SI Group®
The Substance Inside

Coatings – Product Portfolio Overview

Paolina Knezevic
Tech. Service Manager

September, 2021

SI Group – Offerings for Coatings

- **Global leader** in Performance Additives that **enhance the quality, performance, and durability** of countless items we use every day, including coatings

- SI Group was acquired by SK Capital in 2018 and merged with Addivant
- Rich both company roots led to extended product portfolio, more technology platforms, enhanced global manufacturing capabilities
- 3000 employees, 30 manufacturing sites globally
- With focus on customers needs and sustainability - Gold certified per EcoVadis in 2021

- PHENOLIC RESINS
- ANTIOXIDANTS
- UV STABILIZERS

- Global manufacturing footprint for resins and additives, security of supply
- Backward integration as a world leader in alkylphenol chemistry, main building blocks for resins and stabilizers (AOX & UVS)
- Developing sustainable solutions: ultra low monomer solutions, elimination of materials of high concern offering safe and functional alternatives
- Capacity expansion: US, China

PHENOLIC RESINS

- Wide variety of solid and liquid, reactive and non-reactive resins for property enhancements:
  - Chemical resistance
  - Thermal resistance
  - Mechanical strength
  - Anti-corrosion
  - Adhesion on various substrates
  - Good compatibility with other systems
  - Flame retardancy
  - Dielectric properties
- Example of Applications:
  - Anti-corrosive industrial coatings – marine, automotive, tank linings
  - Epoxy-phenolic powder coatings for enhanced chemical resistance – pipes in chemical and oil industries
  - Interior metal packaging
  - Electrical insulating coatings (wire, transformers, etc.)

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SIG Resins – Resols in Solution – Liquid Form

Resin	Application	Solvent
SFC-112	Metal packaging, 2-piece DRD, 3-piece – **flexibility, light color**	n-Butanol
SFC-144	Metal Packaging, 2-piece DRD, 3-piece – **flexibility, light color**	Xylene
FB-110 XB50	Metal Packaging, 2-piece DRD, 3-piece – **reactivity, gold color**	Xylene, n-Butanol
SFC-138B	Metal Packaging, 2-piece DRD, 3-piece – **reactivity, gold color**	n-Butanol
HRJ-13804	Tinting resin – **gold color**	n-ButOH, i-ButOH, Glycol Ether PM
FB-209 BT57	2-piece DRD, 3-piece – **reactivity, chemical resistance, light color**	n-Butanol, Toluene
FB-210 B60	2-piece DRD, 3-piece – **reactivity, chemical resistance, light color**	n-Butanol
L19-M3 42	Ready phenolic + epoxy system, 3-piece, 2-piece (DRD), light color	n-ButOH, EDG, S150
FB-250 XB50	Wash primer (anti-corrosive primer) – **chemical resistance**	Xylene, n-Butanol
HRJ-13078	2-piece DWI for beverage cans (not stand alone, minor component), water based, yellow	Water

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SIG Resins – Resols - Solid Form

Resin	Monomer	Application
FB-190	PTBP based	2-piece DRD, 3-piece – **flexibility, high reactivity, higher chem resistance, not stable in solution**
SP-103	PTBP based	2-piece DRD, 3-piece, alkyd modifiers – **flexibility, light in color**
HRJ-1367	PTBP based	2-piece DRD, 3-piece, alkyd modifiers – **flexibility, light in color, higher reactivity than SP-103**
SP-134	PTBP based	2-piece DRD, 3-piece, alkyd modifiers – **flexibility, light in color, higher heat resistance**
SP-1045	PTOP based	2-piece DRD, 3-piece, alkyd modifiers – **very flexible, light in color**

SIG Resins – Novolacs - Solid Form

Resin	Monomer	Application
HRJ-12952	Phenol based	Hardener for epoxy powder coatings
SMD-31144	PTBP based	Medium softening point, modifiers for alkyds, inks
SMD-31144HT	PTBP based	High softening point, modifiers for alkyds, inks
ELAZTOBOND™ 6000	PTOP based	Medium softening point, modifiers for alkyds, inks
HRJ-11937	PTBP based	Very high softening point, modifiers for alkyd paints, inks

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ANTIOXIDANTS

- Used to prevent oxidative degradation of polymers in coatings subject to heat exposure
- Increase durability and performance of the coatings

- **Primary Antioxidants** – radical scavengers
  - Chemistry: hindered phenolic
  - Brands: ANOX™, LOWINOX™
  - Product portfolio:
    - Standard primary AOX - ANOX™ 20, ANOX™ PP18
    - Specialties

- ANOX™ 1315 – Liquid, efficient AOX, ultra low emissive, with great solubility, PU (polyether polyols), good gas fading resistance, FDA approved
- LOWINOX™ 1790 – Solid high performance excellent gas fading performance, powder coatings, regulatory compliance

- **Secondary Antioxidants** – peroxide decomposers
  - Chemistry: phosphites
  - Brands: WESTON™, ULTRANOX™
  - Product portfolio:
    - Standard secondary AOX – WESTON TNPP, ALKANOX™ 240
    - Specialties

- WESTON™ TDP ZP – Liquid, aliphatic, low odor, no free phenol efficient phosphite stabilizer
- WESTON™ 705 – Liquid, aromatic, regulatory compliant, direct replacement of endocrine disruptor TNPP, FDA approved
- ULTRANOX™ 626 – Solid, aromatic, high performance phosphite stabilizer

- **Blends** –
  - Synergistic effect of 1º and 2º AOX, non-dusting versions, less RMs handling, lower variability
  - Brands: ANOX™
  - Product portfolio:
    - Standard blends
    - Custom blends

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Additives - Antioxidants

- Preventing oxidation of the polymer subject to heat exposure, non regenerative
- 2 major classes and their blends, SIG offerings:

1. **Primary Antioxidants:** hindered phenolic – stabilization over service life of the coating – radical scavengers (ANOX™, LOWINOX™)
2. **Secondary Antioxidants:** phosphites – stabilization during the processing/application of the coating (ALKANOX™, WESTON™, ULTRANOX™)
3. **Antioxidant Blends** of 1 & 2 – combined AOX effect (ANOX™ BB011)

- **Selection:**
  - General use AOX: Anox 20, Anox PP18
  - High activity non-discoloring AOX, low volatility, polymers (no migration), low extraction: LOWINOX 44B25, LOWINOX CPL, LOWINOX 1790 (replaces LOWINOX GP45)
  - Liquid or solid, melting point for powder coatings

ANOX™ 1315
- Primary AOX – hindered phenolic
- Liquid - handling
- Low emission vs. AOX-1135 type
- Great compatibility and low migration
- Non-discoloring, low viscosity
- Low freezing (< - 20 °C)

WESTON™ 705
- Secondary AOX – phosphite
- Liquid - handling
- Regulatory compliant – nonylphenol free
- Higher phosphorus content than alternatives
- Used as TNPP drop in
- Replacement for solid ALKANOX 240 – AOX 168 type

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UV STABILIZERS

- Prevent photo-oxidation and degradation of the polymer – photochemical reactions caused by absorbed UV light
- 2 major groups of materials and their blends and blends with AOX
- SI Group product brand – LOWILITE™

UVAs
UV Light Absorbers

Absorb the light at certain wave length and dissipate into heat
Choice depends on the system, other components, UV spectra coverage required…

1. Benzophenones – older class, regularly replaceable coatings, lower band coverage: LOWILITE 22
2. **Benzotriazoles** – widest coverage of UV spectra: LOWILITE 26, 28, LOWILITE 234 (not SVHC)
3. Triazines – high level of absorbtion

HALS
Hindered Amine Light Stabilizers

Scavenge radicals formed by interaction of light with the polymers

Monomeric (LOWILITE 77, 92) vs **Polymeric** (LOWILITE 19, 62, 94) – migration (surface, substrate)

Basic (LOWILITE 19, 77, 92, 94) vs **Non-Basic** (LOWILITE 62) – Basic have interaction with acidic catalysts and pigments, change activity

BLENDS
Blends of UV/AOX light stabilizers

Possible custom blends to meet particular product/customer needs

LOWILITE UV B1260 – liquid, blend of primary AOX + UV stabilizers

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Additives – UV Light Stabilizers

- Photo-oxidation and degradation of the polymer – photochemical reactions caused by absorbed UV light
- 2 major groups of materials, both regenerative, SIG offerings – LOWILITE™:

1. UVAs – UV Light Absorbers:

- Absorb the light at certain wave length and dissipate into heat
- Choice depends on the system, other components, coverage required etc.

1. Benzophenones – older class, regularly replaceable coatings, lower band coverage – LOWILITE 22
2. **Benzotriazoles** – widest coverage of UV spectra, deactivated by metals, amines – LOWILITE 26, 28, LOWILITE 234 (not SVHC)
3. Triazines – in development

2. HALS – Hindered Amine Light Stabilizers:

- Scavenge radicals formed by interaction of light with the polymers
- **Monomeric** (LOWILITE 77, 92) or **polymeric** (LOWILITE 19, 62, 94) – migration
- **Basic** (LOWILITE 19, 77, 92, 94) or **Non-Basic** (62) – Basic have interaction with acidic catalysts and pigments
- In addition to UV Stabilizer effect of HALS they are also used as tribo-charging additives in powder coatings – they improve electro-chargeability of powders – 0.1-0.3% - LOWLITE™ 62 & 19

3. BLENDS - Blends of AOX & UV light stabilizers:

- Liquid - LOWILITE UV B1260 – blend of primary AOX + UV stabilizers

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