers).
- **ARBOCEL®** is produced in various qualities (fiber lengths, thicknesses, purities, etc.) for a very wide range of industrial applications.



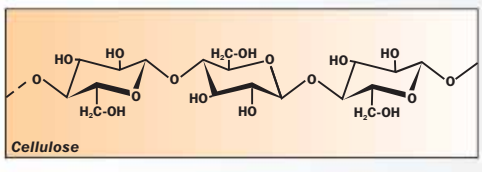
Scanning electron micrograph of **ARBOCEL® BWW 40**

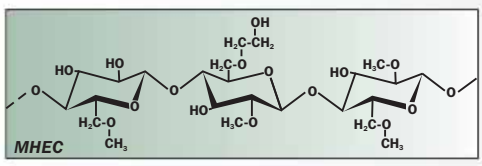


Scanning electron micrograph of **ARBOCEL® BC 1000**


3D cellulose structure

A.6 Comparison of Cellulose Ethers versus ARBOCEL®





Common properties, differences

	Cellulose ether	ARBOCEL® quality
Water soluble	yes	no
Stickiness	yes	no
Water retention	yes	yes
Example: Centrifugal method AACC	> 2000 %	BE 600/30 PU approx. 350 % BWW 40 approx. 580 % BC 1000 approx. 1000 %
Viscosity increase	yes	yes, but less compared to high viscosity cellulose ethers

ARBOCEL®
Natural Cellulose Fibers

*REM-Picture **ARBOCEL®** BWW 40*

A. General Information

A.7 Properties of ARBOCEL® Cellulose Fibers

- From the finest grades with a mean fiber length of 10 μm to the longest fiber grades with a mean fiber length of 2000 μm.
- Composite densities in finished products: 1.1 - 1.3 g/cm^3.
- In the long-fiber grades, curved fibers have a “felting” effect.
- **ARBOCEL®** cellulose fibers are also used as an asbestos substitute.
  Usually 30 - 50 % of the weight of asbestos previously used is sufficient.
- Completely safe and therefore suitable as substitute for asbestos in many applications.
- The steady-state moisture content of **ARBOCEL®** cellulose fibers is approx. 10 - 12 %. **ARBOCEL®** is normally supplied with a moisture content in the range of 4 - 8 %. In this form **ARBOCEL®** cellulose is slightly hygroscopic (water-absorbing). We therefore recommend that it is stored in a dry place.
- Insoluble in water and organic solvents.
- Resistant to dilute acids and bases.
- Guide values for temperature exposure:
  160 °C for several days
  180 °C for approx. 1 day
  200 °C is the limit of thermal exposure
- Water that penetrates into the fiber capillaries reaches the freezing point at approximately -70 °C. As a result of the formation of hydrogen bridge bonds between cellulose and water, the structure of the water is modified in such a way that the water is more compact at low temperatures than in liquid form. In practice this means complete frost protection of **ARBOCEL®** fibers (no bursting effect possible as with ice).

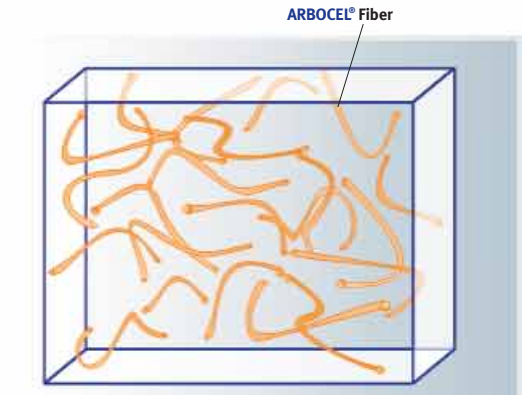
B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

B.1 Why is ARBOCEL® Used?

1. Strong thickening effect / fiber reinforcement

ARBOCEL® cellulose fibers form a three-dimensional framework with pronounced cross-linking effect. The cross-links trap liquids (water, emulsions, bitumen, etc.) in the structure. The greater the average fiber length, the greater is the thickening effect.

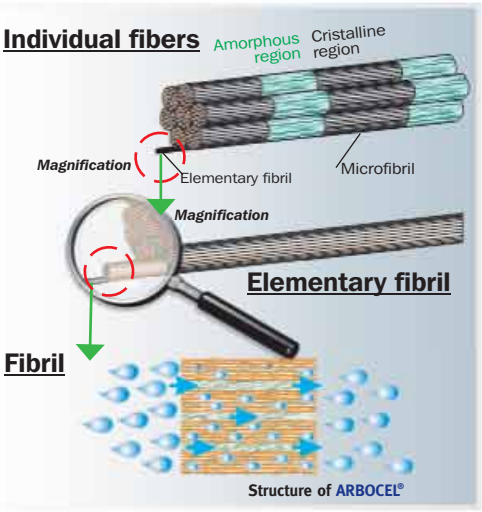
Thanks to these properties, **ARBOCEL®** has proved to be a suitable asbestos replacement.



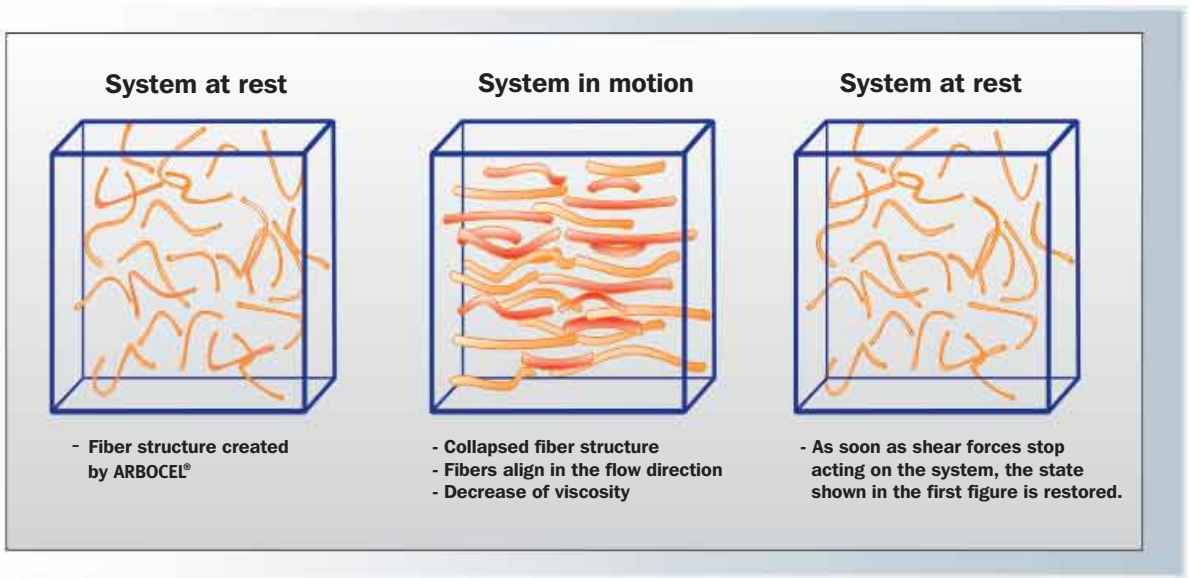
Mechanism of action - 3D fiber network

2. Improved processing characteristics thanks to the structural viscosity behavior of ARBOCEL® fibers

When shear forces act on the system (e.g. through stirring, pumping, etc.), some of the liquid trapped in the fiber structure is released into the matrix. The fibers align along the flow direction and consequently are able to slide past each other. The system becomes liquid (decrease of the viscosity). When the material is at rest, the fiber structure reforms, immediately re-trapping the liquid, i.e. the original viscosity state is immediately restored.



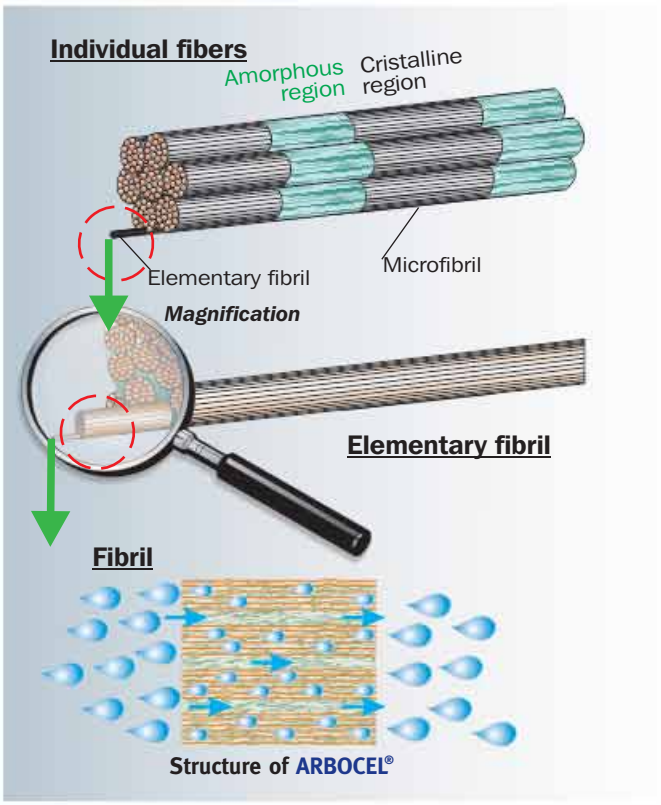
Structural viscous behavior of ARBOCEL®



B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

3. Good liquid absorption capacity in the ARBOCEL® fiber structure

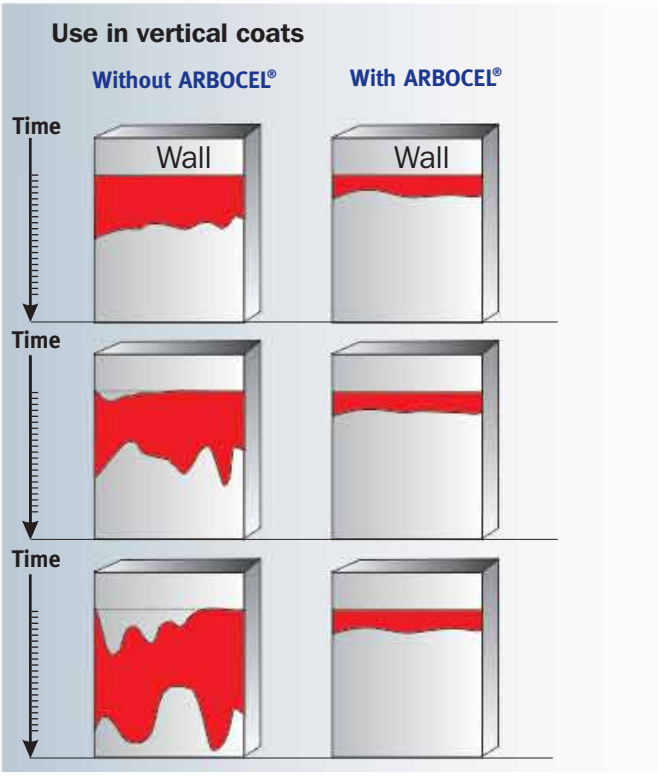
Liquid can be absorbed and transported through the **ARBOCEL®** capillaries. Once the system has set, the **ARBOCEL®** fibers are bound in the matrix, i.e. embedded in the binder, preventing any further absorption of moisture (e.g. from rain).



4. Better slump resistance

No slippage during processing in the just-applied state. As a result, much thicker coats can be applied in a single step.

In addition, the fiber reinforcement provides excellent thermal properties, with good liquid retention even at high temperatures.

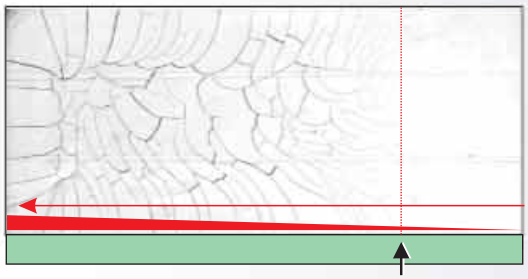


B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

5. Crack inhibitor

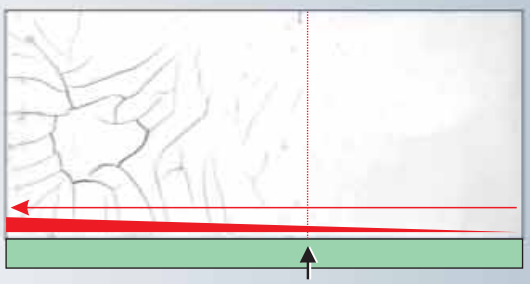
The mechanical energy generated during the setting or drying process is absorbed by the reinforcing fibers.

Crack inhibitor shown on an emulsion paint



2000µm Layer thickness 210µm 50µm

*Formulation **without** ARBOCEL®*



2000µm Layer thickness 430µm 50µm

*Reformulation **with** 5% ARBOCEL®*

6. Reduced shrinkage due to the reinforcing fibers

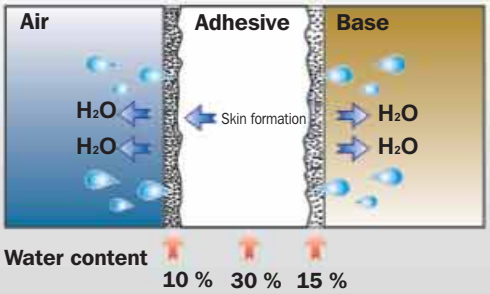
*Formulation **without** ARBOCEL®*

*Formulation **with** ARBOCEL®*

7. Long open time because liquid is transported by the cellulose fibers from inside (core) to the surface, where evaporation takes place.

Open time / tendency to form skin with and without ARBOCEL®

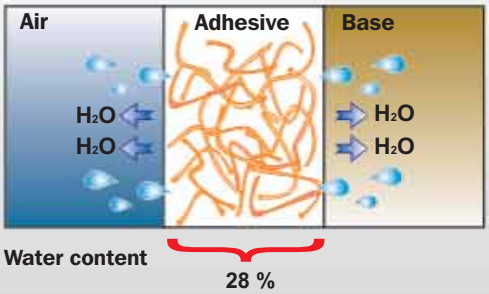
Adhesive with water retaining agent, approx. 20 minutes after application



Water content 10 % 30 % 15 %

No water equilibrium with the coating
Result ⇒ skin formation

Adhesive with water retaining agent and ARBOCEL®, approx. 20 minutes after application



Water content 28 %

Water equilibrium ensured by cellulose fiber structure
Result ⇒ greatly reduced tendency to form skin, uniform stress-free drying / setting

Note: The above values (e.g. 20 minutes) are intended only to demonstrate the effects of **ARBOCEL®**.

ARBOCEL®

Natural Cellulose Fibers

B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

B.2 Recommended JRS Qualities

Brand name	Color	Raw material	Grade	Average fiber length µm	Bulk weight approx. g/l	Cement-lime, Gypsum / Plaster, Lim: Mineral finishing plasters (cement / cement-lime)	Mineral insulating plasters (cement / cement-lime)	Mineral stucco base coats (plaster/ plaster-lime cement-lime / cement)	Mineral stucco light base coats	Mineral powder adhesives construction adhesives	Adhesives for thermal composite insulator systems	Mineral filler leveling compounds, joint fillers for plasterboards, skim coats	Extruded cement products
ARBOCEL®	White	Cellulose	BE 600/30 PU	40	220								
			B 600	60	200								
			B 00	120	165								
			BWW 40	200	125					■		■	
			FLP 500	500	85	■							
			FI 540 CA*	600	155	■							
			BC 200	300	70								
			BC 1000	700	37								
			B 400	900	30								
	Off-white		FD 00	150	165							■	
			FD 40	250	130					■		■	
	Gray		PWC 500	500	85	■	■				■		
			ZZC 500	400	90		■	■	■	■	■		
			ZZ 8/2 CA 1*	1000	70					■			
			ZZ 8/1 G	1000	30								■
ARBOTHIX® SYLOTHIX®	White	PE-fibride	51	400	25								
			52[1]	400	25								
			53[2]	100	25								
			PE 100	100	25								
LIGNOCEL®	Yellow	Wood	C 120	70-150	115								
			9	800-1100	175								

* Modified qualities with improved metering and blending properities.

1) and **2)** coated with amorphous silicic acid

ARBOCEL®

Natural Cellulose Fibers

Special types: Other **ARBOCEL®** grades with modified properties can be produced in cooperation with our customers. **Take advantage** of our technical experience and production expertise.

Binders

e	Synthetic resin					Bitumen			Epoxy		Other	
	Emulsion paints	Emulsion-bound stucco finish coats	Emulsion-bound tile adhesives	Emulsion-bound filler, joint, leveling compounds	Emulsion-bound joint fillers for plasterboards	Vibration damping pads	Bituminous expansion sheets	Cold bitumen applications in general / bitumen emulsions	Epoxy-resin-bound floors	1 or 2-component epoxy adhesives and sealants	Smoothing compound	Magnesite-bound flooring compounds
	■											
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■ preferred JRS grades

B. ARBOCEL® in Construction Chemical Products (mineral or emulsion-bound) and Bituminous Products

B.3 ARBOCEL® Selection Criteria

The most suitable **ARBOCEL®** grade depends on:

- The required profile of the finished product (e.g. surface, color, etc.)
- Type of mixer (Dry system or ready-to-use system)
- Application of the product
- Metering requirements

Our experts will be happy to help you finding the optimum **ARBOCEL®** grade for your application.

B.4 General Correlation: fiber length / effectiveness / mixing behavior:

ARBOCEL® type	Fiber length	Effectiveness	Mixing behavior	
			In dry mixtures	In aqueous systems
BE 600/30 PU	Short ø 40 µm	Low	Very good	Very good
PWC 500	Medium ø 500 µm	Good	Good	Very good
B 400	Long ø 900 µm	Very good	Possible*	Good

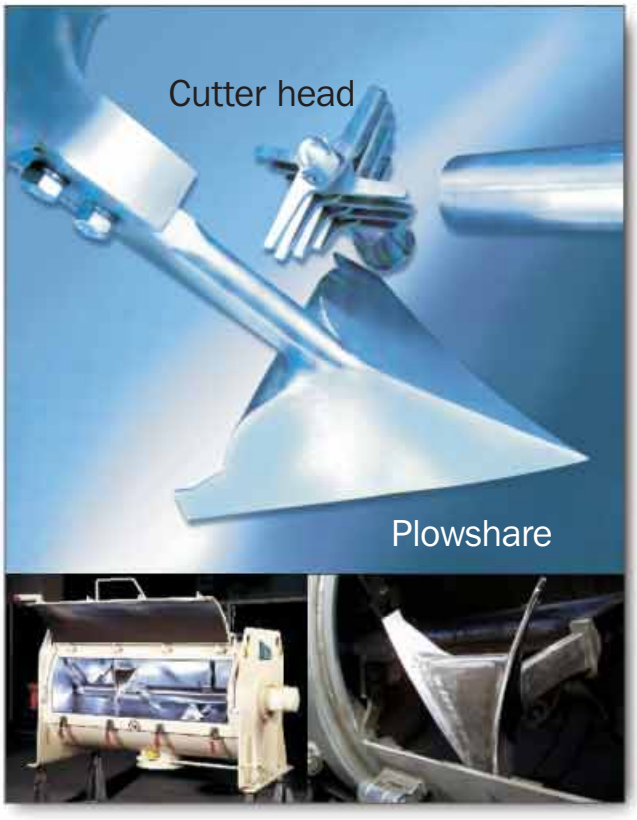
* If you have any difficulties blending **ARBOCEL®** we will be happy to help you.

C. Mineral / Dry Systems

Binder types:
cement, cement/lime,
gypsum, gypsum/lime,
magnesite, water glass

C.1 ARBOCEL® Grades Used:

The recommended grades used are **ARBOCEL® BWW 40**, **ARBOCEL® FD 40**, **ARBOCEL® PWC 500** and **ARBOCEL® ZZ 8/2 CA 1**.



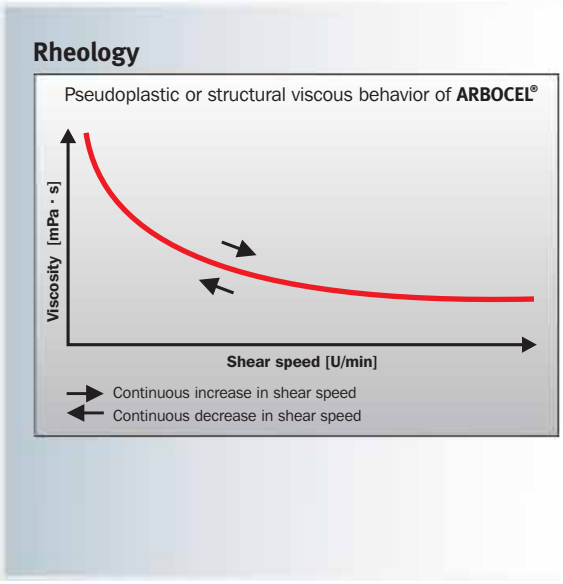
C.2 Blending Instructions for Dry Mixtures:

Short (40 µm - 120 µm) to medium-length (120 µm- 500 µm) **ARBOCEL®** fibers are usually easy to blend. If high-performance mixers with swirlers / cutter heads (e.g. Eirich, Lödige, Drais or m-tec blades) are available, it is typically possible to blend **ARBOCEL®** long fibers.

C.3 Guidance Notes:

1. It is essential that the working consistency is adjusted, not the appearance, since **ARBOCEL®** fibers have structural viscous properties. This means that the viscosity appears greater at rest than when shear forces are at work (i.e. when the product is being stirred, applied by brush, etc.).

2. If the original water/cement values need to be maintained, the increased water requirement due to **ARBOCEL®** must be compensated for by adjusting the proportion of cement or binder by weight.



C. Mineral / Dry Systems

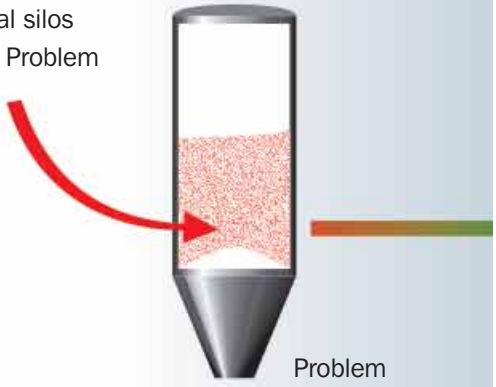
C.4 Metering and Transport Options

The material handling characteristics of **ARBOCEL®** fibers are typically more difficult than that of the basic products used in construction chemistry (e.g. sand, cement, etc.). JRS will be happy to assist you in matters relating to the metering, storage and transport of **ARBOCEL®** products. Take advantage of our expertise in the bulk handling of our **ARBOCEL®** fibers.

Problem

Where can metering / transport difficulties arise?

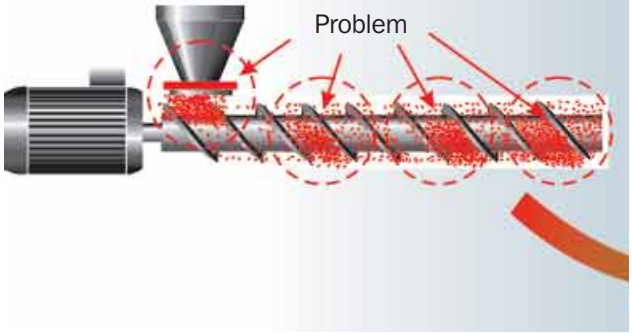
a.) in conical silos
bridging Problem



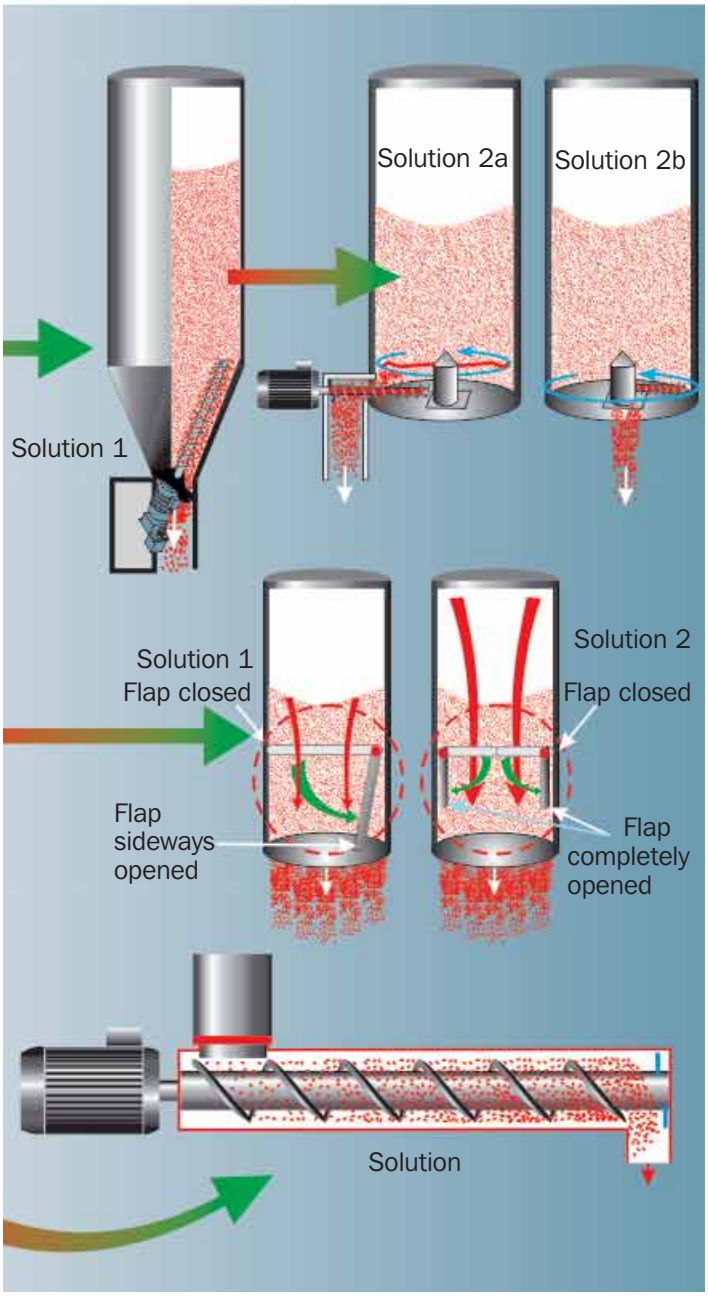
b.) on weighing machines

c.) in worm conveyors

Problem: **danger of material accumulation**



Solution



C. Mineral / Dry Systems

Solutions

JRS offers the following services:

a.) **Silo discharge modifications.** On request, JRS will supply complete silos with suitable discharge equipment.

b.) **Customer-specific supply and metering equipment,** can also be manufactured by JRS on request.

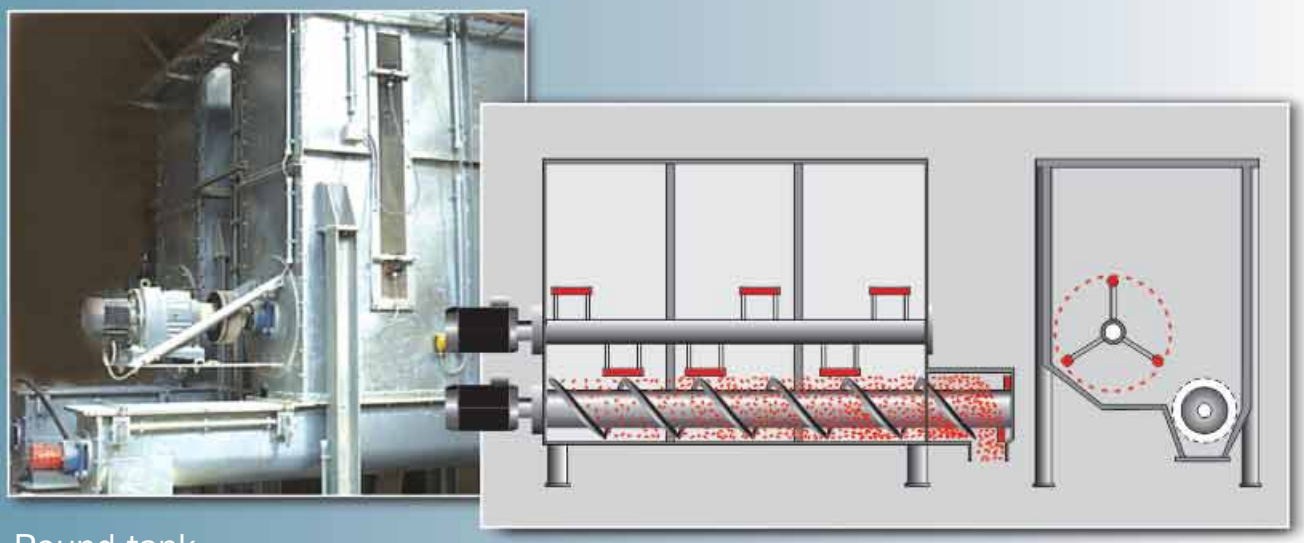
c.) **Modification of existing silos** (fitting of suitable discharge aids).

d.) **Specially modified ARBOCEL® grades** with optimized flow/metering properties.

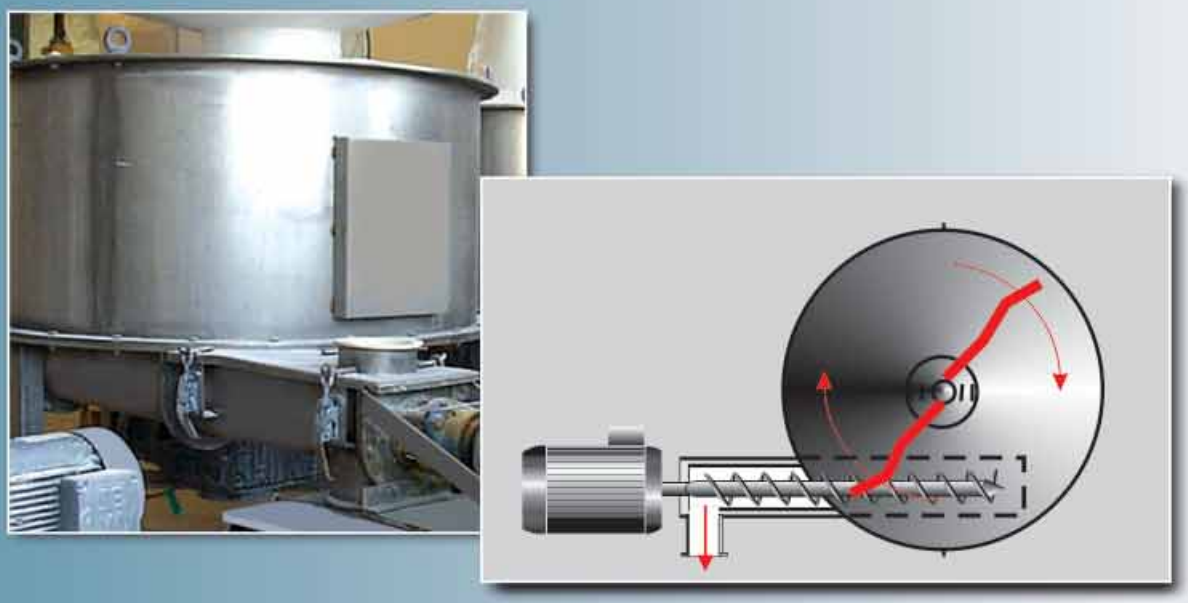
e.) **Advice on the sizing and design of plant components** for bulk handling.

f.) **Planning, construction and commissioning of complete customized silo systems.**

Rectangular tank



Round tank



C. Mineral / Dry Systems

C.5 Applications / Quantities Used

C.5.1 Powder adhesives (cement tile adhesives)

0.4 - 0.5 % **ARBOCEL® FD 40** or **ARBOCEL® BWW 40** by weight
0.3 - 0.4 % **ARBOCEL® ZZ 8/2 CA 1** by weight

Advantages with **ARBOCEL®** *:*
– *Good slump resistance of the adhesive (reduced tile slip)*
– *Improved workability*
(thick without the need to exert great force)
– *Reduces undesirable sticking to tools*
– *In many cases longer open time and better adhesion strength*

C.5.2 Stuccos / Plasters

a) Mineral stucco finish coats
(cement / lime-cement*): gypsum, gypsum / lime*

0.4 - 1.0 % **ARBOCEL® PWC 500**, **ARBOCEL® FLP 500** or **ARBOCEL® FI 540 CA** by weight

Advantages with **ARBOCEL®** *:*
– *Good slump resistance*
– *Improved workability*
– *Inhibits cracking after application and during setting*
– *Improves texturing (sharp contours)*

** binders*

b) Mineral insulating plasters

0.3 - 0.5 % **ARBOCEL® PWC 500** or **ARBOCEL® ZZC 500** by weight

Advantages with **ARBOCEL®** **:**
– *Very good slump resistance*
(even when applied in thick coats)
– *Improved workability*
– *Separation inhibitor for dry ready-to-use mixtures*

C. Mineral / Dry Systems

c) Mineral stucco / plaster base coats

0.2 - 0.5 % **ARBOCEL® PWC 500** or
ARBOCEL® ZZC 500 by weight

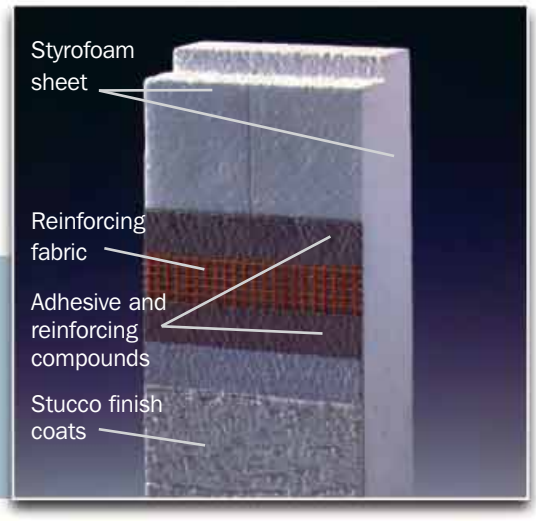
Advantages with **ARBOCEL®** *:*
– Easy to work when smoothing
– Separation inhibitor for dry ready-to-use mixtures
– Improves slump resistance

d) Mineral stucco / plaster light base coats

Binder: plaster, plaster / lime:
0.2 - 0.3 % **ARBOCEL® PWC 500**
or **ARBOCEL® ZZC 500** by weight

Binder: cement, cement / lime:
0.2 - 0.3 % **ARBOCEL® PWC 500**
or **ARBOCEL® ZZC 500** by weight

Advantages with **ARBOCEL®** *:*
– Easier to work when smoothing
– Improves yield of the plaster
– Separation inhibitor for dry ready-to-use mixtures
– Longer life of worm conveyors
– Improves slump resistance



C.5.3 Adhesive and reinforcing compounds in exterior insulation finishing system (EIFS)

Approx. 0.3 % **ARBOCEL® PWC 500** or
ARBOCEL® ZZC 500 by weight

Advantages with **ARBOCEL®** *:*
– Good slump resistance
– Improves working properties
– Reduction of formulation costs

C. Mineral / Dry Systems

C.5.4 Joint fillers for plasterboards

0.5 - 1.0 % **ARBOCEL® FD 40** or
ARBOCEL® FD 00 by weight

Advantages with ***ARBOCEL®*** *:*
– Reduces cracking and shrinkage
– Improves workability
– Improves standability

C.5.5 Filler compounds and joint fillers

0.5 - 1.0 % **ARBOCEL® FD 00** or
ARBOCEL® FD 40 by weight

Advantages with ***ARBOCEL®*** *:*
– Reduces cracking and shrinkage
– Improves workability
– Improves standability

C.5.6 Pastes for heavy wallpapers

3.0 % **ARBOCEL® BWW 40** by weight
5.0 % **ARBOCEL® B 600** by weight

Advantages with ***ARBOCEL®*** *:*
– Improves workability
– Less tendency to splatter when being applied
– Formulation costs can be reduced

C. Mineral / Dry Systems

C.5.7 Construction adhesives

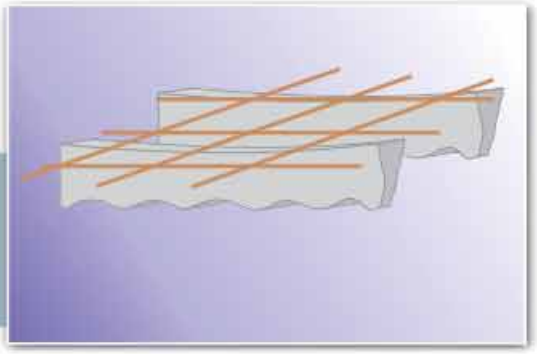
0.2 - 0.5 % **ARBOCEL® ZZC 500** by weight

Advantages with **ARBOCEL®** *:*
– Improves workability
– Reduces tool sticking
– Optimizes formulation costs
– Improves slump resistance

C.5.8 Extruded spacers for steel mats in concrete construction

0.1 - 1.0 % **ARBOCEL® ZZ 8/1 G** by weight

Advantages with **ARBOCEL®** *:*
– Extrusion aid
– Improves slump resistance
– Formulation costs can be optimized



C.5.9 Extruded cement profiles

(e.g. window ledges)

3.0 - 5.0 % **ARBOCEL® ZZ 8/1 G** by weight

Advantages with **ARBOCEL®** *:*
– Extrusion aid
– Improves slump resistance

C.5.10 Skim Coats

1.0 - 3.0 % **ARBOCEL® FD 00** by weight

Advantages with **ARBOCEL®** *:*
– Suppresses cracking
– Improves working properties

D. Emulsion-Bound Systems / Paste Systems

D.1 ARBOCEL® Grades Used

ARBOCEL® BE 600/30 PU, **ARBOCEL® B 00**, **ARBOCEL® BWW 40** and **ARBOCEL® B 400**

D.2 Mixing Notes

Blending **ARBOCEL®** fibers is usually straight forward. The addition of wetting agents is normally not required. In order to reach the final viscosity more quickly, it is advisable to add **ARBOCEL®** in the aqueous phase. **ARBOCEL®** can also be added after production of the batch for controlling viscosity. If dissolvers are used, it is recommended that **ARBOCEL®** be added at the end of the mixing process. Even small amounts of **ARBOCEL®** will significantly increase the viscosity of an emulsion-bound system. The longer the fibers of the **ARBOCEL®** type used, the greater is the viscosity increase.

D.3 Guidance Notes

The consistency of the **ARBOCEL®** formulation must be set for an optimum tradeoff between workability and slump resistance. Keep in mind that with systems containing **ARBOCEL®** it is not the apparent consistency at rest that should be set but rather the working consistency. Systems in which **ARBOCEL®** is completely at rest are more viscous.

Laboratory dissolver

D. Emulsion-Bound Systems / Paste Systems

D.4 Applications / Quantities Used

D.4.1 Synthetic resin coatings

Exterior use: 0.2 - 0.4 % **ARBOCEL® B 400** or **ARBOCEL® BC 1000** by weight
Interior use: 0.5 - 2.0 % **ARBOCEL® B 400** or **ARBOCEL® BC 1000** by weight

Advantages with **ARBOCEL®** *:*
– Good slump resistance
– Improved workability
– Prevents cracking
– Very good texturing (sharp contours)

D.4.2 Joint fillers for Plasterboards

0.5 - 1.0 % **ARBOCEL® B 00** by weight

Advantages with **ARBOCEL®** *:*
– Reduces cracking and shrinkage
– Improves workability
– Improves standability

D.4.3 Emulsion tile adhesives

0.4 - 0.5 % **ARBOCEL® BWW 40** or **ARBOCEL® BC 200** by weight

Advantages with **ARBOCEL®** *:*
– Good slump resistance (no slipping of tiles)
– Improved workability

D.4.4 Emulsion fillers/joint filler compounds

0.5 - 0.8 % **ARBOCEL® B 600** or **ARBOCEL® B 00** by weight

Advantages with **ARBOCEL®** *:*
– Inhibits cracking and shrinking
– Improves workability
– Improves sandability

D. Emulsion-Bound Systems / Paste Systems

D.4.5 Emulsion paints (semi gloss and flat)

a) Paints for airless spray application

1.0 - 5.0 % **ARBOCEL® BE 600/30 PU** by weight

Advantages with **ARBOCEL®** :
– *Suppresses sheen*
– *Improves rheological properties*
– *Reduces density*
– *Inhibits cracking*

b) Facade paints applied by roller or brush

0.5 - 3.0 % **ARBOCEL® B 00** or
ARBOCEL® BWW 40 by weight.

Advantages with **ARBOCEL®** :
– *Improves rheological properties*
– *Suppresses cracking and shrinking*
– *Thicker applied coats*

c) Crack-bridging reinforcing paints

0.4 - 0.8 % **ARBOCEL® BC 200** or
ARBOCEL® BC 1000 by weight

Advantages with **ARBOCEL®** :
– *Crack suppression*
– *Improves rheological properties*

D. Emulsion-Bound Systems / Paste Systems

Where else is ARBOCEL® used in paint applications?

- **Emulsion paints**
- **Silicate paints**
- **Lime-cement paints**
- **Powder paints**
- **Paints with structure effects (wood fibres)**

Applications and amounts in paint applications

Application	Recommended ARBOCEL® grade	Recommended average quantity
Interior emulsion paints, matt, applied by airless spray	BE 600/30 PU	1.0 - 5.0 %
Interior emulsion paints, matt, applied by airless spray	BE 600/30 PU	0.5 - 2.5 %
Emulsion silicate paints	BE 600/30 PU	0.5 - 1.0 %
Emulsion powder paints (special full-tone powder paints) Emulsion silicate paints	BE 600/30 PU	5.0 - 8.0 %
Textured paints applied by rollers	BWW 40 B 00	0.5 - 3.0 %
Reinforcing paints	BC 200 BC 1000	0.5 - 3.0 %
Paints for road markings	BC 1000	0.4 - 0.8 %

E. Bituminous Systems

E.1 ARBOCEL® Grades Used:

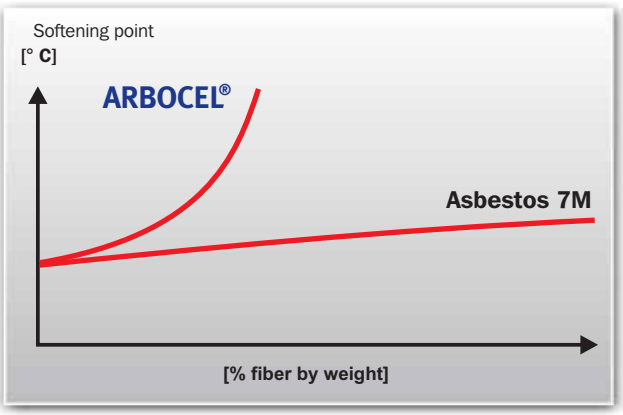
The grades most commonly used in the bitumen sector are **ARBOCEL® ZZ 8/1 G** and **ARBOCEL® ZZC 500**. When used as an asbestos replacement, 30 % to maximum 50 % by weight of the asbestos quantity previously used is usually sufficient.

The resulting deficiency of volume should be compensated for by the addition of a suitable filler.

ARBOCEL® cellulose fibers result in:

– *Greater thickening*
– *Extremely good slump resistance even in hot environments (over 90 °C)*
– *Good workability*

In comparison to group 7 asbestos, **ARBOCEL® ZZ 8/1 G** gives a rougher and less glossy surface. If a smoother surface is required, it is recommended that **ARBOCEL® ZZC 500** be used. Since this product is a shorter fiber, 20 - 40 % more **ARBOCEL®** by weight must be added in comparison to **ARBOCEL® ZZ 8/1 G**.



E.2 Guidance Notes:

– The longer the average fiber length of the **ARBOCEL®** grade, the greater is its yield and the more the viscosity is increased.

– The larger the amount of **ARBOCEL®** used, the greater the cross-linking effect of the fiber structure formed. The fiber structure enhances the thermal resistance of the formulation.

– The fiber structure results in bitumen being deposited on the fibers.

– The shorter the average fiber length of the **ARBOCEL®** grade, the smoother the surface of the finished product.

– If dissolvers are used, we recommend that the fibers be added at the end of the blending process.

– With moderate to low-viscosity cold bitumen compounds, sedimentation may occur. This can be inhibited by stabilizers such as magnesium coated silicates or pyrogenic silicic acids.

– In the case of bitumen systems that are applied by airless spray, the correct **ARBOCEL®** grade for the nozzle size must be used to prevent clogging.

– The use of **ARBOCEL®** fibers can result in a subsequent thickening effect, thus raising the viscosity. This effect also occurs in bitumen products containing solvents (sol-gel changes), especially in cold bitumen with a petroleum spirit base. Normally this effect runs its course in a matter of a few days.

– It is also interesting to note that the softening point is higher when the same amount is added in comparison to asbestos 7 M and that it also increases more steeply.

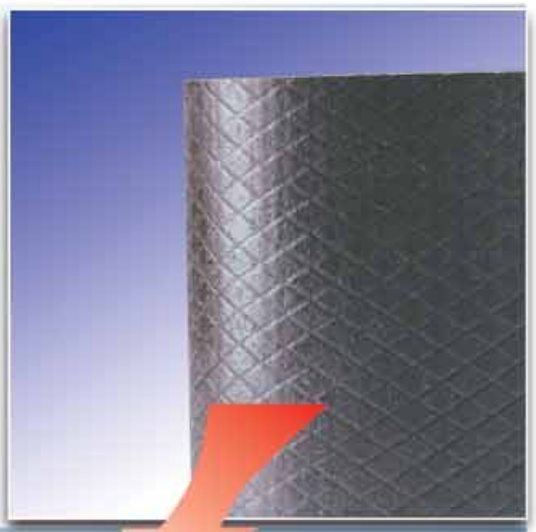
E. Bituminous Systems

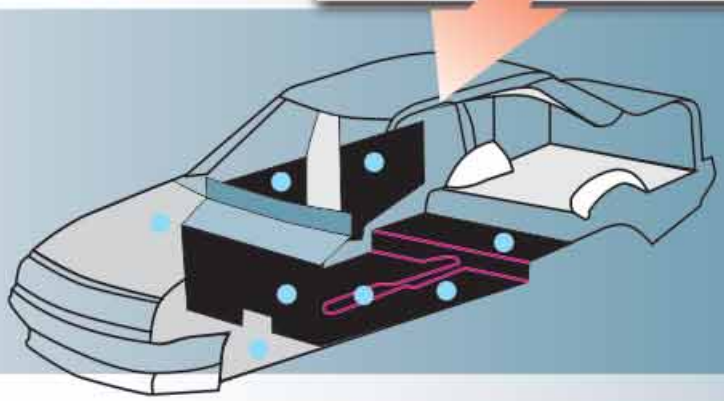
E.3 Applications / Quantities

E.3.1 Vibration dampening pads

These are 2 mm embossed sheets which are usually applied directly to car panels to suppress noise.

Amount used:
0.8 - 3.0 % **ARBOCEL® ZZ 8/1 G** by weight





Advantages with **ARBOCEL®** *:*
– Increases heat resistance
– Replaces asbestos
– Improves working properties

E.3.2 Expansion Bands

These are used as a joint material, e.g. in highway construction in the joint between consolidation strips (concrete to asphalt or concrete to concrete). The tape is activated by heating.

Quantity used:
approx. 5.0 - 8.0 % **ARBOCEL® ZZ 8/1 G** by weight

Advantages with **ARBOCEL®** *:*
– Greatly increases heat resistance
– Replaces asbestos
– Improves working properties

E. Bituminous Systems

E.3.3 Filler compounds / putty

3.0 - 6.0 % **ARBOCEL® ZZ 8/1 G** by weight
4.0 - 7.0 % **ARBOCEL® ZZC 500** by weight for smoother surfaces

Advantages with **ARBOCEL®** *:*
– Replaces asbestos
– Greatly increases heat resistance
– Inhibits cracking

Note:
ARBOCEL® is usually used only in medium and high-viscosity systems.

E.3.4 Medium and high-viscosity spray and brush-applied compounds

2.0 - 4.0 % **ARBOCEL® ZZ 8/1 G** by weight (brush-applied use)
3.0 - 5.0 % **ARBOCEL® ZZC 500** by weight (spray-applied use)

Advantages with **ARBOCEL®** *:*
– Replaces asbestos
– Inhibits cracking
– Permits thicker coats to be applied in one process
– Greatly increases heat resistance of coats, i.e. no running down vertical walls

E. Bituminous Systems

E.3.5 Roof coatings (with or without aluminum)

2.0 - 6.0 % **ARBOCEL® ZZC 500** or
ARBOCEL® ZZ 8/1 G by weight

Advantages with ***ARBOCEL®*** *:*
– Replaces asbestos
– Greatly increases heat resistance
– Reduces tendency of aluminum particles (in product) to settle out
– In bitumen foils partial replacement of SBS possible

Note:

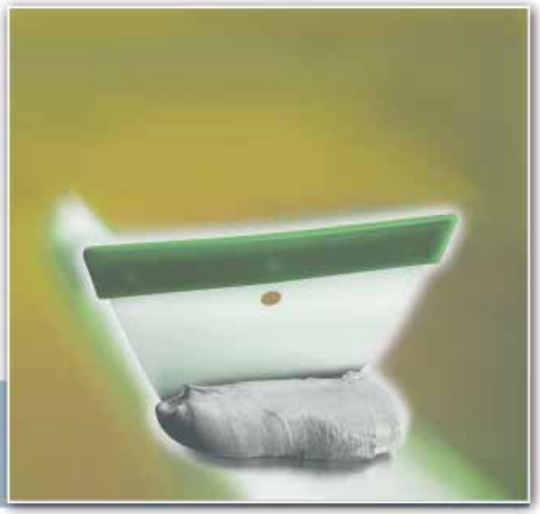
In general when **ARBOCEL®** is used in bitumen emulsions it must be ensured that the **ARBOCEL®** is added in small portions to the bitumen emulsion while stirring. (If too much **ARBOCEL®** is added, the bitumen emulsion can separate and form clumps). The rest of the materials can then be added and blended.

ARBOCEL® is usually used in anionic bitumen emulsions.

F. LIGNOCEL®

F.1 Application

LIGNOCEL® wood fiber materials are used in construction chemical products only if the wood constituents (lignin, resin and hemicellulose) will not adversely affect the finished product (wood constituents can result in yellowing, bleaching or discoloration).



F.2 Smoothing Compounds

Approx. 30 - 40 % **LIGNOCEL® C 120** by weight

Advantages with **LIGNOCEL®** *:*
– Improves working properties
– Makes for a more cost-effective filler

F.3 Magnesite-bound Flooring Compounds

Approx. 30 - 40 % **LIGNOCEL® 9** by weight

Advantages with **LIGNOCEL®** *:*
– Stabilizes the mixture
– Reduces cracking during setting
– Promotes slow, uniform setting

SYLOTHIX®
PE-Fibrid

G. SYLOTHIX® / ARBOTHIX®
Setting and thixotropic agents

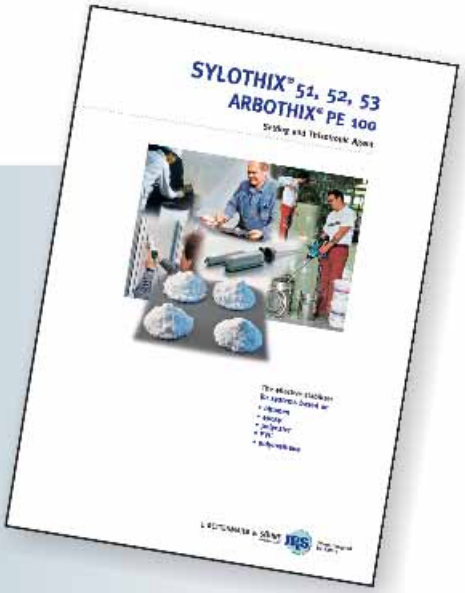
G.1 Stabilizer for Viscous Systems

SYLOTHIX® / **ARBOTHIX®** are highly efficient thixotropic agents used in:

- Bitumen
- Epoxy
- Polyester
- PVC
- Polyurethane

Advantages of SYLOTHIX® / ARBOTHIX®

- Stabilizes
- Improves slump resistance
- Thickening (thixotropic) effect
- Easy to work
- Less dust generation



G.2 Type Chart

* **ARBOTHIX® PE 100** corresponds to and complements the **SYLOTHIX®** product line in its properties.

Type	SYLOTHIX® 51	SYLOTHIX® 52	SYLOTHIX® 53	*ARBOTHIX® PE 100
Fiber length	400 µm	400 µm	100 µm	100 µm
Portion of amorphous silicic acid (particle size 3 µm)	-	ca. 60 %	ca. 50 %	
Humidity	max. 2 %	max. 3 %	max. 3 %	max. 2 %
Mixing ease	+	++	+++	+++
Effectiveness	+++	++	+	++
	SYLOTHIX® and **ARBOTHIX®** can become electrically charged as they flow from equipment. The product in dust form can form an inflammable and explosive mixture with air. **SYLOTHIX®** and **ARBOTHIX®** should be stored in a clean dry room. Opened containers should be resealed to avoid product contamination. The material should be used within six months.			
Health And Safety Information Please follow safety guidelines as well as national legislation and regulations. Additional information can be found on our Safety Data Sheet.	**SYLOTHIX® 51** is a fine polyethylene fiber. During processing care must be taken to ensure that no dust is generated	**SYLOTHIX® 52** is a combination of fine polylethylene fibers and synthetic amorphous silicic acid. During processing care must be taken to avoid dust generation. In Germany an absolute fine dust level of 4 mg/m³ must not be exceeded during the handling of **SYLOTHIX® 52** (maximum workplace level).	**SYLOTHIX® 53** is a combination of fine polylethylene fibers and synthetic amorphous silicic acid. During processing care must be taken to avoid dust generation. In Germany an absolute fine dust level of 4 mg/m³ must not be exceeded during the handling of **SYLOTHIX® 53** (maximum workplace level).	**ARBOTHIX® PE 100** is a fine polyethylene fiber. During processing care must be taken to avoid dust generation. In Germany an absolute fine dust level of 4 mg/m³ must not be exceeded during the handling of **ARBOTHIX® PE 100** (maximum workplace level)

G.3 Guidance Notes

SYLOTHIX® and **ARBOTHIX®** can be worked into all liquid media and resins with high-speed mixers / dissolvers. The stirring or dispersing time is approx. 5 - 10 minutes. **SYLOTHIX®** and **ARBOTHIX®** should not be compacted / compressed before blending (clumping).
The blending temperature should not exceed 110 °C.
Recommended dosage: 1 - 3 % by weight.

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Natural Cellulose Fibers

LIGNOCEL®
Wood Fiber Materials

SYLOTHIX®
Polyethylene Fibers

ARBOTHIX®
Polyethylene Fibers

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Microcrystalline Cellulose (MCC)
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Ultrafine Celluloses (UFC)
Croscarmellose (CCM)
Sodium Starch Glycolate (SSG)
Composit Products
Contract Services

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21 Production plants in Germany, Finland, UK, USA, Mexiko, India

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Fibers designed by Nature

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