



**AFCONA Additives
Update for E.M. Sullivan Team**

Sept 22nd, 2016

We continue where others stop



Agenda

- What's new?
- Core Capabilities and Chemistries
- TS Laboratory Role and Focus
- Product Review
- Success stories to-date
- Sanity Check?



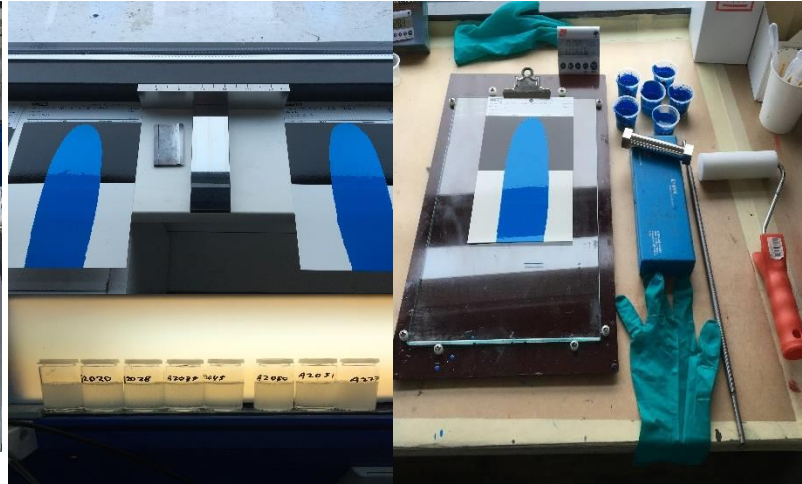
What's New

- Lab buildout completed
- Lab Equipment installed and operational
- New Chemist hired/trained
- Lab fully vetted and initial RM stocks built
- Plastics portfolio launched globally

NA Regional Office & TS Lab- Hudson, Ohio



NA Regional Office & TS Lab-Hudson, Ohio





Core Capabilities

- Condensation process, high temperature process
- Random Radical polymerization
- Controlled Radical polymerization (CRFP)
- Block Polymer synthesis
- Polysiloxanes, Polyacrylics, Polyesters, Polyurethanes, and various organic modifications of these polymers

Batch sizes

8 units of 4M³ Reactors
2 units of 8M³ Reactors
3 units of 5-8M³ MEK recycles Reactors
2 units of 0.5M³ Pilot Reactors
1 unit of 50L Pilot Reactor

Laboratory, Analysis & Testing



Besides routine chemical analysis methods, AFCONA lab uses IR, GPC, GC, NMR to observe structures of our polymers. These analytic capabilities are used both in R&D and in QC.

The application lab lends support to newly developed samples and also works as a QC procedure-application testing - **on every batch of product.**



- Core Capabilities
 - Pigment dispersion & assessment
 - Paint & coating formulation
 - Evaluations of key performance criteria
 - Defoaming & Deaerating
 - Substrate wetting/leveling
 - Slip
 - Compatibility & stability
 - Basic physical/chemical testing
 - Temp/viscosity/pH/density
 - Adhesion/water & chemical resistance
 - Product performance testing & benchmarking

- Vital Equipment
 - Mechanical Paint Shaker
 - Dispermills
 - Scales
 - Various viscometers-Brookfield/Din/Ford/Zahn
 - Applicator bars/wire rods
 - Applicator rollers (**PU** and wool)
 - Hegman grind blocks
 - Sag bar
 - Gloss meter
 - Thermometer & thermocouples
 - Lab ovens (cure & stability)
 - Filtration

- Sanctioned & Standardized TM's
 - Viscosity
 - Dispersion quality
 - Grind/rub-out/hide/jetness/pour-out
 - Wetting/Flow-out
 - Gloss
 - Foaming (vial/HSD/foam roller)
 - Slip
 - Stability
 - visc/flocculation/settling/regression/synearesis



Technical Service

- Laboratory Support Protocols
 - Project requests (internal / customer)
 - Project reports (internal / external)
 - Tracking & closure
- We own our ways of working
 - Living process / documents
 - Must work for us!



Technical Service

- Laboratory Support Protocols
 - Project requests
 - Customer
 - Application
 - Product/formulation details
 - Performance gap or pain point
 - Key criteria to deliver
 - Constraints



Technical Service

- Laboratory Support Protocols
 - Project requests (internal / customer)
 - Project reports (internal / external)
- Tracking & closure
- We own our ways of working
 - Living process / documents
 - Must work for us!



Lab Project Tracker

Project Number	Customer	Description / Application	Target Market	Target Products	Request Date	Start Date	Target Date	Delivery Date	Status	Solution provided
1	Milliken	Carbon Black dispersions for automotive PU foam	Auto OEM	4000/5000 series	3/14/2016	4/15/2016	6/15/2016		Significant Delay	
2		b	inks	3000 series						
3		c	plastics	4000 series						
4	PPG Auto		OEM	5000 series						
5	PPG		Deco	6000 series						
6	American Colors		Pigment Dispersions	4000/5000 series					Slight Delay	
7				7000 series						
8	Dudick	Flooring	Industrial	2000/3000 series					On Target	
9	Dudick	Flooring	Industrial	3000 series						
									Significant Delay	
									Slight Delay	
									On Target	



Technical Service

- Help me help you!
 - Current & future needs
 - Focus and prioritization
 - Continuous improvement
 - Developing our skills and capabilities
 - Communication
 - Follow-up



Technical Service

- Next steps
 - Complete lab build-out
 - Build & maintain inventories
 - Lab supplies
 - RM's (our wish list)
 - Competitive samples/countertypes
 - Hire first Lab Tech
 - Initial Start-up
 - Vetting of NA laboratory



How Can we Support You?

- Offsets to any existing additive products
- New or chronic “Pain Points”
 - Quality/security of supply
 - Difficult/problematic applications
 - Competitive pressure
- New product development projects
- New/unique application opportunities
- New target market segments



Core “Go-To” Products

- 2000 Series: Defoamers & Deaerators
 - SB solvent: Afcona 2022, 2038, 2045, 2724
 - SB water: Afcona 2524
 - NSB: Afcona-2270
- 3000 Series: Slip and Levelling
 - Solvent: Afcona 3034, 3251, 3238, 3280, 3285
 - Water: Afcona 3522, 3585
- 4000 Series HMWD’s
 - Solvent: Afcona 4010, 4017, 4063, 4201, 4701
 - Water: Afcona 4565, 4595
- 5000 Series Conventional Dispersants & Wetting Agents
 - Solvent: Afcona 5210, 5251, 5285
 - Water: Afcona 5585, 5071
- 6000 Series Additives
 - Solvent/Water: Afcona 6226
- 7000 Series
 - Afcona-XXXX

Highlighted Portfolio Spreadsheet

Afcona Series	Classification/Chemistry	Core Function	Other Key Features	Unique to Afcona
2000 Series Defoam/Deaerators				
Afcona-2022	Solvent- Polysiloxane	Strong defoaming & deaeration	Wide compatibility	
Afcona-2038	Solvent- Polysiloxane	Most compatible s/b defoamer	great for clear coat applications	
Afcona-2045	Solvent- Polysiloxane	Excellent defoaming in PU systems	Also good in Epoxy, TPA and UPE systems	
Afcona-2724	Solvent- Polysiloxane	Deaeration in clear systems	Also improves surface levelling	
Afcona-2524	Water-Polysiloxane	Good defoaming + levelling + anticrater	low shear / post addition	
Afcona-2050	Solvent- Non Silicone	Strong defoaming & deaeration		
Afcona 2270	Solvent- Non Silicone	100% active defoamer for solvent & water apps	clears or pigmented systems.	
Afcona 2270	Water-Non Silicone	100% active defoamer for solvent & water apps	High shear stability	
3000 Series Slip and Levelling				
Afcona-3034	Solvent- Polysiloxane	Surface levelling agent. Strong ST reduction	Fluorocarbon modified polysiloxane	
Afcona-3238	Solvent- Polysiloxane	Good levelling + antifoam	Good for low gloss/matte finishes	
Afcona 3251	Solvent- Polysiloxane	Very high slip	good clarity. Excellent in PU and UV systems	
Afcona-3280	Solvent- Polysiloxane	Short chain polysiloxane. Great Intercoat adhesion		
Afcona-3285	Solvent- Polysiloxane	Hydroxyl terminated-XL into PU systems	100% active. Good slip / Levelling	
Afcona-3700	Fluoronated Poly-Solvent	Fluorommodified Polyacrylic. Very strong ST reduction	Low energy substrate wetting. Recoatable	
Afcona-3730	Solvent- Polysiloxane	Levelling agent based upon HMW Polyester		
Afcona-3522	Water-Polysiloxane	Non polar Polysiloxane emulsion: Slip/levelling/water repellency	Also good for highly matted finishes	
Afcona-3585	Water-Polysiloxane	Very strong syrface tension reduction	Fast substrate wetting/ high compatibility	
4000 Series HMW Polymeric Dispersants				
Afcona-4010	Solvent-Polyurethane	Excellent for inorganic pigments like TiO2 & matted finishes	Provides thixotropy for antisetling	
Afcona-4017	Solvent-Polyurethane	Best co-grinding agent in poertfolio	Helps system remain homogeneous	
Afcona-4063	Solvent-Polyurethane	Workhorse product for inoragnc & organic pigments	Steric hinderance provides great stability	
Afcona-4201	Solvent-Polyurethane	100% active. Great for all pigment types-especially organics and CB	Great for high solids/VOC free systems including inks	
Afcona-4701	Solvent-Polyurethane	High performance in all pigment types. Excellent jetness in CB apps	Great compatibility. Unique CFRP technology	
Afcona-4565	Water-Polyacrylate	Filmogenic/pH independent	All pigment types, high cpmptability	
Afcona-4595	Water-Polyacrylate	Great for CB and Fe2O3 pigments. Strong viscosity reduction	Good in highly filled systems	
5000 Series Conventional Wetting Agents				
Afcona-5210	Solvent-acid polyester phosphate	100% active. Works in solvent and waterborne systems	Works well for inorganic and organic pigments	
Afcona-5251	Solvent-HMW Carboxylic polymer	Best for Fe2O3 pigments. Good viscosity reduction/stability/clarity		
Afcona-5285	Solvent-Anionic/acid copolymer	Strong viscosity depression	Best in highly filled systems & matte finishes	
Afcona-5585	Water-Block Copolymer	Solvent free / Universal color concentrates	All pigment types/highly compatible	
AFCONA 5071	Water- HMW carboxylic acid salt	Solvent free. Excellent anti-settling agent. Anti flooding/floating		
6000 Series Miscellaneous Additives				
Afcona-6226	Solvent- FAM Polyester	Universal color concentrates/ all pigment types	improved color strength & acceptance	
Afcona-6226	Water-FAM Polyester	Universal color concentrates/ all pigment types	Lower viscosity/higher stability pastes	

New Products

- **AFCONA-2280** Deaerator/Defoamer for NC, acrylic, and PU based wood coatings. Also can be used in PU and epoxy floor coatings. Direct offset to Airex 980.
- **AFCONA-2530** Cost-effective defoamer for unpigmented waterbased coating systems. Lower price point than A-2524, can successfully replace BYK-024 and other defoamers for clear waterbased systems.
- **AFCONA-5581** 100% active wetting and dispersing agent for organic and carbon black pigments in both water- and solventborne systems. Compatible across a range of different binder systems, including difficult binders such as CAB, NC, etc. Not intended for inorganic pigments



Highlighted Defoamers

- **2000 Series Defoamers and deaerators**
 - AFCONA-2270

AFCONA - 2270

Chemical : Defoaming polymer with no silicone content

Solvent : 100% active

- Solvent-free anti-foam and de-aeration agent
- Very suitable for high solid, BTX-free, VOC-free coatings
- Suitable for all solvent based, solvent free and **water-based** coatings
- Excellent defoaming in **water-based** pigment concentrates



Highlighted Slip & Leveling Agents

- **3000 Series slip and levelling agents**
 - **Solvent based systems**
 - AFCONA-3285, AFCONA-3835, and AFCONA-3700
 - **Water based systems**
 - AFCONA-3285 and AFCONA-3585

AFCONA - 3285

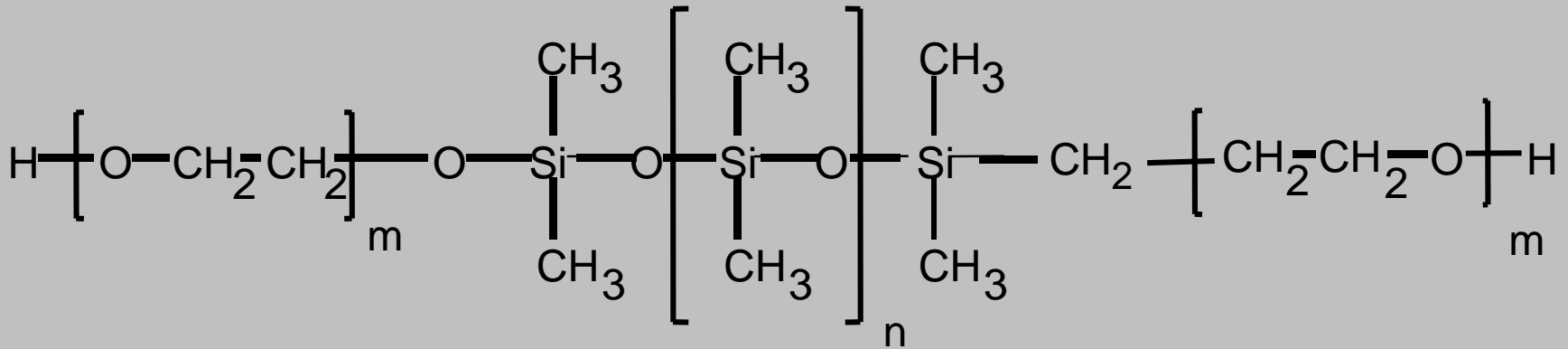
Chemical : Organically modified polysiloxane

Solvent : 100% active

- Hydroxy functional terminated slip and leveling agent
- Cross-links in 2K PU as well as in stoving systems to give permanent slip
- Very compatible
- Can be used in [water-based](#) system, if pre-diluted in glycol ether

AFCONA - 3285

AFCONA – 3285 - Silicone based with solid content >96%



Performance in solvent and [waterbased](#) coatings

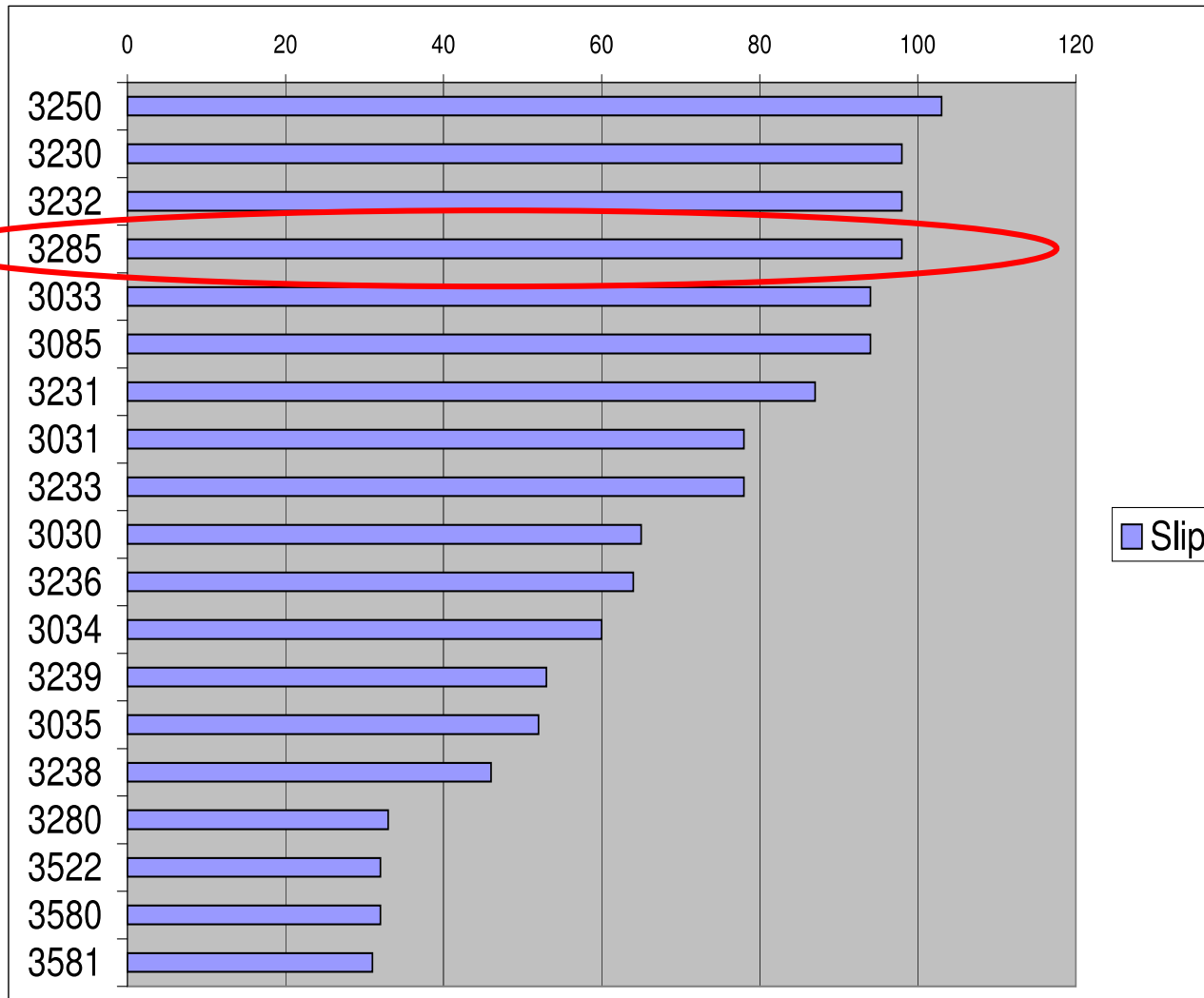
- Slip performance
- Low in foam stabilization
- Levelling performance

AFCONA - 3285



Afcona 3285, 1% in water of
a 50% solution in Dowanol
DPM.

AFCONA - 3285



AFCONA - 3835

Chemical: Organically modified reactive polysiloxane with methacrylic functional groups

Solvent: 100% active

- Cross-linkable slip and leveling agent for UV coatings
- Permanent slip after crosslinking
- Methacrylic groups allow it to be reacted into Unsaturated Polyester redox systems

AFCONA - 3700

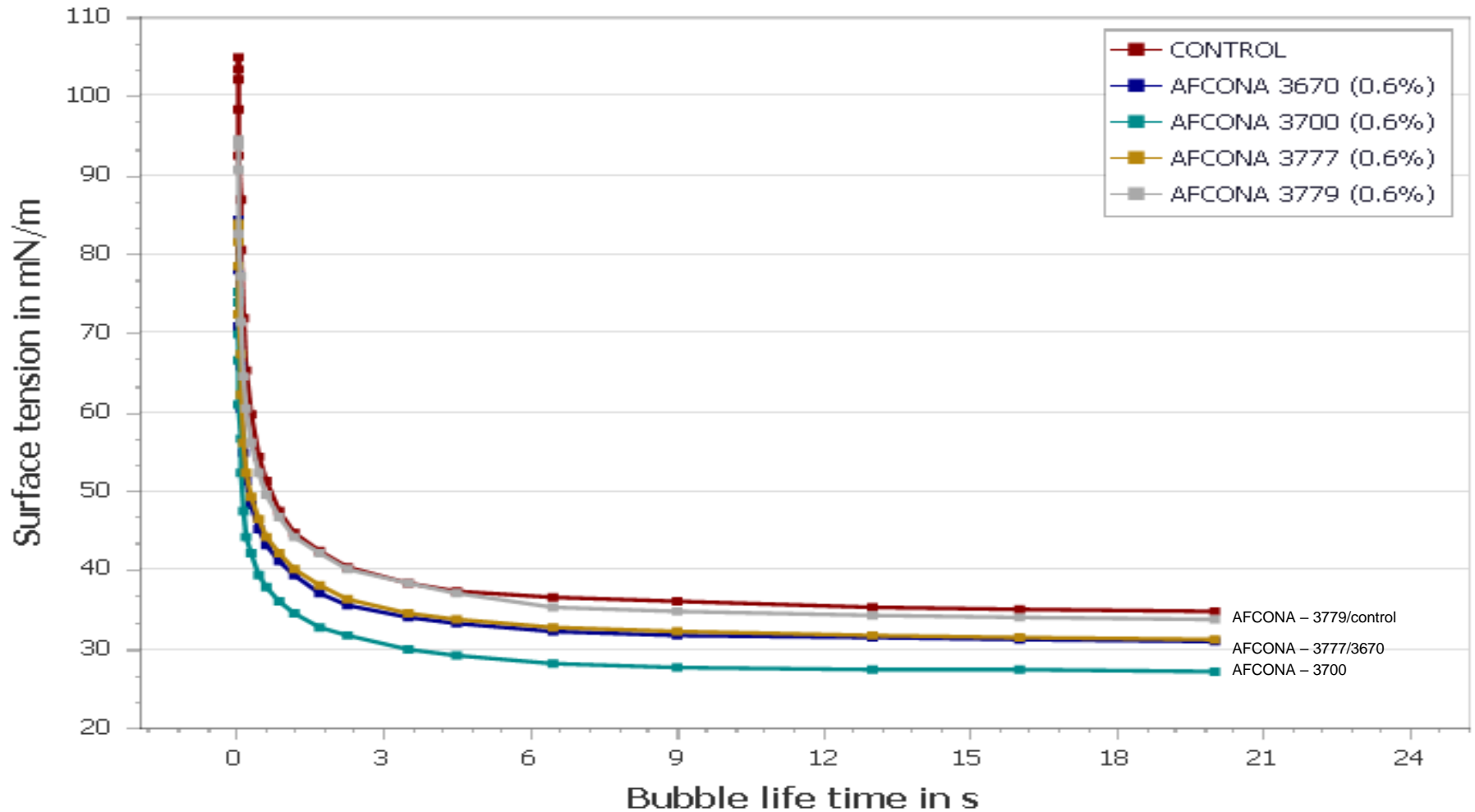
Chemical : Polymeric fluorocarbon compound

Solvent : 100% active

- High fluorocarbon content polyacrylic with very strong surface tension reduction
- Excellent in anti-crater, substrate wetting and promotion of vertical flow
- Can be used in all solvent-based systems especially car refinish, plastic paints and industrial coatings

Dynamic Surface Tension

0.6% in total formulation



AFCONA - 3585

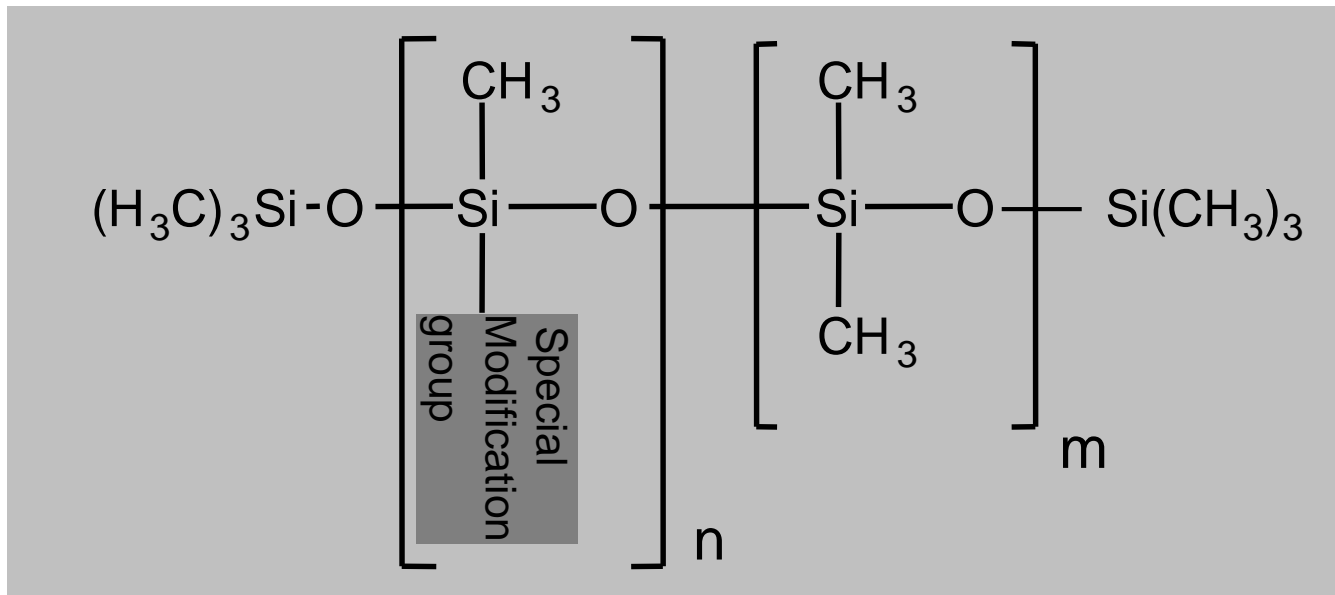
Chemical : Organically modified short chain polysiloxane

Solvent : 100% active

- Can be used in all **water-based** binder systems
- Strong surface tension reduction
- Good compatibility
- Excellent anti-crater and substrate wetting
- No intercoat adhesion problems

AFCONA - 3585

AFCONA – 3585 - Silicone based with solid content >96%.

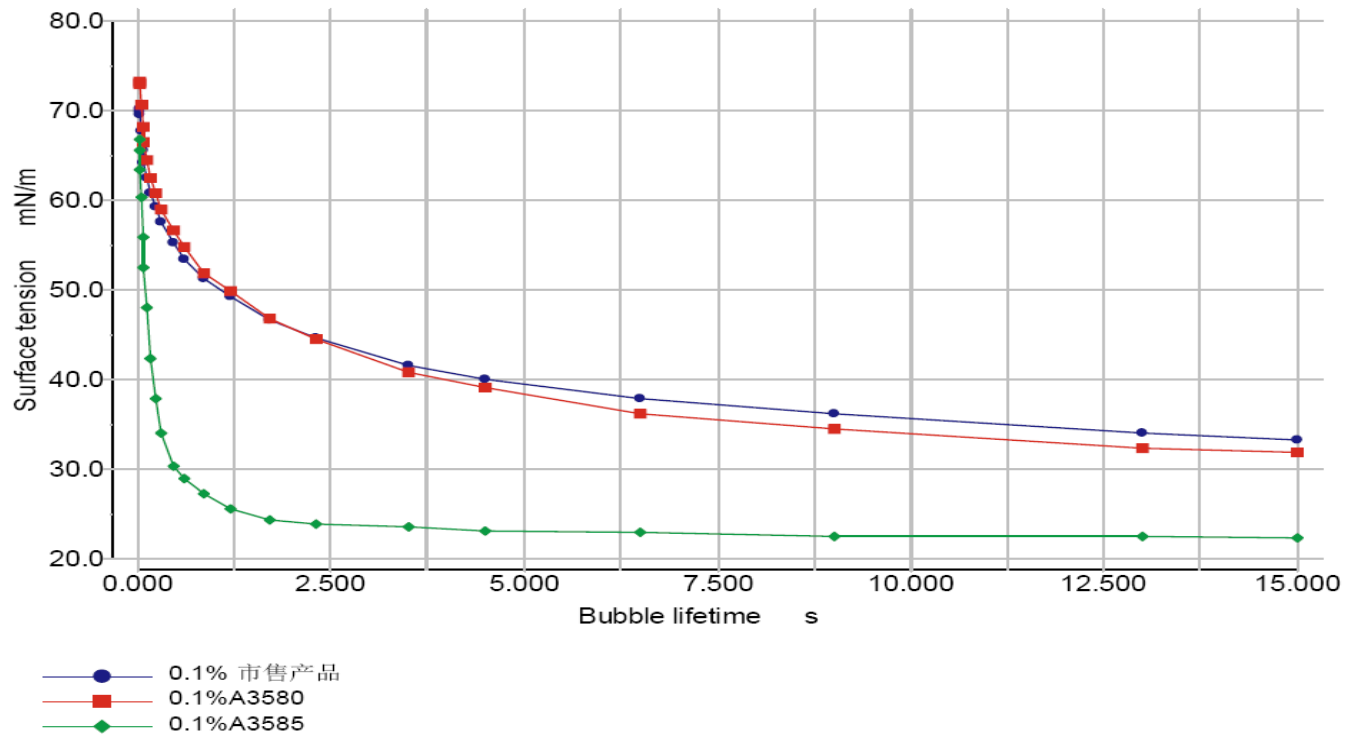


Performance in water based coating

- Anti-crater
- Substrate wetting
- Recoatable
- Low slip

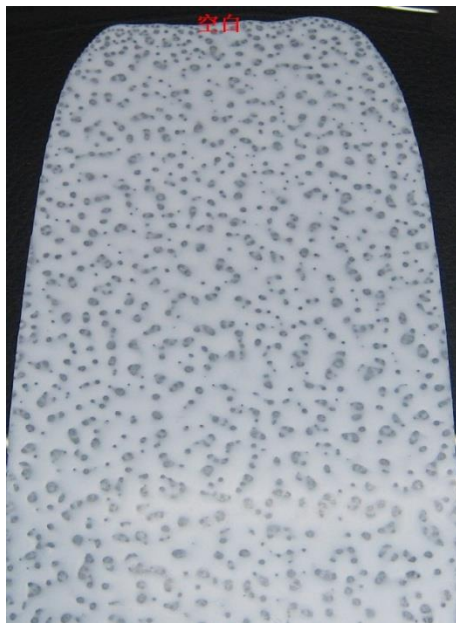
AFCONA - 3585

Titel: 0.1%加量气泡存在时间与表面张力数值变化关系

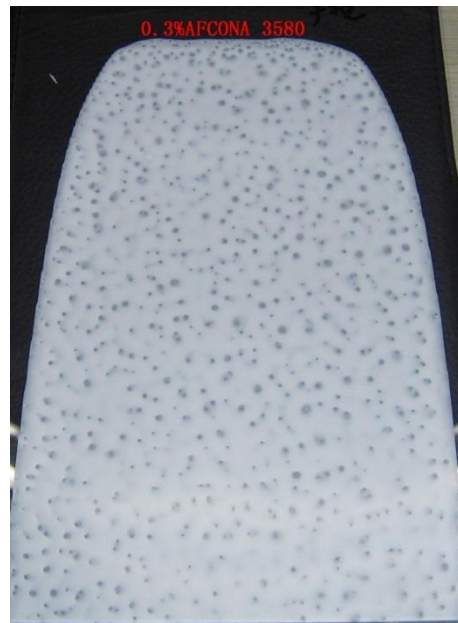


AFCONA - 3585

Anti-crater performance



Control



AFCONA - 3580



Competitor



AFCONA - 3585



Highlighted HMWD's

- **4000 Series high molecular weight dispersing agents**
 - **Solvent based systems**
 - AFCONA-4701
 - **Water based systems**
 - AFCONA-4565

AFCONA - 4701

Chemical : Acrylic HMWD CRP polymer

Solvent : 49 – 52% in Methoxy Propyl Acetate

- Excellent compatibility in difficult binders
- Low viscosity/ high pigment loading
- Improve gloss and D.O.I
- High Jetness in carbon black (blue undertone)
- High transparency and color strength in organic pigments

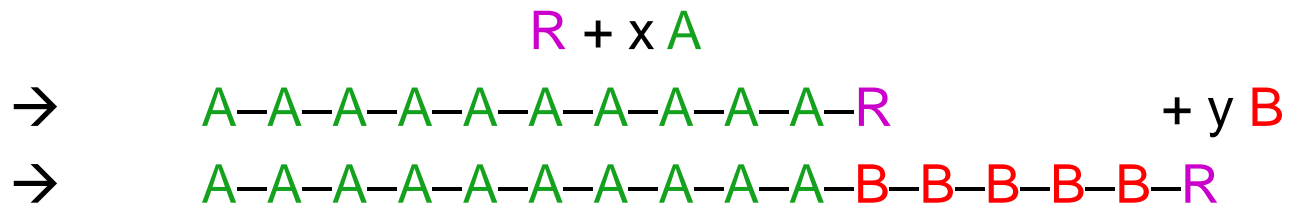
CRP Polymerization

- Limitation of conventional radical polymerization
- Random structure
- Poor control of molecular weight and molecular weight distribution
- Difficult to make building blocks of copolymer

CRP Polymerization

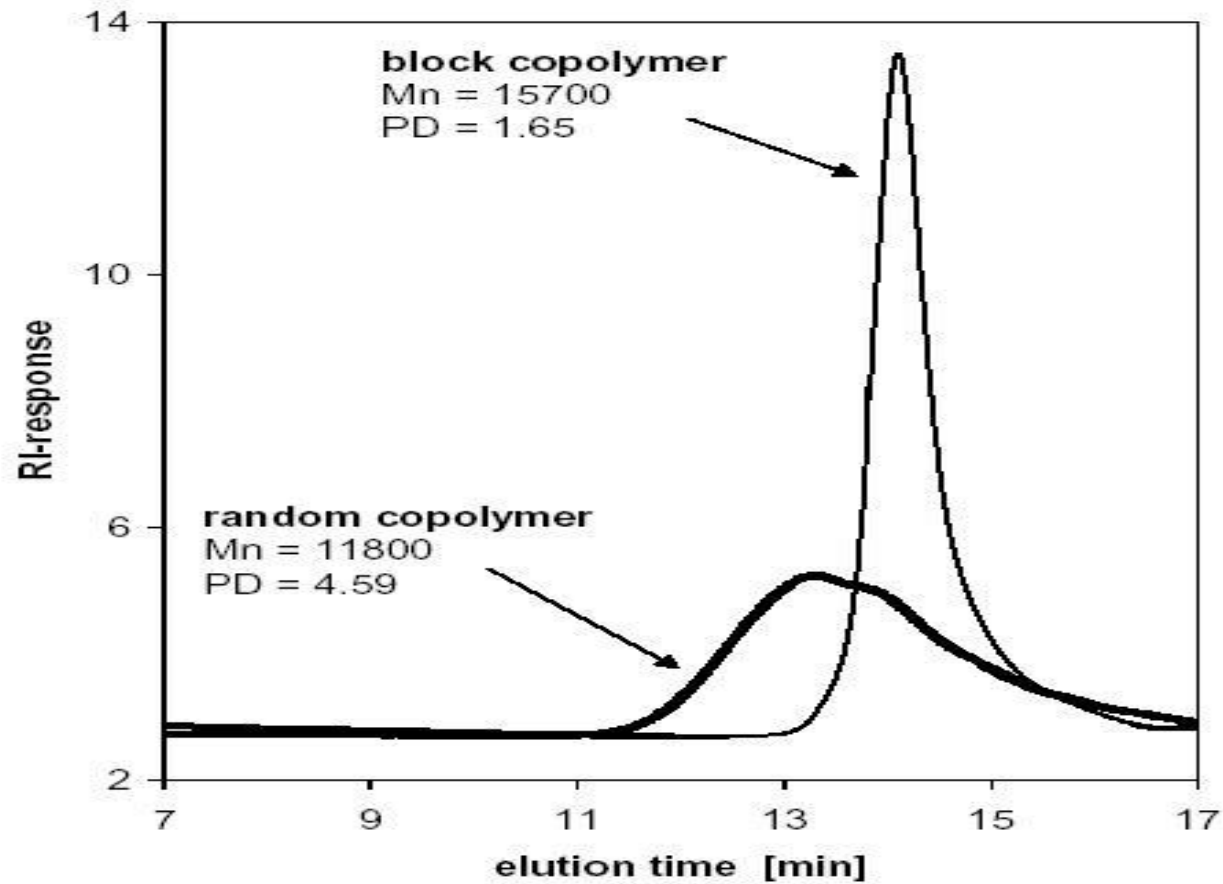
Controlled Radical Polymerisation

Regulator (R), monomer A and B



- Block Building
- Narrow Molecular Weight Distribution

CRP Polymerization



CRP Polymerization

Application Test

- Test in universal pigment concentrate
- Pigments use are
 - Carbon Black: FW 200 (PB7)
 - Hosteperm Violet RL Special (PV23)
 - Paliogen Red L3885 (PR179)
 - Sicotrans Yellow L1916 (PY42)
- Test in resin: Acrylic, Polyol and CAB

CRP Polymerization

Formulation Based On AFCONA 4701

Raw Material	FW 200	Paliogen Red L3885	Hostaperm Violet RL	Sicotrans Yellow L1916
Laropal A81 60%	50.00	40.00	40.00	30.00
Xylene	15.00	18.75	23.60	11.00
PMA	15.00	18.75	23.60	11.00
<i>AFCONA 4701</i>	10.00	7.50	4.80	18.00
Pigment	10.00	15.00	8.00	30.00
Total	100	100	100	100

CRP Polymerization

Metallic Basecoat

Setalux 1184	40.00
PMA	4.00
Otal 2006	15.00
CAB 381-0.5	10.00
AFCONA 3700	0.50
Aluminium Paste	10.00
Xylene	10.00
BA	<u>10.50</u>
Total	100.0

PU Clear Base

Setalux 1186	80.00
Xylene	10.00
PMA	<u>10.00</u>
Total	100.0

Mix ratio: Base to Pigment Paste = 3 to 1

CRP Polymerization

PU – Violet RL

AFCONA 4701 Non-CRP Dispersant



Metallic Basecoat – Violet RL

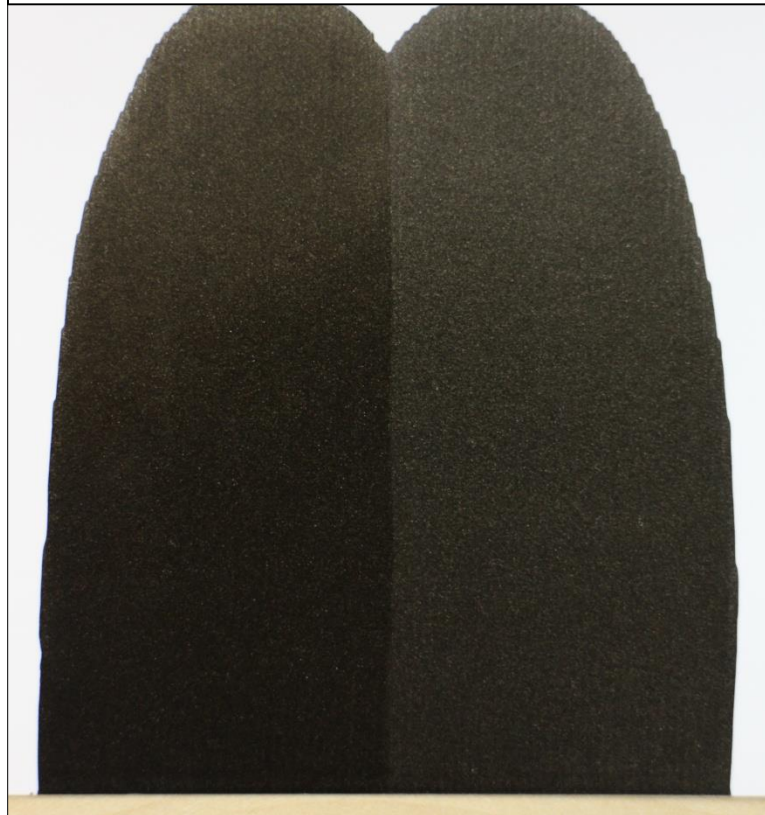
AFCONA 4701 Non-CRP Dispersant



CRP Polymerization

Metallic Basecoat – FW200

AFCONA 4701 Non-CRP Dispersant



Example formulations for pigment pastes

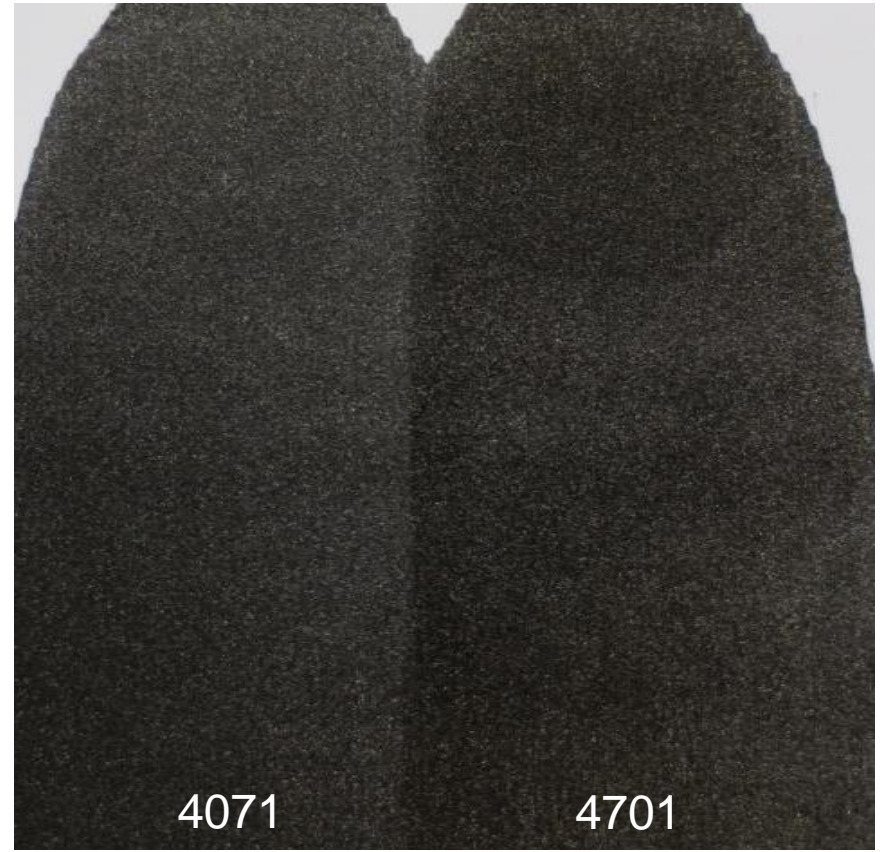
Items	Blue PB15:3		Red PR179		Pink E PR122		Monach 1400	
	AFCONA - 4071	AFCONA - 4701	AFCONA - 4071	AFCONA - 4701	AFCONA - 4071	AFCONA - 4701	AFCONA - 4071	AFCONA - 4701
Low OH polyacrylate 50% solid	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
Dispersant	6.67	6.00	8.00	7.20	5.44	4.90	6.40	5.75
AFCONA 6745	0.40	0.40	0.00	0.00	0.00	0.00	0.40	0.40
Pigment	12.00	12.00	12.00	12.00	9.80	9.80	5.75	5.75
Butyl Acetate	19.00	19.30	18.50	18.90	20.88	21.15	22.22	22.55
Xylene	19.00	19.30	18.50	18.90	20.88	21.15	22.23	22.55
PMA	2.93	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
% of dispersants on pigment	25%	25%	30%	30%	25%	25%	50%	50%

Performance



Comment : In blue, the difference is not pronounced, however in PR 179, A4701 shows much better transparency and results in a more brilliant color

Performance



Comment : In pink (PR122) 4701 shows better result. However in high jetness black, 4701 shows much better performance as the black is dark with golden tone

AFCONA - 4565

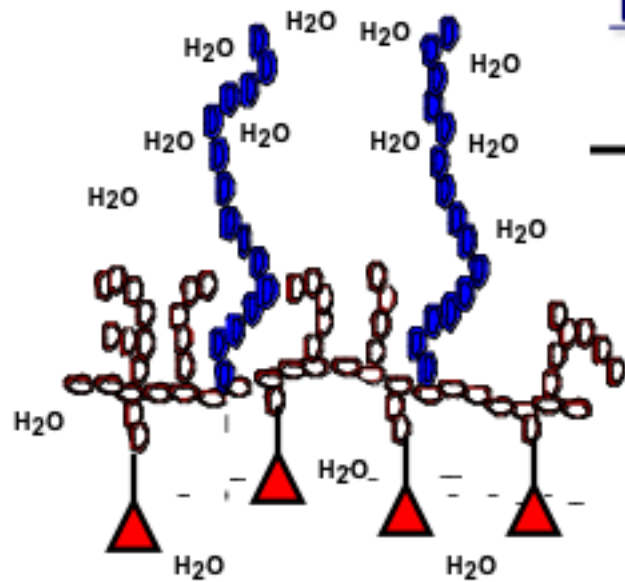
Chemical : Modified polyacrylate polymer

Solvent : Water

- High molecular weight polymeric dispersant for deflocculation of pigments in water-based industrial coatings and pigment concentrates
- pH-independent
- Filmogenic, after drying it loses solubility in water

AFCONA - 4565

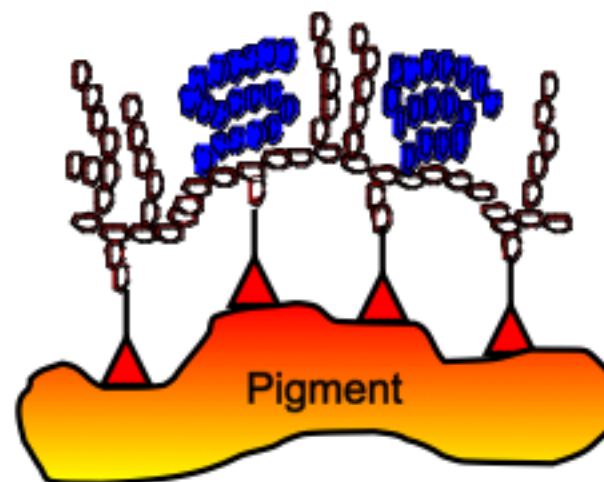
Wet phase



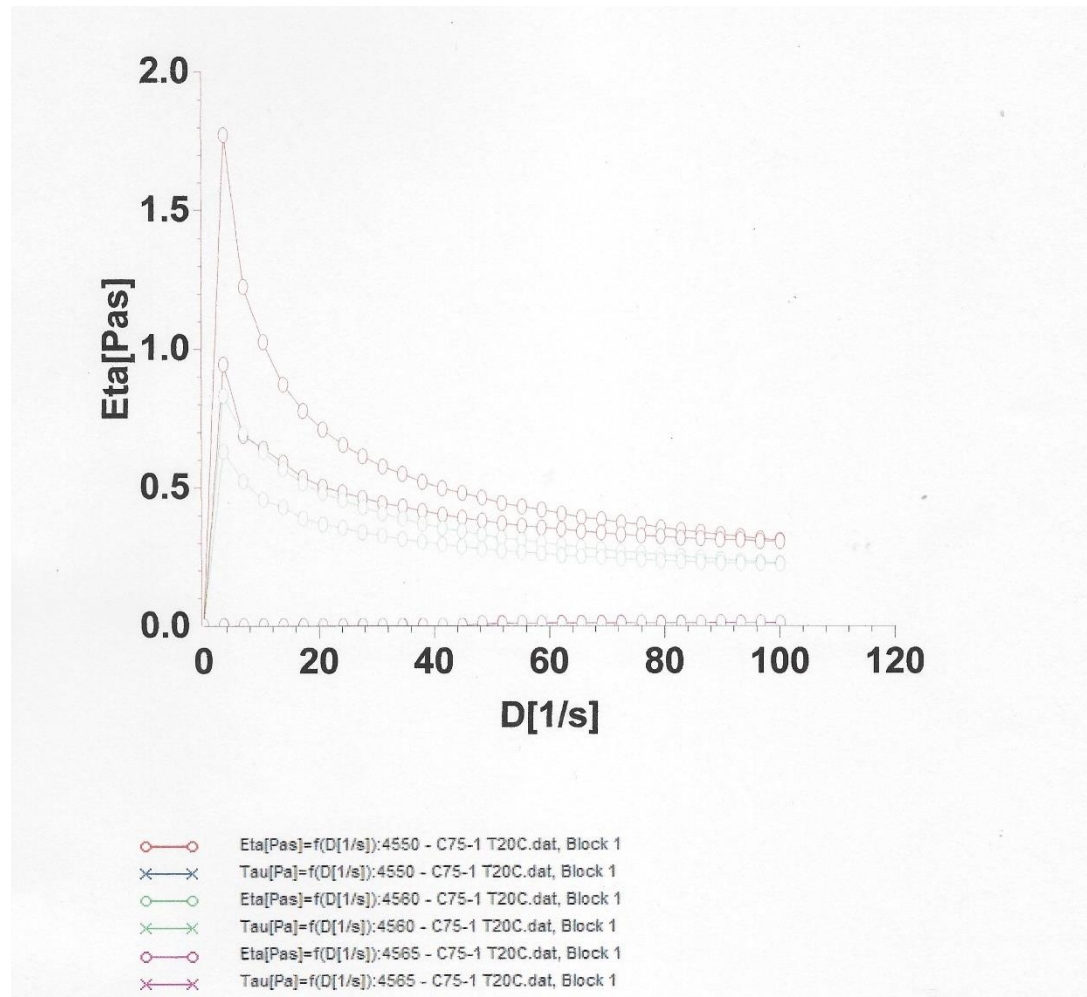
Transition



Dry phase



AFCONA - 4565





Highlighted Dispersants & Wetting Agents

- **5000 Series conventional dispersing & wetting agents**
 - **Solvent based systems**
 - AFCONA-5251
 - **Water based systems**
 - AFCONA-5585

Chemicals : HMW Carboxylic acid polymer

Solvent : 100% active

- Specially developed for deflocculation of transparent iron oxides
- Excellent for dispersion of TiO₂ at very high concentration
- Provides low viscosity in inorganic pigment and filler dispersions
- Recommended for high filled systems or high solid applications

AFCONA - 5251

Formulations		
AFCONA 5251	10,00	10,00
MPA	40,00	40,00
Yellow AC0544 Rockwood	50,00	
Red AC1005 Rockwood		50,00
Total	100,00	100,00



Chemical : High molecular weight block polymer with pigment affinity groups

Solvent : 100% active

- Solvent-free wetting and dispersing additive for universal colorants
- Effective for the production of pigment concentrates for solvent and water based industrial and architectural coatings
- VOC free
- Labeling free



Highlighted Products

- **6000 Series specialty additive**
 - Afcona-6226





AFCONA - 6226

Chemical : Fatty acid modified polyester

Solvent : 100% active

- Dispersant and emulsifier for universal colorants
- Performs as color acceptance additive
- Technical improvement of AFCONA – 6225 with lighter color and lower viscosity
- Provides universal colorants with lower viscosity and higher color strength than AFCONA - 6225
- Friendlier labeling than AFCONA - 6225

Results for Rub Out Test and Tinting Strength

<p>Violet RL 23 Solvent Base AFCONA 6226 AFCONA 6225 (Initial sample)</p>	<p>Violet RL 23 Solvent Base AFCONA 6226 AFCONA 6225 (After Stability)</p>	<p>Violet RL23 Water base AFCONA 6226 AFCONA 6225 ➤(initial sample)</p>	<p>Violet RL 23 Water base AFCONA 6226 AFCONA 6225 ➤After stability</p>
			

Success Stories

- Michigan architectural paint company
 - Resolve flood and floating A-6225/A-5071
- Cleveland-area color dispersion house
 - PVC-plastisol black dispersion only dispersant package that gives stability A-8530
 - TiO₂ dispersion for GI application A-5010
- Michigan DTM coatings mfr
 - Replace BYK ATU w. A-5044
 - Replacing Disperbyk w. A-5071

Success Stories

- East Coast Color Dispersion house
 - A-4701 in Automotive black dispersion: tested best between BYK, BASF, Tego
- SC small dispersion house
 - Resolved flooding and floating with A-5071/A-6226
- Cleveland sports field marking paint
 - Replaced BYK-155 with A-5515 – cost savings exercise

Success Stories

- Mexico
 - A-4595 replaced Disperbyk-190 at multiple accounts
 - A-5044 replaced ATU at multiple accounts
 - A-6226 improved color dispersion in POS colorant at large architectural paints customer

- Epoxy flooring mfr in GA:
 - Switched to A-3700 after FC discontinuation from other supplier

Success Stories

- Canada
 - A-4063 replaced Disperbyk-163 at industrial coatings manufacturer
- KY dispersion house
 - Solved dispersion issue of TiO₂ in PU dispersion A-5251
- Cleveland mfr of PU and epoxy flooring
 - Resolved air entrapment issue A-3251/A-2050

Success Stories

- And Brett's favorite:
- New York piano lacquer mfr:
 - Resolved foam/surface leveling issue with A-3585/A-2524.

Expect to have 100% of their business at 4 quarts per year!

Sanity Check

- Do you have all the tools you need?
 - Product literature
 - TDS/MSDS
 - Sample Process
 - Pricing
 - Supporting info/documentation
 - Anything else?
- Ancillary market segments/customers/applications
- Unmet regional market needs?
- Emerging hotspots?
- Portfolio Gaps or opportunities?



Thank You!

Questions?