



PANGEL

**INNOVATIVE SOLUTIONS FOR
THE PAINT INDUSTRY**

*Dentro de la tierra. Dentro de nuestras vidas.
Inside the earth. Within our lives.*



Some Figures on Tolsa Group

*Spanish Multinational Company with a history of over **58 years**.*

- **BUSINESS:**

Extraction, transformation and sales of special clays and composts.

- **WORKFORCE:**

750 people.

- **TURNOVER:**

165 million € (2009).

TOLSA GROUP: HISTORY

Founded 1957 in
Toledo (Spain)

Family owned business

Innovative and expansive mentality

BERKBENT RANGE

FOR THE CIVIL ENGINEERING SECTOR



- ❖ 1957 Tolsa
- ❖ 1986 Tolsa France
- ❖ 1990 Italcat
- ❖ 1996 Steetley Minerals
- ❖ 1998 SSPT
- ❖ 1999 Mabensa
- ❖ 2002 Mostert Absorbents
- ❖ 2005 Gordion



Tolsa Group Worldwide



TOLSA GROUP OPERATION UNITS

MINING AREAS



Spain
Morocco
Argentina
Senegal
Turkey

PRODUCTIONS UNITS



Spain
United Kingdom
France
Holland


DISTRIBUTION & SALES



Spain
United Kingdom
Italy
France
Holland



The Markets we supply

- 
- Coatings & Bitumen
 - Construction additives (mortar, plaster & concrete)
 - Civil Engineering & Drilling fluids
 - Foundry
 - Paper
 - Animal nutrition
 - Environmental (Filtration, oil treatment, water & effluents, waste treatment, landremediation).
 - Industrial Absorbents
 - Agriculture (solid & liquid fertilizers, agrochemicals)
 - Pet litters & Gardening Products

Additives and Fillers





Additives & Fillers



Tolsa Group manufactures a wide range of additives and functional fillers with use in a wide variety of fields and industrial applications.

PANGEL range bring to the market a complete tool-box of special clay based additives for paints and coatings, fertilizers and in a variety of different bitumen and asphalt based systems.

PANSIL products provides a full set of absorbing and spherical fillers that makes possible to absorb liquids and gases as well as improve weight while insulation, flow and resistance properties are optimized in the final formulation.



TOLSA GROUP Raw Materials



B e n t o n i t e s

Grupo Tolsa manufactures high quality bentonite products used as binders, sealants, retention agents, thickeners or absorbents



S e p i o l i t e & A t t a p u l g i t e

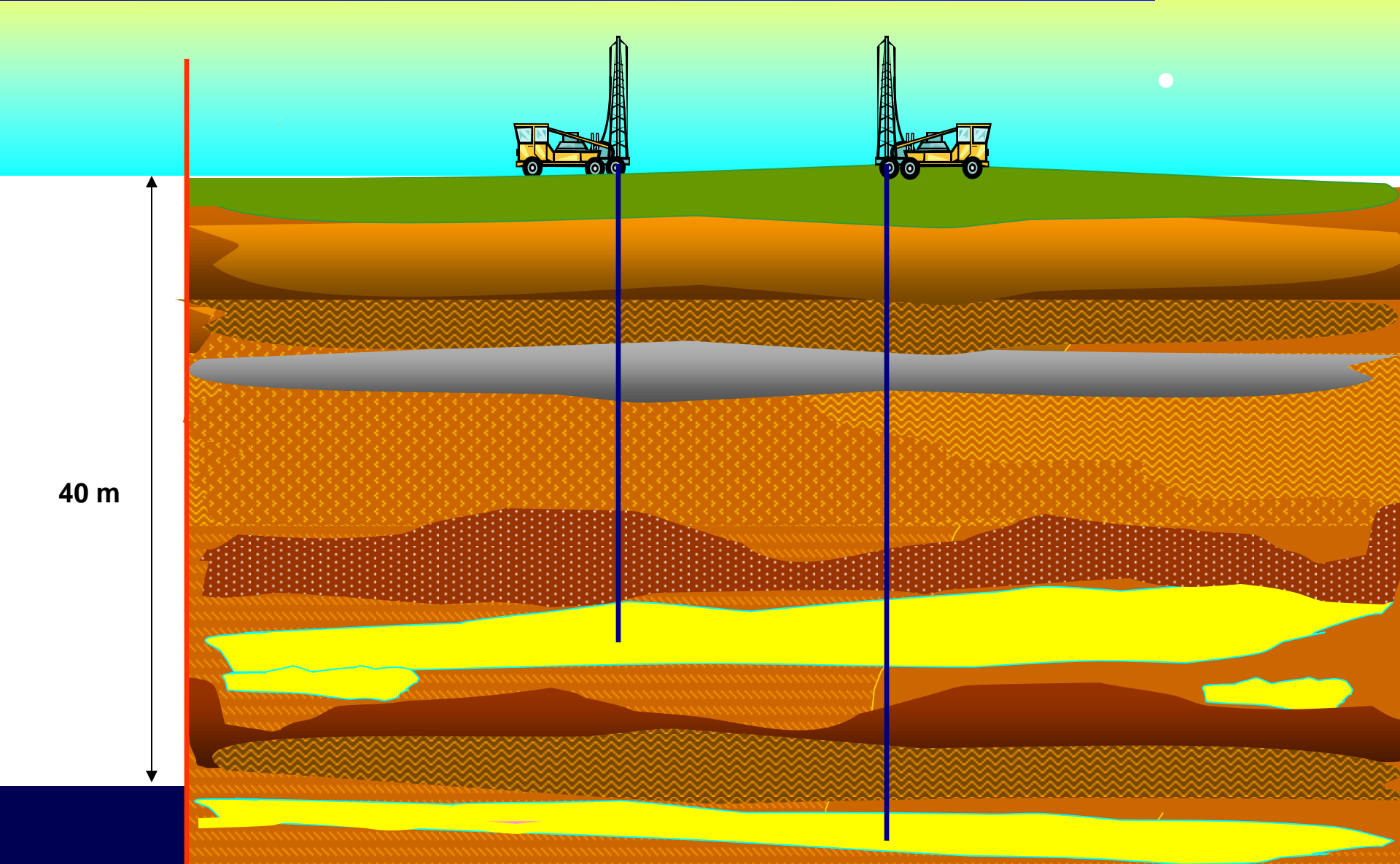
Grupo Tolsa manufactures granular products used as industrial or pet absorbents or high quality carriers; and micronized products used as thickeners, thixotropes, suspending agents or high absorption fillers



O t h e r P r o d u c t s

Tolsa is constanly seeking for new products to complement our portfolio of additives for the industry

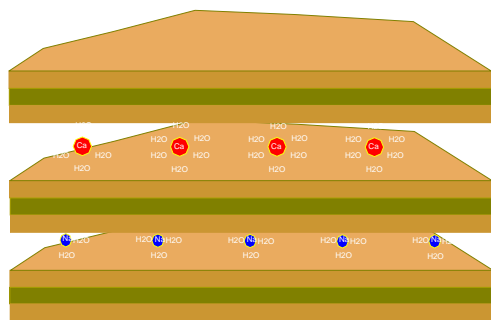
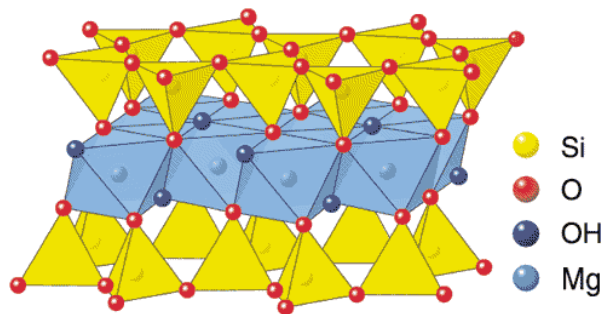
Sepiolite mining (Madrid)



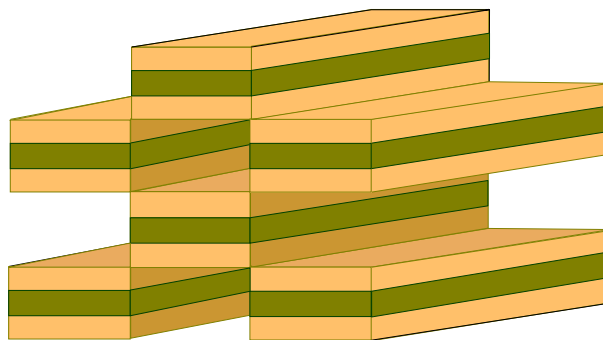




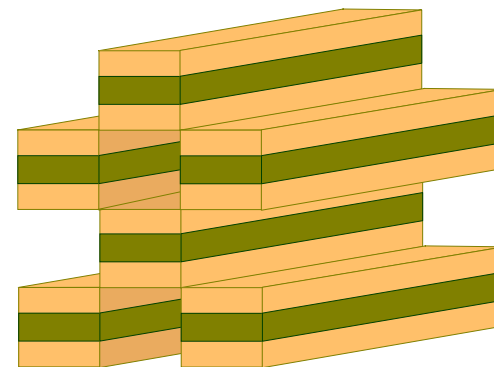
Phyllosilicates Structure



**Smectites
(Bentonites)**



Sepiolite



Attapulgite

Special Clays

SEPIOLITE



CALIFORNIAN
HECTORITE



WYOMING
BENTONITE

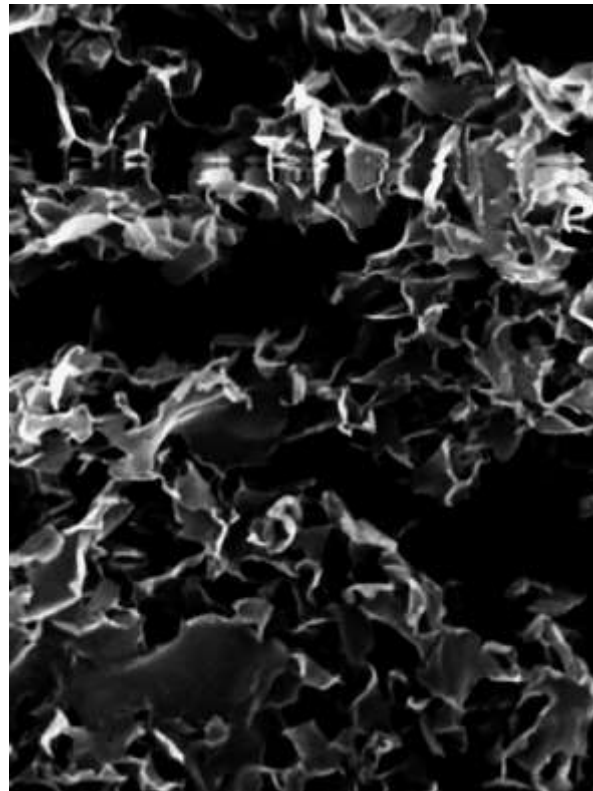


LAPONITE 100nm

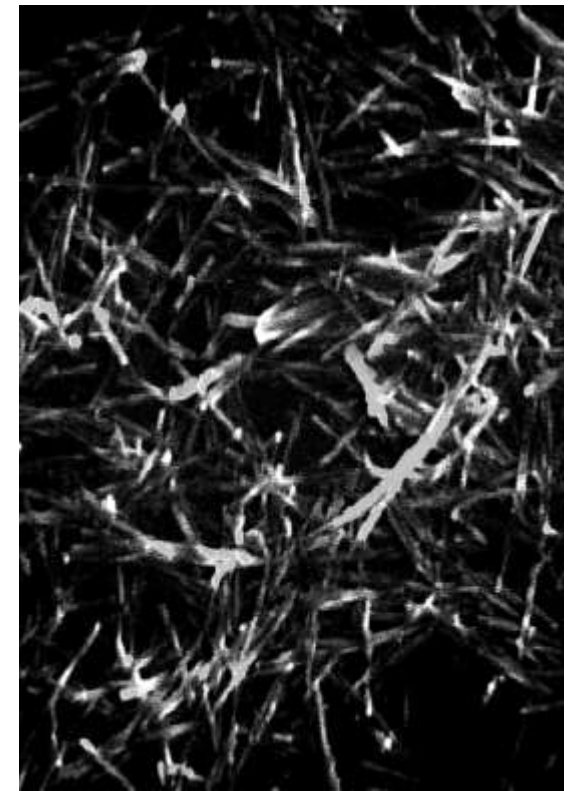


Particle Size

	Thickness	Diameter
Bentonite	9.5 Å	0.2 -2 µm
Hectorite	9.2 Å	0.2 -5 µm
	Diameter	Length
Sepiolite	20 nm	0.2 -2 µm
Attapulgite	20 nm	0.1 -1 µm



Bentonite (Smectite)



Sepiolite/Attapulgite



Properties

Our products provide two main properties:

<u>ABSORPTION</u>	<u>RHEOLOGY</u>
VOC Control	Suspending Agent
Filtration	Can Stability
Carriers	Sag Control
Binders	Syneresis Control
Technical Filler	Slide Control
Anti-Caking	Thickening
Emulsions	Workability



PANGEL

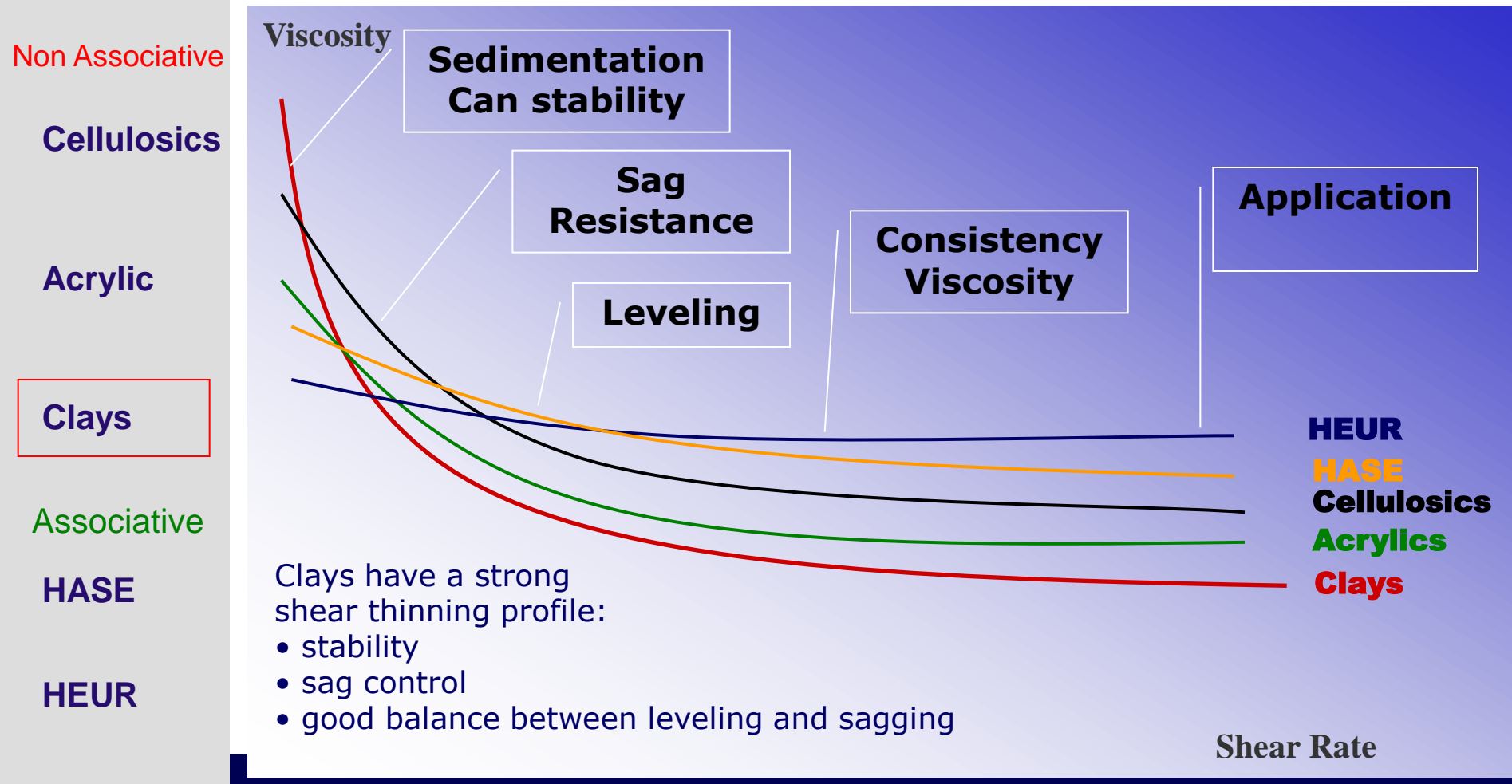
Innovative Solutions

Paints & Coatings
WATER BASED

Dentro de la tierra. Dentro de nuestras vidas.
Inside the earth. Within our lives.

TOLSA  **GROUP**

Water based Rheological Additives



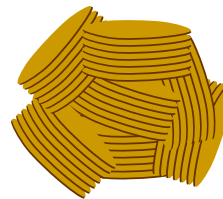
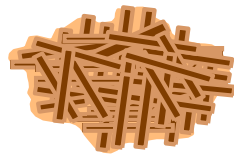


Effect of Dispersion

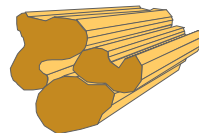
Pangel S

Pangel M/OM

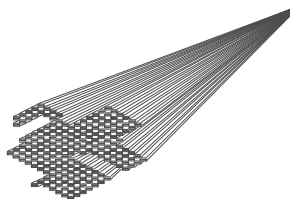
**Agglomerate
of bundles**



**Bundle of
Particles**



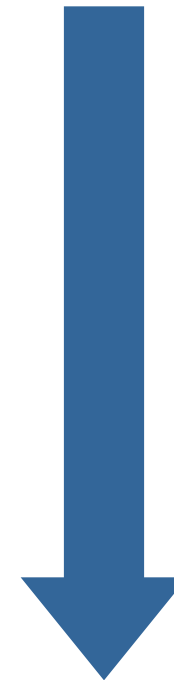
**Elementary
Particle**



No thickening

**RHEOLOGICAL
ADDITIVE**

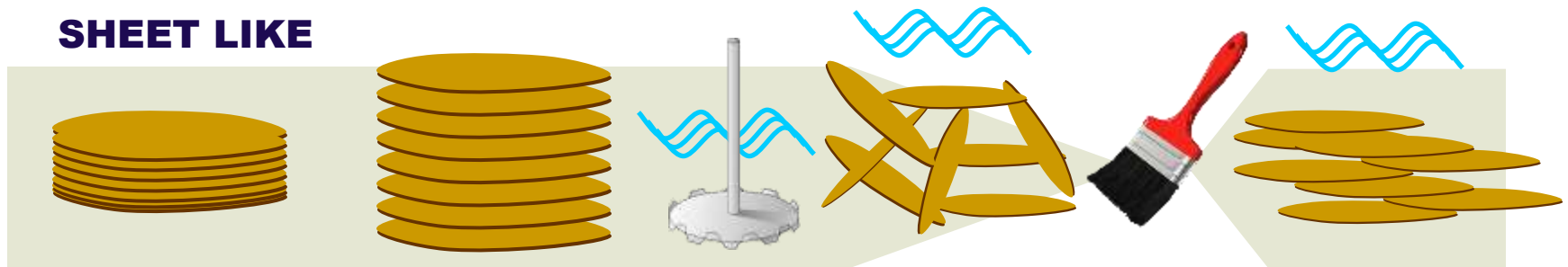
**HIGHLY EFFICIENT
RHEOLOGICAL
ADDITIVE**





Clays Gelling Mechanism

SHEET LIKE

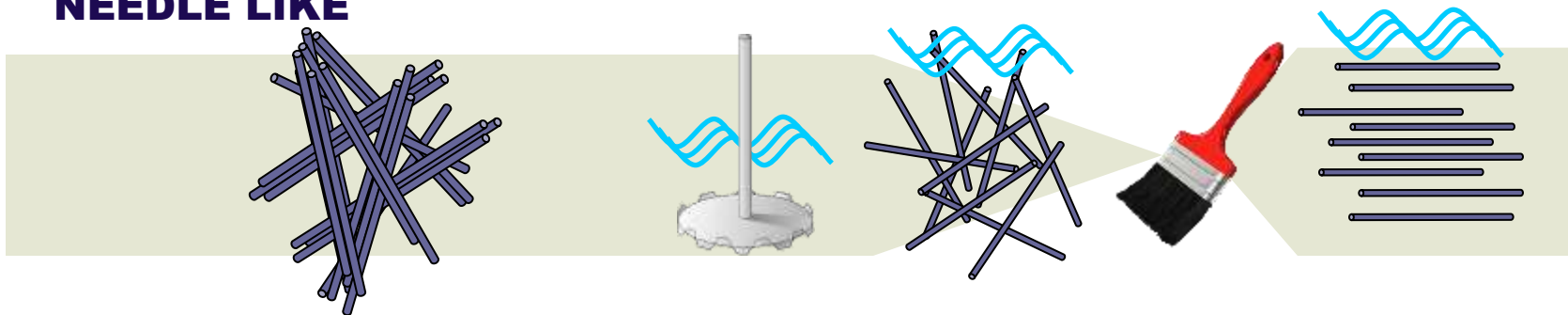


SWELLING

GEL STRUCTURE

STRUCTURE TEMPORARY
DESTROYED

NEEDLE LIKE





Bentonite vs Sepiolite

Bentonite

- Better dispersion at low shear
- Better optical properties
- Better in low solids systems: gel coats, varnish, water suspensions

Sepiolite

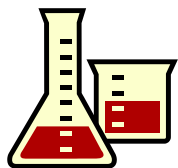
- Better sedimentation (high solids)
- Sediment if any, easy to redisperse
- Better sag control for same leveling



Sepiolite vs Attapulgite

Attapulgite is widely used in American formulators as co-thickener in water based deco paints

- Attapulgite
 - Good dispersion at low shear
 - Lower cost per Kg
- Sepiolite
 - Half dosage is usually required
 - Better cost/efficiency
 - Hence less effect in optical properties



Our Products

PANGEL

products are highly pseudoplastic additives based in different silicate minerals for both water and solvent based systems.



water-borne

Pangel S series

Pangel M series

Pangel W

solvent-borne


Pangel B series

Pangel OM series



Additives for water-borne systems

Our products:

Pangel S9	Purified sepiolite	High pseudoplasticity unaffected by electrolytes
Pangel W 	Organically modified sepiolite	Enhanced viscosity. Provides open time and water retention of plasters. Increases wash and scrub resistance
Pangel M100	Activated montmorillonite	Stability and viscosity control
Pangel M200	Natural sodium Montmorillonite	Higher pseudoplasticity than M100, with same stability and viscosity
Pangel M300	Purified white Montmorillonite	The highest thickening efficiency and pseudoplasticity



Additives for water-borne systems

Pangel M series: Rheological additives produced from high-purity bentonite for an easy gelling and dispersing capacity.

Pangel S series: Rheological additives produced from high-purity sepiolite with outstanding suspension and anti-sagging capacity.

Pangel W series: Organically modified rheological additives, specifically developed to enhance thickening and anti-sagging properties. Pangel W provides also water retention and excellent brushability.



Innovative Solutions

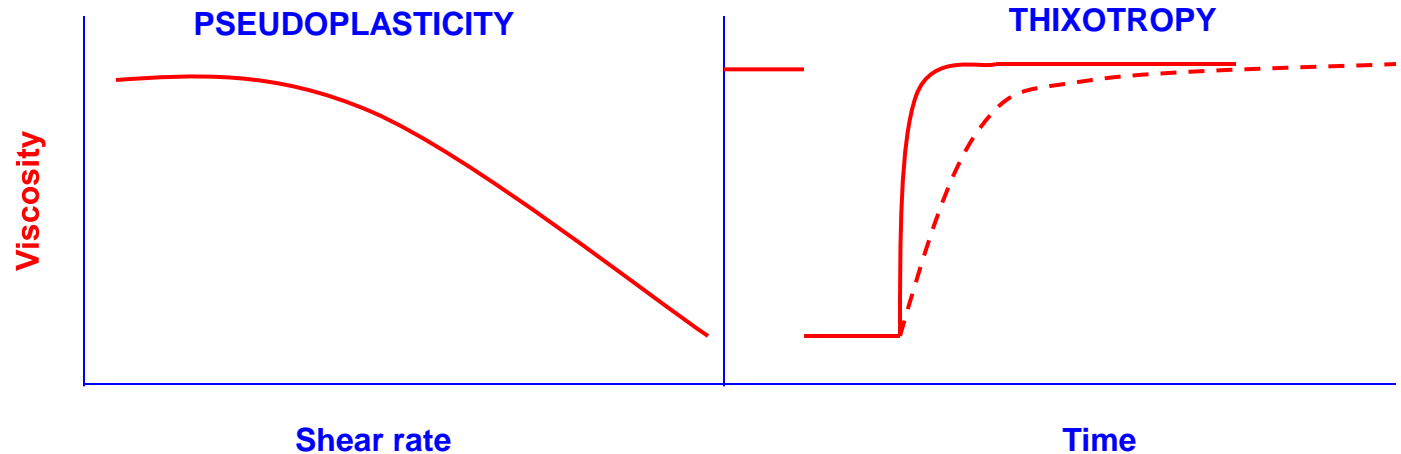
Paints & Coatings
SOLVENT BASED

Dentro de la tierra. Dentro de nuestras vidas.
Inside the earth. Within our lives.

TOLSA  GROUP



Solvent Based Rheological Additives



Selection of suitable thickener:

- Rheology (both pseudoplasticity and thixotropy)
- Transparency
- Gloss
- Thermal control during addition
- Thermal stability of rheology
- Ease of addition
- ...
- Cost (almost forgot)



Rheological Additives

Organics	Ease of addition.	Mainly work as dispersants
Polyamide wax Hydrogenated Castor Oil	Highly pseudoplastic very high thixotropy. High gloss. High thickness.	Activated by high temperature. Tendency to seeding. Rheology affected by temperature
Organobentonite Organosepiolite	Very highly pseudoplastic, thixotropy good enough for main applications. Easy handling. Rheology unaffected by Temperature	Impaired gloss, High shear is needed (not post addition)
Fumed silica	High pseudoplasticity. Transparency	Difficult handling. Risk of over dispersion.

OrganoBentonites

- Better dispersion at low shear
- Better optical properties
- Better in low solids systems:
Gel coats, varnish

OrganoSepiolites

- Better sedimentation (high solids)
- Sediment if any, easy to redisperse
- Better sag control for same leveling



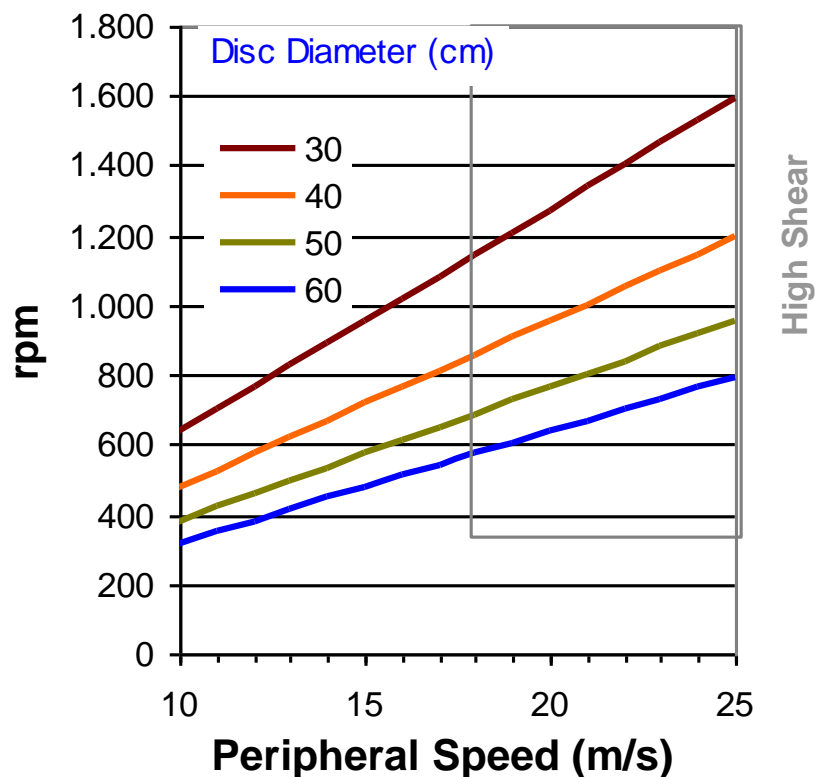
Additives for solvent-borne systems

Pangel B series: Rheological organoclay additives based upon high-purity sepiolite with an extra-performance with additional **suspension capacity**, **anti-sagging** and homogenizing properties. They have been designed to adapt to different polarities.

Pangel OM series: Rheological organoclay additives based upon high-purity bentonite for an **easy incorporation** to solvent-based systems. Their different organophilic behaviour has been designed to adapt to different polarities.

Pangel OMD series: Self-activated organoclay additives based upon high-purity bentonite for an **easy incorporation** to solvent-based systems. Their different organophilic behaviour has been designed to adapt to different polarities.

How to Use it



Mixing conditions as with other rheological additives is a key step

High linear shear rates are recommended. Doughnut shape mixing mass is a good indicator of right mixing conditions





How to Use it

When comparing organosepiolite:

- Use of **polar activator** is not required nor recommended as will produce a drop in viscosity of the milling paste
- Better performance is obtained when there is not free **dispersant** in the vessel, therefore addition of Pangel B after pigments and/or fillers
- **Performance** against organobentonite should be evaluated in final formulation not in only solvent systems (pregels)

Select your best additive

- Additives from the **Pangel S** and **Pangel B** series are based upon **sepiolite clay**, hence they have a strong pseudoplastic and thixotropic rheological behaviour, and are thus more effective in pigment and filler settling control.
- Additives from the **Pangel M** and **Pangel OM/OMD** series are based upon **bentonite clay**, hence they have been designed to be easily introduced in almost all formulations, being ideal to replace current thixotropic additive without introducing major changes in the formulation.



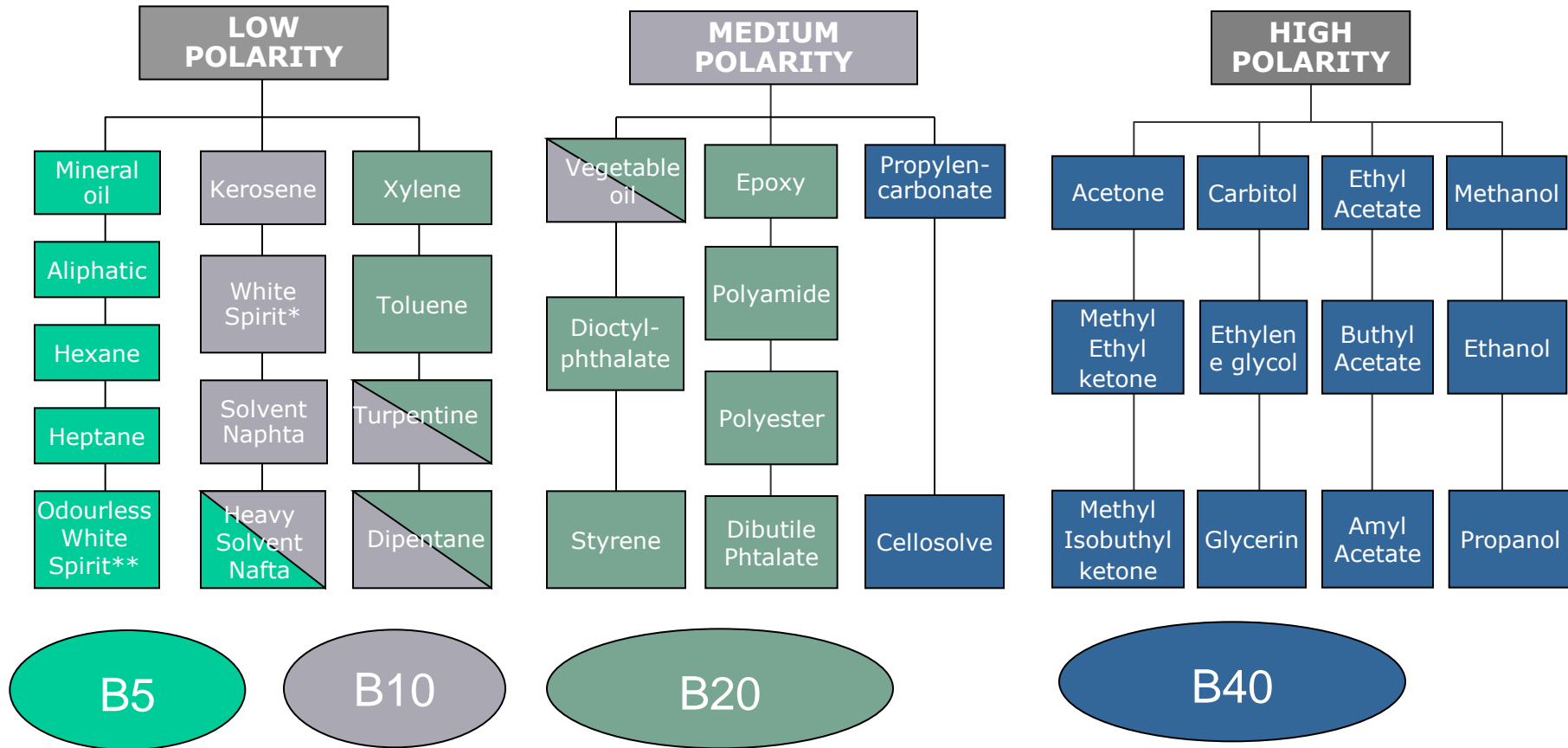
Additives for solvent-borne systems

Pangel M and **Pangel OM** series are suitable for all solvent-borne formulations:

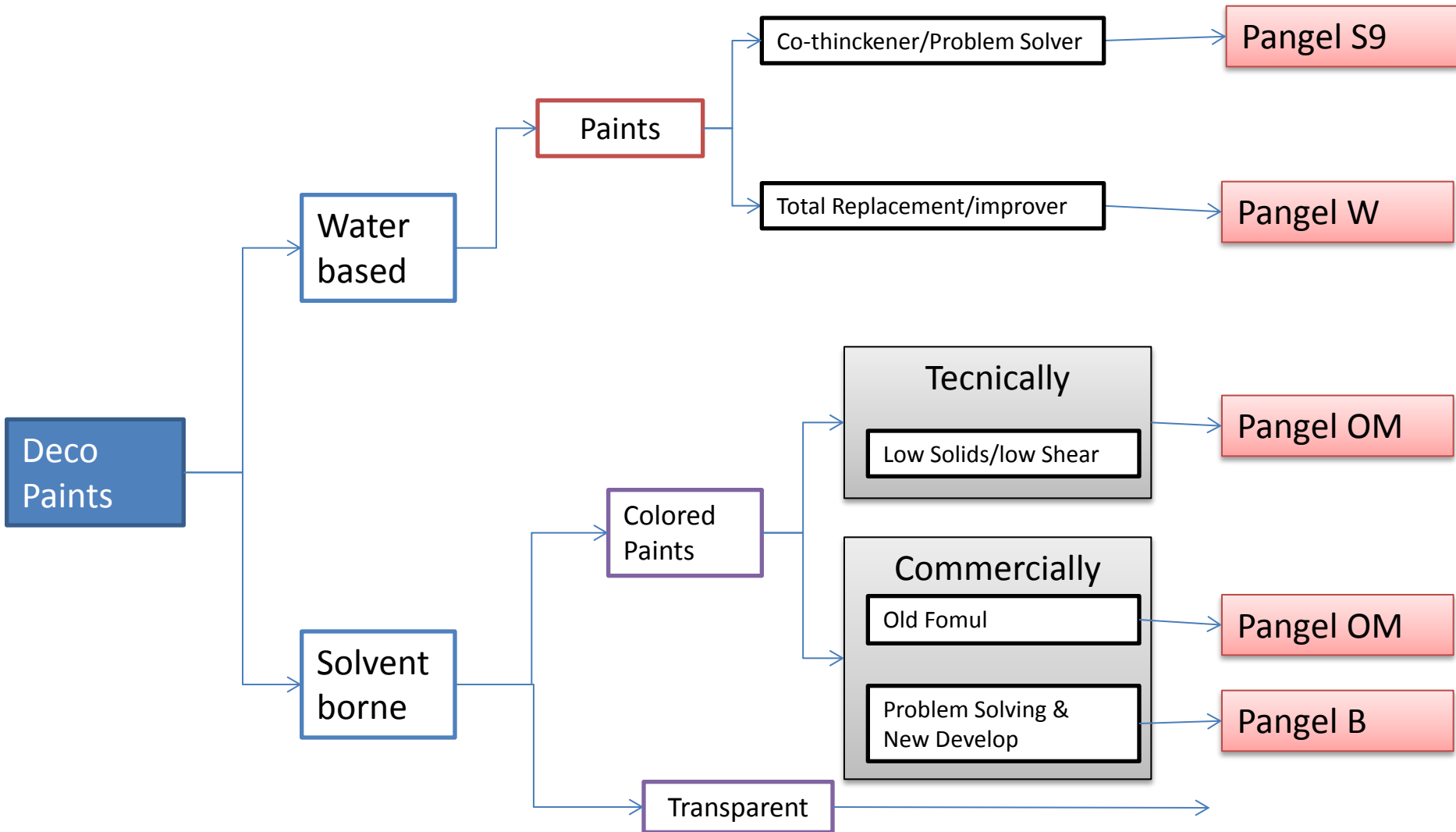
Low Polarity	Intermediate Polarity		High Polarity
Lubricant greases, drilling muds...	Lubricant greases, invert emulsions, offset inks, road paints, asphalts in solvents...	Alkyd and anticorrosive paint, epoxy 2K, priming, unsaturated polyester, adhesives...	Adhesives, coating for casting moulds, paint strippers...
Pangel B5	Pangel B10	Pangel B20	Pangel B40
Pangel OM4	Pangel OM8		
	Pangel OMD1	Pangel OMD2	



Pangel B Polarity Chart



SELECTION TOOL : DECO PAINTS



APPLICATION

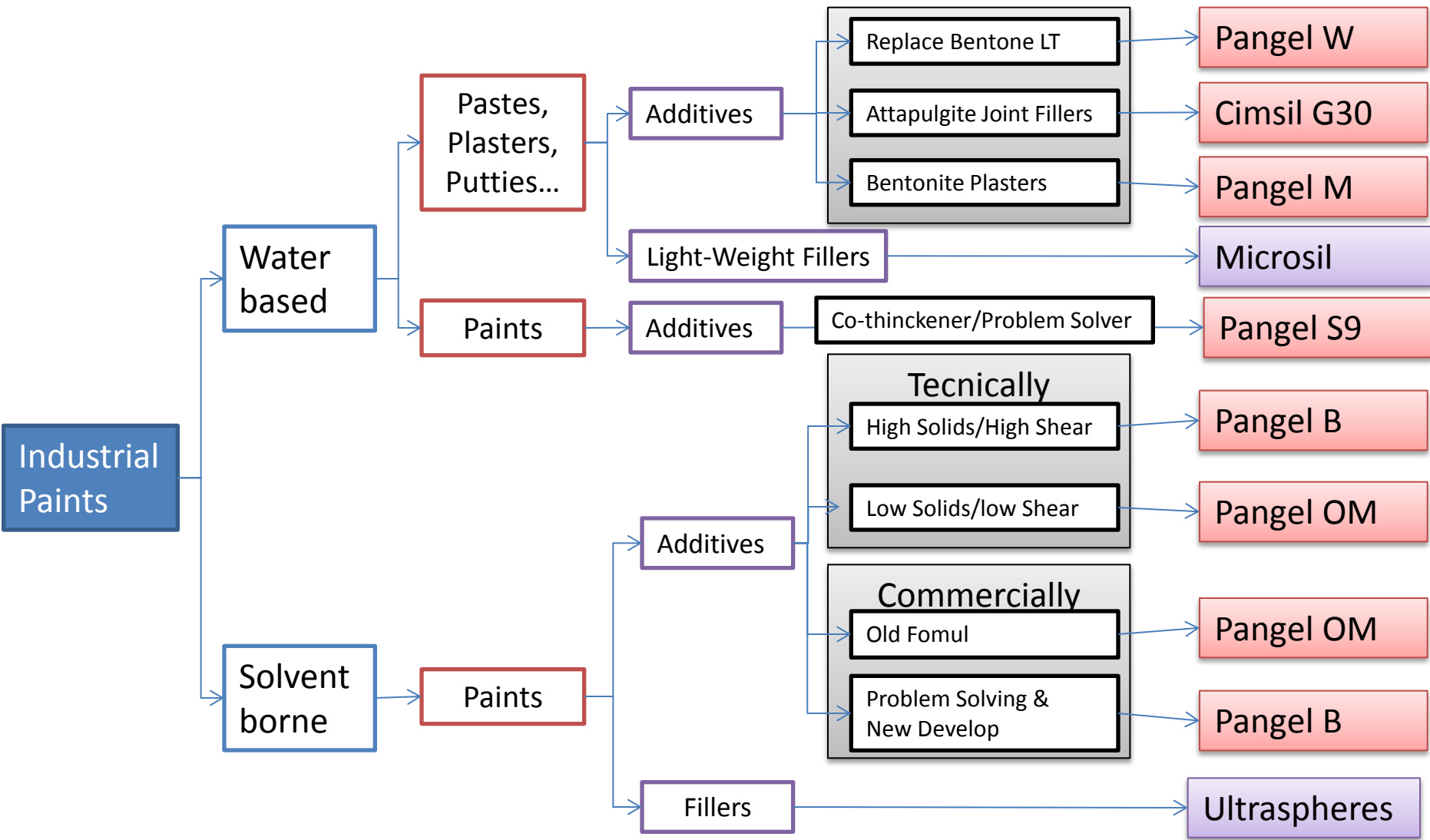
Product
Manufact.

TOLSA
Type of
OFFER

Decision
Criteria

TOLSA
PRODUCT

SELECTION TOOL : INDUSTRIAL PAINTS



APPLICATION

Product
Manufact.

TOLSA
Type of
OFFER

Decision
Criteria

TOLSA
PRODUCT

TOLSA  GROUP

Growing together





Acrylic latex enamel semigloss

Lb/100 gallons	Attapulgate	Pangel S-9	Pangel S-9
Water	104.25	104.25	104.25
Propylene Glycol	21.6	21.6	21.6
Colloid 643	1.46	1.46	1.46
Tamol 731-25%	9.58	9.58	9.58
Dowicil 75	0.83	0.83	0.83
Nopcocide N-96	5	5	5
Unitane OR-600	208.34	208.34	208.34
Polygloss 90	29.95	33.2	35.16
Attapulgate	8.33	-	-
Pangel S-9	-	4.17	2.77
<i>Disperse high speed 20 min.</i>			
Water	300.18	300.18	300.18
Acrysol EXP-300	21.27	21.27	21.27
Rhoplex AC-64	310.94	310.94	310.94
Colloid 643	2.92	2.92	2.92
Texanol	9.88	9.88	9.88
Ammonia	1.54	1.54	1.54
Totals	1036.07	1035.16	1035.72
PVC (%)	28	28	28
Solids by weight (%)	43.8	43.8	43.8
Solids by volume (%)	30.1	30.1	30.1



Results

	Attapulgit	Pangel S-9	Pangel S-9
	8.33	4.17	2.77
Consistency (KU)	123	123	120
Fineness of Grind (Hegman)	6	6	6
Reflectance, Y value (%)	91.3	91.5	91.5
Contrast Ratio	0.984	0.98	0.977
Relative Tint Strength (%)	0	0.6	-2.9
Sheen, 85°	69.3	73.5	73.9
Gloss, 60°	34.1	35.8	35.1
Leveling (10=perfect)	8	9	9
Sag resistance (Mils)	12+	12+	12+
Viscosity, ICI (Poise)	0.95	0.85	0.83
Oven stability, 1 week, 60 °C	Excellent	Excellent	Excellent

1

2

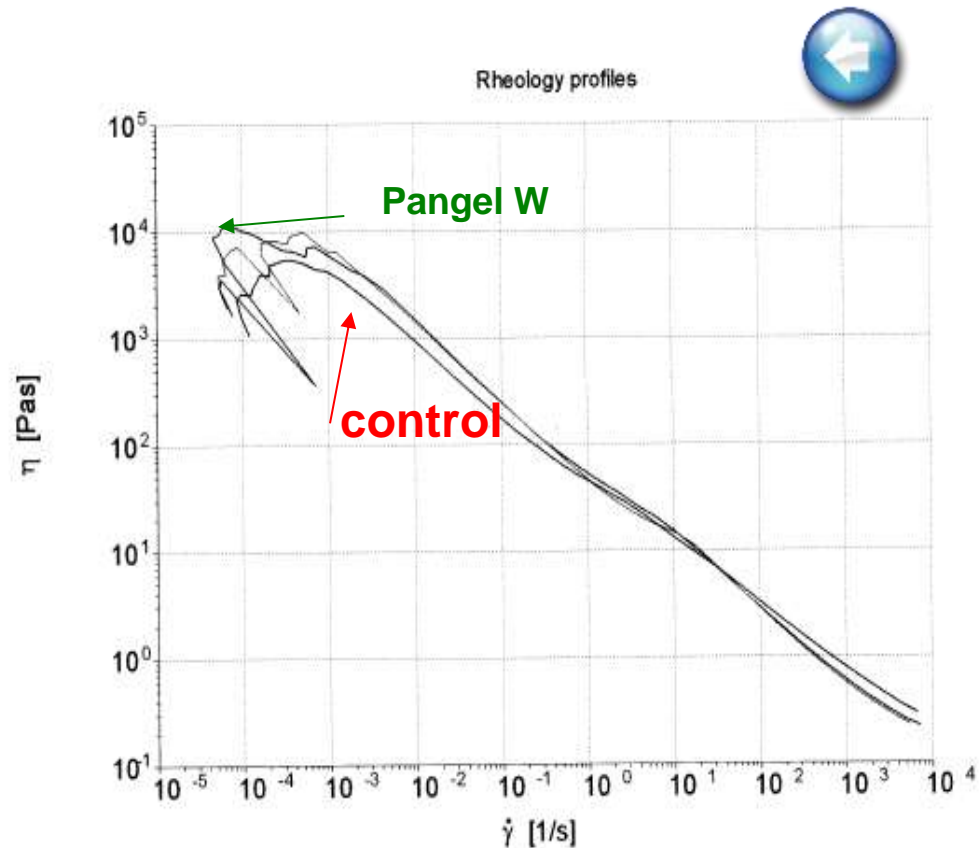
3





Pangel W in Deco Paint

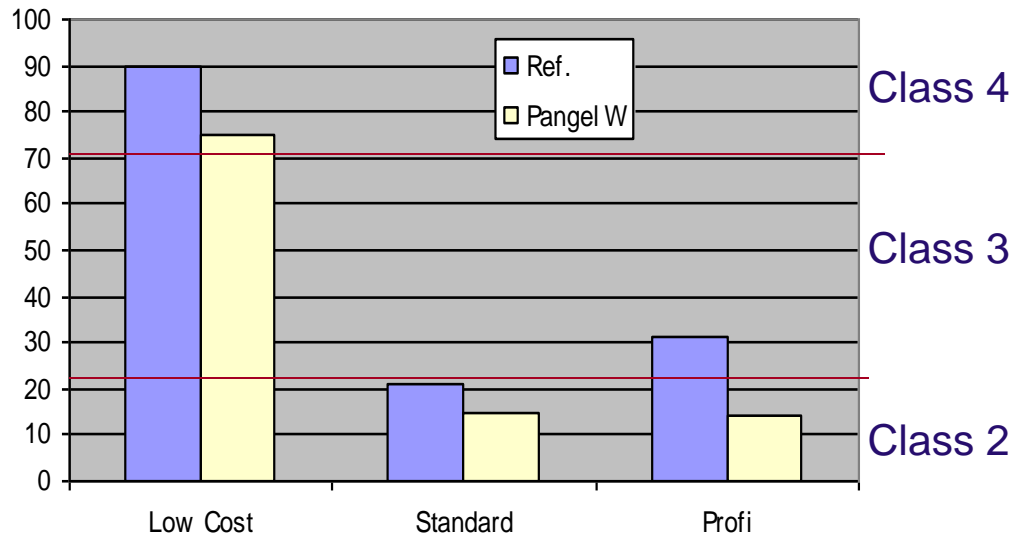
	Low cost		Standard		Profi	
sources	pbw (g)	Gew.-%	pbw (g)	Gew.-%	pbw (g)	Gew.-%
Wasser	180,0	33,90%	170,0	32,72%	170,0	33,73%
Calgon N (10%)	0,5	0,09%	0,5	0,10%	0,5	0,10%
Coatex P 50	1,5	0,28%	1,5	0,29%	1,5	0,30%
Acticide MBS	1,0	0,19%	1,0	0,19%	1,0	0,20%
Tylose MH 6000 YP2	3,0	0,56%	2,0	0,38%	2,0	0,40%
Pangel W						
NaOH 10%ig	1,0	0,19%	1,0	0,19%	1,0	0,20%
Tego Foamex LA 511E	1,0	0,19%	1,5	0,29%	2,0	0,40%
Σ Wasser / Additive	188,0	35,40%	177,5	34,17%	178,0	35,32%
Kronos 2310			15,0	2,89%	42,0	8,33%
Omyacarb 2-GU	110,0	20,72%	130,0	25,02%	115,0	22,82%
Omyacarb 15-GU	50,0	9,42%	50,0	9,62%	30,0	5,95%
Industrie Spezial	140,0	26,37%	70,0	13,47%	30,0	5,95%
Finntalc M15	10,0	1,88%	30,0	5,77%	45,0	8,93%
Arbocell B 00					1,0	0,20%
Optiwhite MX					10,0	1,98%
Σ Füllstoff + Pigm	300,0	56,50%	295,0	56,79%	279,0	55,36%
Mowil. LDM 1871	32,0	6,03%	45,0	8,66%	51,0	10,12%
Viscoatex 46	1,0	0,19%	2,0	0,38%	2,0	0,40%
total :	531,0	100%	519,5	100%	504,0	100%
pigm. volume concen.	87,1%		81,8%		78,1%	





Pangel W in Deco Paint

Wet Abrasion 28d



Replacement of HEC by Pangel W has improved the performance against wet scrub abrasion test of the three paint qualities.



Pangel W in WB Epoxy Paint

Formulation 1

Component A	P(%)
Water	17,44
Beckopox EH 613w/80WA	6,06
Additol VXW 6208/60	0,93
Thickener	0,30
Nubirox 106	2,51
Tioxide TR-92	5,59
Barinit 7060	11,89
-----	---
Talc SS A 60/50	8,69
Component B	P(%)
Beckopox EP 386/52WA	46,59
TOTAL	100,0

Thickener	Ref (*)	Pangel W
Hegman (µm)	< 90	< 90
Stormer Visc. (24h, 25°C, K.U.)	24 h room T ^a .	136,2
	1 month room T ^a ..	134,2
Can stability	24 h room T ^a ..	108,3
	1 month room T ^a ..	115,4
liberation		Total
Estado 3		Estado 3
Levelling indexm (1-10)	6	6
Sagging (µm)	< 125	< 300

1

* Organically modified bentonite for water based systems

-Clear improvement in sag control



Pangel W in WB Epoxy Paint

Formulation 2

Component A	P(%)
Water	9,15
Beckopox EP 386w/52WA	46,20
Additol VXW 6208/60	1,30
Additol VXW 6393	0,30
Thickener	0,20
Bayferrox 318	1,05
Tioxide TR-92	19,70
Barinit 7060	15,40
Talc SS A 60/50	6,10
Texanol	0,60
TOTAL A	100,0
Component B	P(%)
Beckopox VEH 2188w/55WA	88,0
Water	12,0
TOTAL B	100,0

Thickener	Ref. (*)	Pangel W
Finura Hegman final (µm)	< 60	< 60
Visc. Stormer (24h, 25°C, K.U.)	24 h room T ^a ..	102,6
	1 month room T ^a .	93,7
Can stability	24 h room T ^a	120,7
	1 month room T ^a .	111,0
	24 h room T ^a	Total
	1 month room T ^a .	Total
Levelling index (1-10)	5	6
Sagging (µm)	< 175	< 300

1

- Clear improvement in sag control





Pangel B20 in 2K Epoxy

component A	weigth		volume	
Milling base				
Rutapox 0164	103,8	21,9%	88,7	28,2%
titanium oxide	108,2	22,9%	26,4	8,4%
Barium sulfate	86,5	18,3%	19,2	6,1%
Pangel B20	6,5	1,4%	3,2	1,0%
Xylol	43,1	9,1%	49,8	15,8%
Completado				
Rutapox 0164	33,3	7,0%	28,5	9,0%
Xylol	9,3	2,0%	10,8	3,4%
total A	390,7	82,5%	226,6	72%
component B				
Rütadur MF-250	69,5	14,7%	73,1	23,2%
Xylol	13,1	2,8%	15,2	4,8%
total B	82,6	17%	88,3	28%
total A+ B	473,3	100%	314,9	100%

High Solids Gloss White Enamel.
Pangel B20 will be tested against conventional and new generation organobentonite

Properties:

Solids content:	86,2%
Volumen of solids:	75,9%
PVC:	25,7%
VOC (g/L):	166
resin/pigment:	1,03
Drying time touch/total:	5/24 h

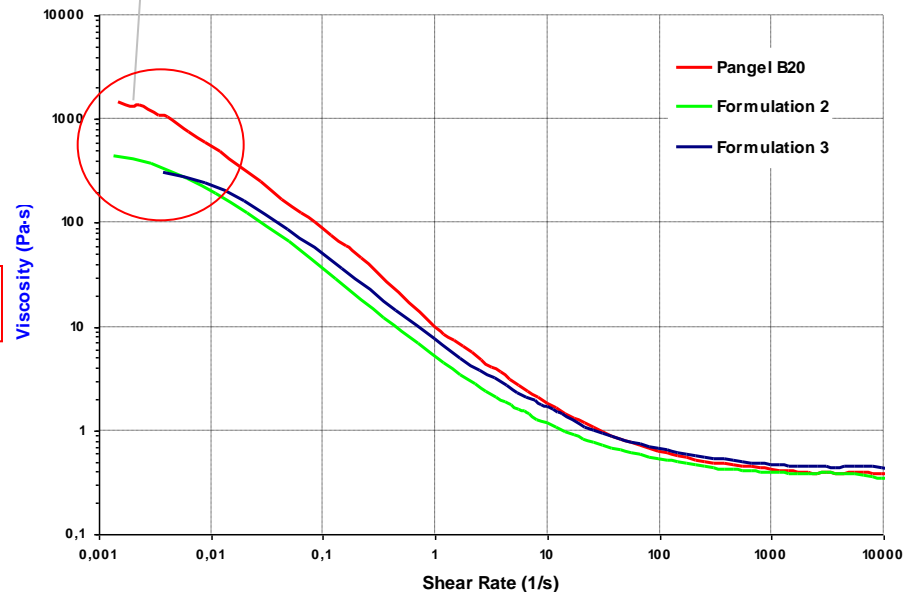


Pangel B20 in 2K Epoxy

Formulation	1	2	3
PANGEL B20	6,5 g (1,4%)		
Organobentonite A (1,6 g 0,5% of methanol has been added as polar activator)		6,5 g (1,4%)	
Organobentonite B			6,5 g (1,4%)
Propierties			
Component A			
Stormer Viscosity(K.U.) UNE48-076-92	109	102	108
Brookfield Viscosity (@5rpm, mPa.s)	3.680	400	5.600
Solid Content UNE-EN ISO 3251	88%	88%	88%
Can stability (after one month at 20 °C) UNE48-083-92	State 1	State 4	State 1
Brookfield Viscosity (@5rpm, mPa.s)	9.700	960	4.800
Componente A+ B			
Stormer Viscosity	90	83	88
Brookfield Viscosity (@5rpm, mPa.s)	6.440	3.400	5.120
Sagging UNE48-068-94	300 µm	300 µm	300 µm
Leveling UNE48-043-84	1	1	1
Drying time touch / total UNE48301	5h / 24h	5h / 24h	5h / 24h
Gloss 60° UNE-EN ISO 2813	79	76	82

Better stability compared with conventional organobentonite. Compares favourably with high cost organobentonite (7-8 €/kg)

Good rheological profile. High zero shear viscosity and low ICI viscosity

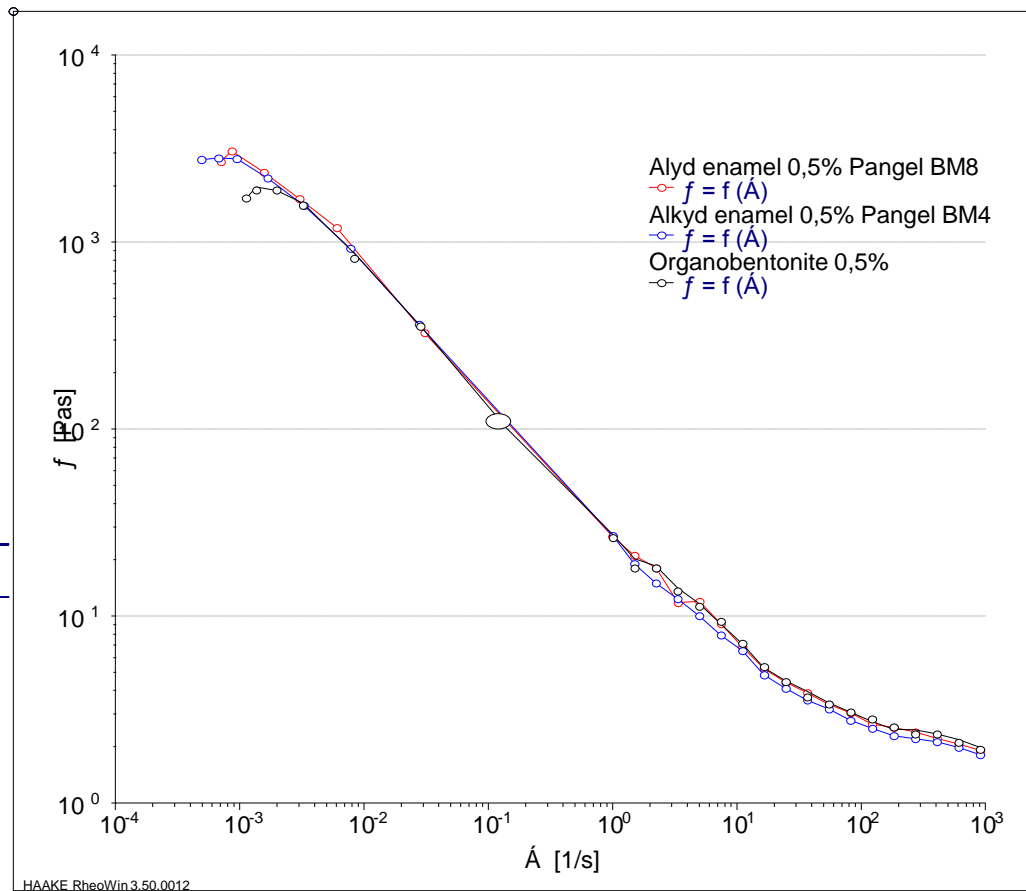




Pangel OM4 in Alkyd

Milling Paste		%	% Vol
Alkydharz AH	alkyd resin	27,5%	40,1%
Efka 5044 ⁽¹⁾	dispersant	0,5%	0,8%
Tioxide R-HD2	titanium dioxide	17,2%	5,8%
Omyacarb 1BE	calcium carbonate	28,8%	14,9%
Thickener⁽²⁾	10% in WS	5,0%	0,3%
		79,0%	68,3%
Let down			
Alkydharz AH		18,1%	27,3%
Butylglycol		1,9%	3,0%
Co Naftenate	drying	0,2%	0,2%
Pb Naftenate	drying	0,5%	0,7%
Efka 6700	anti-skin	0,3%	0,5%
total:		100%	100%

	Ref.	Pangel BM4	Pangel BM8
Stormer Visc.(24h a 25°C, K.U.)	103	112	115
Levelling	3	3	2
Sagging	350	450	450
Can Stab. (1 month, rt)	Stable	Stable	Stable
Sheen 60°	26,2	22,7	17,2
Hegman (µm)	< 5	< 5	< 5
Solids. (%)	76,8	77,6	76,9
Rheological Data			
Zero shear viscosity (Pa.s)	1.650	2.844	3.034
Visc. at 10 ³ s ⁻¹ (Pa.s)	1,38	1,82	1,82
G' lineal (Pa)	41,0	95,5	86,8





Select your best additive

Pangel OM replacement table:

PANGEL OM4

Bentone 34
Bentone 1000
Tixogel VP
Tixogel VPA
Tixogel MP
Perchem 44
Claytone 40

PANGEL OM8

Bentone 38
Bentone 52
Bentone 1000
Tixogel TE
Tixogel UN
Perchem 108
Claytone HT

PANGEL OMD1

Bentone SD-1
Bentone SD-3
Tixogel EZ-100
Tixogel MP-100
Claytone AF
Claytone HY

PANGEL OMD2

Bentone SD-2
Benathix
Tixogel MP-250
Claytone APA



*Dentro de la tierra. Dentro de nuestras vidas.
Inside the earth. Withing our lives.*

TOLSA  GROUP