

## **New Hybrid Rheology Control Agent for WB Coatings**

### **DISPARLON AQH-800**

#### **1. Introduction**

With an increased use of water-based coatings, a higher level of various coating properties is required. One of the needed coating properties is the appropriate rheological behavior. There is a variety of rheology control agents such as cellulose type, urethane type, acrylic type and bentonite type for the WB coatings. They all have advantages and disadvantages so we should choose the suitable one for our purposes.

DISPARLON AQH-800 is our new Soft Paste Rheology Control Agent.

AQH-800 is a hybrid type of special polyamide compounds. AQH-800 can be incorporated easily and forms a network structure in the coating system. The unique hybrid network structure of AQH-800 provides many features different from general rheology modifiers.

#### **2. Features and typical properties of AQH-800**

##### 2-1. Typical properties of AQH-800

Table-1

Appearance	Light yellow soft paste
Active component	Modified amine salt of polyamide
Active %	10%
Volatile	Water, Propylene glycol monomethyl ether
Acid value	7.5

2-2. Features of AQH-800

1) Easy incorporation

AQH-800 can be added directly but using a pre-dispersion of AQH-800 is more effective in some cases.

2) High shear thinning property

Low viscosity at high shear rates (High thixotropic effect). Excellent anti-settling & anti-sagging properties. Excellent sprayability.

3) Heat resistance

Excellent heat resistance caused by the enhanced network structure through hybridizing.

4) Solvent independent

Independent from the types and amount of co-solvents. Can be used in a wide range of the WB coating systems, from Emulsion types to Water-soluble types.

Table-2 Formulation

Component	Parts
NeoCryl XK-12	78.21
Dipropylene Glycol Monobutyl Ether	3.13
Dipropylene Glycol Monomethyl Ether	3.65
dH <sub>2</sub> O	15.01

Figure-1 shows the rheological behaviors of different rheology control agents. General thickeners increase viscosity very much but don't impart high thixotropic effect. These thickeners tend to show higher viscosity to get enough thixotropy. AQH-800 provides high thixotropy at a lower dosage without too much thickening.

Figure-1 Rheological behavior

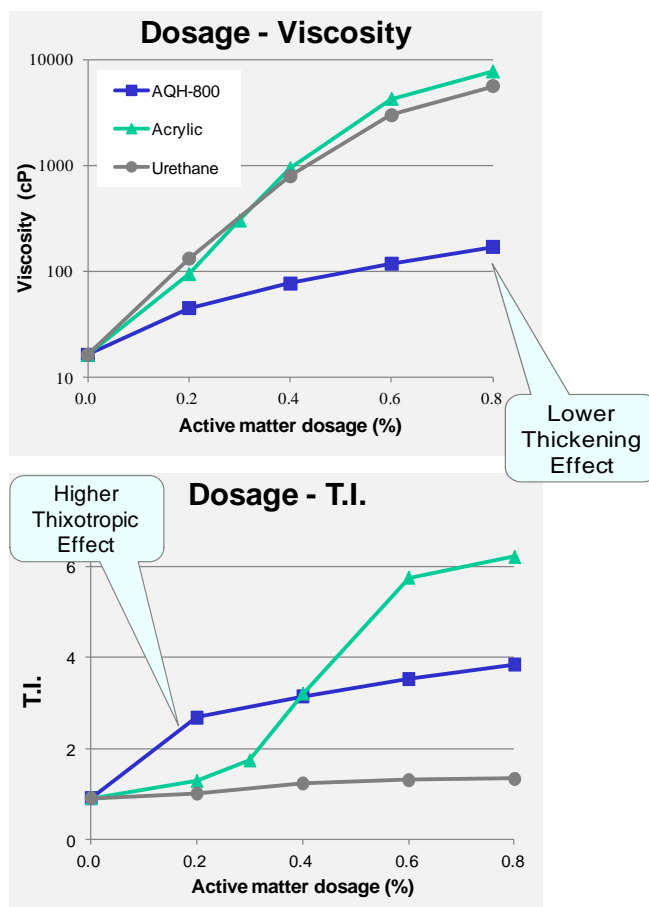


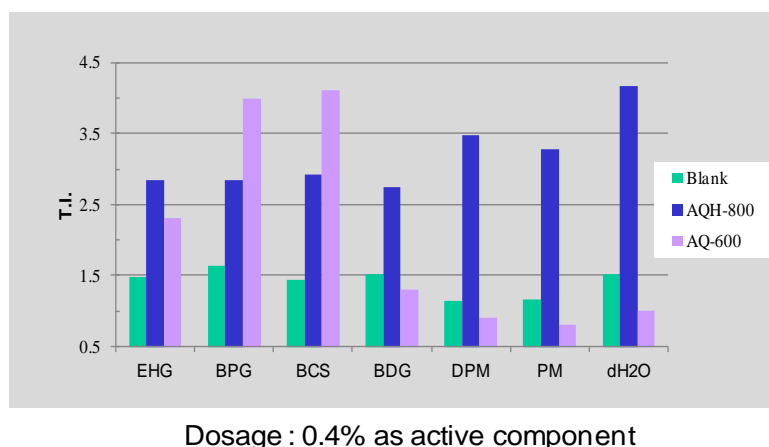
Table-3 Formulation

Component	Parts
NeoCryl A-639	75.56
dH <sub>2</sub> O	14.24
Co-solvent	10.20

Figure-2 Solvent independency of AQH-800

Co-solvent	HLB (Davies)	
Ethylene glycol mono-2-Ethyl hexyl (EHG)	5.4	Hydrophobic type
Propylene glycol monobutyl ether (BPG)	6.9	
Ethylene glycol monobutyl ether (BCS)	7.3	Medium type
Diethylene glycol monobutyl ether (BDG)	7.6	
Dipropylene glycol monomethyl ether (DPM)	8.1	Hydrophilic type
Propylene glycol monomethyl ether (PM)	8.3	

Figure-2 shows the influence of various co-solvents on AQH-800 and AQ-600. AQ-600 is effective with lower polarity co-solvents. The thixotropic effect of AQH-800 isn't influenced too much by the polarity of a co-solvent.



### 3. Mechanism of AQH-800

The strong crystal structure of a hydrophobic amide is applied into hydrophilic polyamide structure and enhances self-assembly properties of the hydrophilic polyamide .

With hydrophobic interactions and hydrogen bonds, AQH-800 becomes a fibrous molecular assembly and then interacts with each other or interacts with some particles such as resins and pigments. As a result, AQH-800 forms a network structure, and provides the required rheological behavior to the coatings.

#### 4. Effects of AQH-800

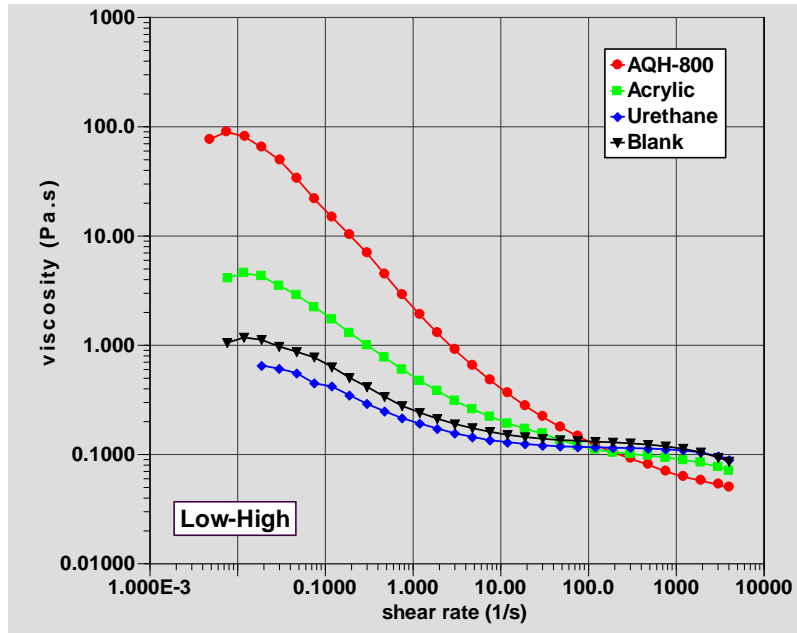
Table-4 Formulation of Automotive OEM primer-surfacer

Part A		
Setaqua 6071 AQ-44	Polyester resin; Nuplex Resins	95.68
W-1	Barium sulfate; Takehara Kagaku Kogyo	29.44
SL-2000	Calcium Carbonate; Takehara Kagaku Kogyo	29.44
JR-600A	Titanium dioxide; TAYCA	58.88
MA-100	Carbon Black; Mitsubishi Chem.	0.44
Water		23.84
DMEA	pH control agent (pH 8.0)	0.48
<b>[Sand-mill grinder 2000rpm x 60min]</b>		238.20
Paint formulation		
<b>Part A</b>		238.2
Setaqua 6071 AQ-44	Polyester resin; Nuplex Resins	95.68
DMEA	pH control agent (pH 8.0)	0.30
Water		31.36
Diethyleneglycol monobutyl ether	Co-solvent	10.08
Setamine MS-152 IB-70	Melamine resin; Nuplex Resins	30.77
<b>Rheology control agent</b>		$\alpha$
<b>[Dissolver 1800rpm x 15min]</b>		406.39 + $\alpha$

**Dosage: 0.4%(as active component), Viscosity: 26 sec (Ford Cup #4) at 25°C**

Figure-3 shows the flow curves of various rheology control agents. AQH-800 brings a higher thixotropic effect than the Acrylic and Urethane thickeners; gives a lower viscosity at high shear rate, and higher viscosity at low shear rate compared to the others. Thus AQH-800 provides excellent anti-settling and anti-sagging properties.

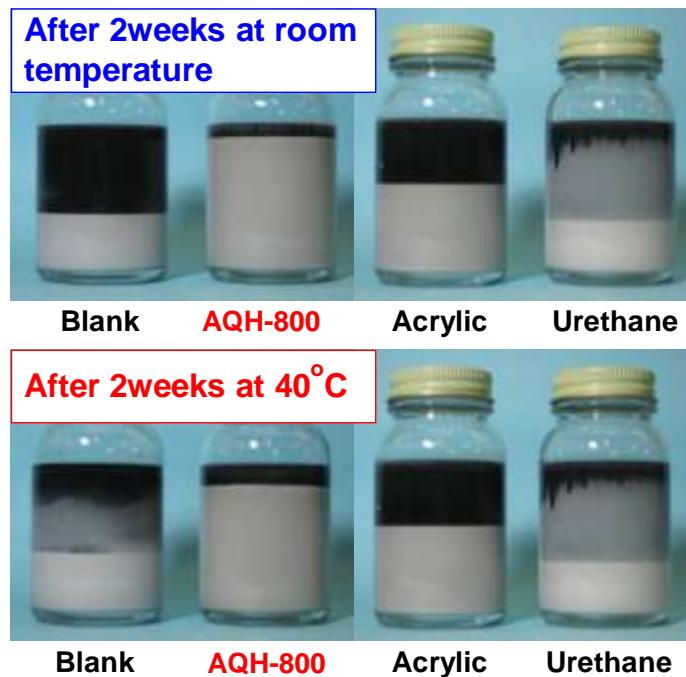
Figure-3 Flow curve



**Dosage: 0.4%(as active component), Viscosity: 26 sec (Ford Cup #4) at 25°C**

AQH-800 prevented pigment sedimentation for 2 weeks at both room temperature and 40 degree C (Photo-1). AQH-800 provided the excellent anti-settling effect as expected from the flow curve and the effect of AQH-800 was stable even at high temperatures.

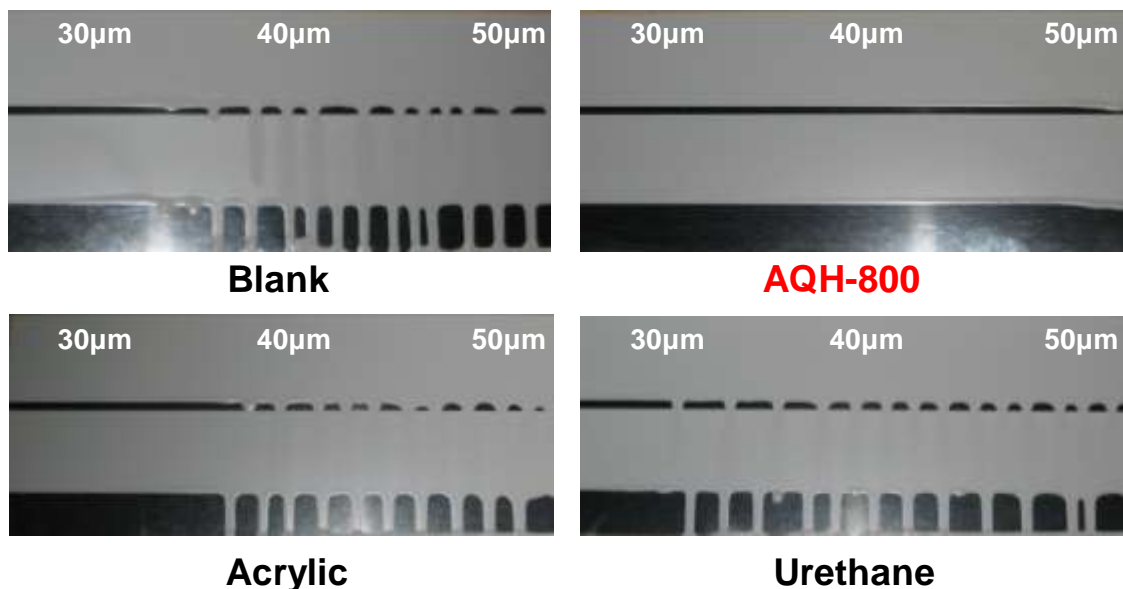
Photo-1 Anti-settling test result



**Dosage: 0.4%(as active component), Viscosity: 26 sec (Ford Cup #4) at 25°C**

AQH-800 showed also an excellent anti-sagging effect as well as the anti-settling effect, compared to Acrylic and Urethane thickeners (Photo-2).

Photo-2 Anti-sagging test result



**Dosage: 0.4%(as active component), Viscosity: 26 sec (Ford Cup #4) at 25°C**  
**Setting: 10min at 25°C, Baking: 10min at 80°C → 30min at 145°C.**

As shown in this document, AQH-800 provides a high thixotropic effect without unnecessary viscosity increase. AQH-800 prevents pigment settling and sagging problems even after storage at high temperature. AQH-800 can be added directly because of soft paste. AQH-800 is independent from the types and amount of co-solvents and can be used in a wide range of the WB coating systems.