Lorama Polysaccharide Resin Technology
LPRT
Lorama Group Inc.

Founded in 1980 in Milton, Ontario, Canada

Locations

- Toronto, Canada (Rexdale & Milton) – Production/R&D
- Barbados - Administration
- Miami, FL - Logistics
- Cleveland, OH - Distribution
- Porto Alegre, Brazil – Production/Distribution
Lorama Polysaccharide Resin Technology LPRT
Lorama Polysaccharide Resin Technology (LPRT):

Allows for the incorporation and stabilisation of water-in-oil emulsions using a film forming- Polysaccharide Resin
Expectations

Equal gloss @ 60°/20°
Equal or better gloss retention
Equal or higher viscosity
Equal or better sag resistance

Equal or better hardness
Equal or better adhesion
Lower Material VOC
Equal leveling

• Lower material VOC
• Equivalent or better performance
• Lower raw material cost
The hydroxyl groups (OH) of the polysaccharide resin hydrogen bond with the carboxyl (COOH) groups of the alkyd forming a denser-higher molecular weight polymer network
The core product of LPRT is **Lorama Polysaccharide Resin LPR76**. Its functions are:

- Assisting in the creation and steric stabilisation of the water-in-oil emulsion
- Preventing the formation of gaps in the film caused by the evaporating water through hydrogen bonding with the alkyd
- Molecular association with the alkyd serving to improve Film Hardness
40X magnification of water-in-oil emulsions:

- The emulsion with LPR76 has a smaller average water micelle,
- More even water micelle distribution
- RESULT – The emulsion with LPR76 has greater stability, and better film properties than the emulsion without it
DWA
Direct Water Addition

EI
Emulsion Intermediate
Direct Water Addition

- LPR 76 Polysaccharide is added at the end of production
- Water is added and High Speed dispersed for 30 mins
- Batch process
- Modification of existing paint
- Less easy to check on emulsion stability (pigments/fillers)
• An intermediate material or pre-mix containing alkyd, solvent, anti-foam, LPR76, and water
• Has a concentrated water content of approximately 60%

Benefits
• The same emulsion can be dosed into several different formulations
• Provides the best emulsion stability
• Allows for a greater rate of water addition
**Processing Steps**

*Mix slowly*

- Alkyd Resin - 75% Solids: 16.92% (w/w)
- D40 Solvent: 13.51% (w/w)
- Anti-foam LAF121: 0.20% (w/w)
- Polysaccharide Resin LPR76: 7.44% (w/w)

*then add under high speed*

- Water: 61.94% (w/w)

Create doughnut-shaped vortex and avoid splashing.

Keep High Speed Dispersion for 30 minutes after adding the last drop of water.
## Rate of Water Addition in the laboratory vs production

<table>
<thead>
<tr>
<th></th>
<th>Laboratory</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Addition</strong></td>
<td>0.2-3.0 litres / minute</td>
<td>Minimum 100 litres / minute Up to 300 litres/minute</td>
</tr>
<tr>
<td><strong>Tip Speed</strong></td>
<td>7-10 metres / second</td>
<td>20-35 metres / second Minimum blade diameter = 0.4m</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>Less powerful equipment limits rate of water addition</td>
<td>High speeds allow for greater rate of water addition</td>
</tr>
<tr>
<td><strong>Viscosity (KU)</strong></td>
<td>95 - 105 @ 25°C</td>
<td>95 - 105 @ 25°C</td>
</tr>
</tbody>
</table>
The recommended mixing time when creating the Emulsion Intermediate is 30 minutes.

Do not let the Emulsion Intermediate heat up past 50°C to prevent solvent evaporation and excessive solvent loss.
Stability after 7 days at 60°C

Poor Emulsion  Good Emulsion
Effective mixing is critical when using LPRT

**Blade Sizing**
The blade diameter should equal 1/3 the tank diameter to ensure good laminar flow, and to get the most efficient dispersion from the equipment.

**Blade Positioning**
The blade should be 1 to 1.5 blade diameters off the bottom of the tank.

Good laminar flow will result in a good vortex.
Viscosity of the emulsion increases as the water is broken into fine micelles and emulsified in the alkyd.

As water is added, viscosity of the emulsion should increase.

Viscosity of emulsion should increase as time under high speed agitation increases.

**Good Emulsion Development**

**Poor Emulsion Development**
Emulsion Intermediate – Don’ts

Do not allow water to pool on the top during water addition

Do not stop agitation after adding water

Do not exceed 30 minutes agitation time

Never use gear pumps to transfer EI (use diaphragm or screw pumps)

Never add solvent to the EI to adjust viscosity or improve flow for transfer

Do not clean/wash tank with water. Always use solvent
Development Stage:
Set required viscosity specification range ±5 KU
Oven Stability Test – 7 Days @ 60° C

Quality Control:
Check viscosity (falls within specified range)
Centrifuge test (1:1 dilution with Xylene 3-4000rpm/20 mins)

For Storage Tank:
Agitate for 10 mins daily at low speed (max. 80 rpm)
Use a recirculating pump (diaphragm pump)
Preparing a Paint

**EMULSION INTERMEDIATE**
Water-in-oil emulsion
Requires a tip speed of greater than 20m/s
Mix for 30 minutes after all water has been added

**LETDOWN**
- Driers
- Alkyd Resin
- Solvent
- Anti-Skin
- C

Letdown tank with low speed agitation.
Combine grind paste, driers, alkyd resin, solvent, anti-skin, emulsion intermediate.
Mix until homogenous

**PIGMENT GRIND**
Requires high speed dispersion

**A**
- Alkyd Resin
- Solvent
- Anti-Foam LAF121
- Lorama LPR76
- Water

**B**
- Pigment
- Alkyd Resin
- Solvent
- Bentone
- Dispersant
Where can LPRT be used?

- Premium Enamels
- Economy Enamels
- Coloured Enamels
- Primers & Undercoats
- Floor Paints
- Roof Paints
- High Gloss, Semi-Gloss, Satin, Matt & Flat paints
- Tintable Bases for POS/In Plant tinting systems

Only suitable for Alkyd Based systems
LPRT VOC Reduction

**Action**

1. Reduce alkyd resin to make room for water
2. Removal of extenders and fillers as necessary
3. Incorporate LPR76 and water

**Result**

- Overall organic solvent content is reduced as alkyd is reduced
- More room for water, reduced PVC, enhanced gloss retention = better film properties and lower cost
- Water (a non-VOC) fills the volume left by the removal of alkyd

The result is less grammes of volatile organic compounds (VOC) per litre of paint.
Achieving VOC Compliance

• High solids Resin systems
  Same approach as conventional alkyd systems but some compromise needed

• Introduction of water –
  • Polysaccharide
  • Surfactant
  • Amine

  Requires some “alternative” thinking vs traditional alkyd systems
High Solids cf LPRT

+ Very stable (no water needed to achieve VOC)

- Greater yellowing tendency
- Slower drying
- Softer films
- Require Co for drying (in doubt for future)
- More expensive
Surfactants vs LPRT

+ Ease of use

- Less stable in emulsion
- More raw materials
- Possible plasticising effect (soft film)
- Surfactant migration
- Tinting issues when used in bases
Amines vs LPRT

+ Lower usage levels

- Effect on drying
- Yellowing
- Potential odour issues
- Stability
General Recommendations

- Lined Cans – Epoxy Phenolic coated

- Always use a silicone free de-foamer

- Replacing 2% of D40 with D60 or similar slow evaporating solvent to improve rheology

- Selective use of extenders, consult with Lorama prior to use
Raw Materials with caution

- Silica
- Mica
- Calcium Carbonate with Surface Treatment
- Clays with Surface Treatment
- Silicone Based Defoamers
- Defoamers for water based systems
- Water Miscible Solvents
- Anionic Surfactants/Dispersants
• This is due to the hydrolysis of the alkyd resin (ester link breakage).
• Portion of a cobalt drier goes to the water phase.
• Partial hydrolysis of the driers.
• Using dispersants with High Amine Value. Amines form chelates with the cobalt, reducing its effectiveness.
• Breaking of the Methyl Ethyl Ketoxime due to temperature, generating MEK and an amine.
• Alkyd resins with low molecular weight.
Dry Time Issue Solutions

- Use a Loss of Dry Inhibitor
- Use alkyd resins with urethane backbone (3-5%).
- Use combination of Long Oil Alkyds with Chain Stopped Alkyds at 60-65% Solids.
- Not all new compounds based on Manganese have been tried but Manganese is less effective than cobalt, needs to be used at higher levels and can compromise whiteness.
• Next Generation LPR 76
• Improvement in Yellowing resistance
• Improved dry time stability
LPR 100 – Dry time stability

![Graph showing dry time stability over time in oven for LPR 100, Competitive Technologies, and Alkyd materials.](image)
LPR 100 - yellowing

Graph showing the change in b-value over time in oven for LPR™100, Competitive Technologies, and Alkyd.
Case Studies

1. High Gloss Economy paint (40% water/70% solids LOA – Duramac 5070/70)

2. Gloss Economy paint (18% water/85% solids LOA resin – Polialkyd AF 704/85)

3. Gloss paint (20% water/blend of 70% LOA/60% MOA)
### Economy White Alkyd Enamel - 40% water

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grind</td>
<td></td>
</tr>
<tr>
<td>LOA Duramac 50-5070</td>
<td>6.29</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>0.47</td>
</tr>
<tr>
<td>Rheofal 101 (Organo clay)</td>
<td>0.23</td>
</tr>
<tr>
<td>HS Disperse 10 mins - then add</td>
<td></td>
</tr>
<tr>
<td>LDA 100 (Dispersing agent)</td>
<td>0.29</td>
</tr>
<tr>
<td>TiO₂</td>
<td>11.50</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>1.75</td>
</tr>
<tr>
<td>Grind to &lt;10 µ, wash tank with</td>
<td></td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.01</td>
</tr>
<tr>
<td>Let Down</td>
<td></td>
</tr>
<tr>
<td>MOA 60% Solids</td>
<td>7.74</td>
</tr>
<tr>
<td>18% Zr Drier (Hex-cem)</td>
<td>0.45</td>
</tr>
<tr>
<td>12% Co Drier</td>
<td>0.15</td>
</tr>
<tr>
<td>10% Ca Drier</td>
<td>0.30</td>
</tr>
<tr>
<td>Mix 5 mins low speed</td>
<td></td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.18</td>
</tr>
<tr>
<td>Mix 30 mins low speed</td>
<td></td>
</tr>
<tr>
<td>Mineral spirits</td>
<td>3.64</td>
</tr>
<tr>
<td><strong>E.I.</strong></td>
<td>67.00</td>
</tr>
</tbody>
</table>

### Emulsion Intermediate

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grind</td>
<td></td>
</tr>
<tr>
<td>LOA 70% (Duramac 50-5070)</td>
<td>20.00</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>12.00</td>
</tr>
<tr>
<td>Defoamer (LAF 121)</td>
<td>0.50</td>
</tr>
<tr>
<td>LPR 76 Polysaccharide</td>
<td>7.50</td>
</tr>
<tr>
<td>Water</td>
<td>60.00</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
</tr>
<tr>
<td>% Resin Solid</td>
<td>14.00</td>
</tr>
</tbody>
</table>

### Paint Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
<td>237.18</td>
</tr>
<tr>
<td>% Pigment</td>
<td>11.73</td>
</tr>
<tr>
<td>Pigment:Binder ratio</td>
<td>0.521</td>
</tr>
<tr>
<td>% Resin Solids</td>
<td>19.20</td>
</tr>
<tr>
<td>% Pigment Volume</td>
<td>3.17</td>
</tr>
<tr>
<td>PVC</td>
<td>12.78</td>
</tr>
</tbody>
</table>
Viscosity Stability - Case Study 1

Viscosity Stability

Weeks stored at 50°C

- Alkyd
- LPR76
- LPR 100
Gloss Stability - Case Study 1

Gloss Stability 20°

Gloss Stability 60°

Weeks stored at 50°C
Dry Time Stability - Case Study 1

Dry Time Stability

Weeks stored at 50°C

Time Hours

0.00 1.00 2.00 3.00 4.00

0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00 16.00 18.00 20.00

Alkyd
LPR76
LPR 100
Yellowing - Case Study 1

Yellowing (b - Value)

Weeks stored at 50°C

- Alkyd
- LPR76
- LPR 100
<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grind</strong></td>
<td></td>
<td><strong>Emulsion Intermediate</strong></td>
<td></td>
</tr>
<tr>
<td>LOA 85% (Polikyd AF 704)</td>
<td>10.78</td>
<td>LOA 85% (Polikyd AF 704)</td>
<td>18.20</td>
</tr>
<tr>
<td>D40</td>
<td>1.87</td>
<td>D40</td>
<td>14.30</td>
</tr>
<tr>
<td>Bentone SD 1</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS Disperse 10 mins - then add</td>
<td></td>
<td>LPR 76 Polysaccharide</td>
<td>7.50</td>
</tr>
<tr>
<td>LDA 100 (Dispersing agent)</td>
<td>0.70</td>
<td>Water</td>
<td>60.00</td>
</tr>
<tr>
<td>TiO₂</td>
<td>28.00</td>
<td>Total</td>
<td>100.00</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>2.91</td>
<td>% Resin Solid</td>
<td>15.47</td>
</tr>
<tr>
<td>Grind to &lt;10 µ, wash tank with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Let Down</strong></td>
<td></td>
<td><strong>Paint Properties</strong></td>
<td></td>
</tr>
<tr>
<td>LOA 85% (Polikyd AF 704)</td>
<td>17.29</td>
<td>VOC</td>
<td>257.69</td>
</tr>
<tr>
<td>18% Zr Drier (Hex-cem)</td>
<td>0.63</td>
<td>% Pigment</td>
<td>28.18</td>
</tr>
<tr>
<td>12% Co Drier</td>
<td>0.24</td>
<td>Pigment:Binder ratio</td>
<td>0.909</td>
</tr>
<tr>
<td>10% Ca Drier</td>
<td>0.50</td>
<td>% Resin Solids</td>
<td>28.50</td>
</tr>
<tr>
<td>Mix 5 mins low speed</td>
<td></td>
<td>% Pigment Volume</td>
<td>8.52</td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.26</td>
<td>PVC</td>
<td>19.32</td>
</tr>
<tr>
<td>Mix 30 mins low speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral spirits</td>
<td>6.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E.I.</strong></td>
<td>30.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Viscosity Stability - Case Study 2

Viscosity Stability

Weeks stored at 50°C

Viscosity KU

STD
LPR76
LPR 100
Gloss Stability - Case Study 2

Gloss Stability 20°C

Gloss Stability 60°C

Weeks stored at 50°C

Weeks stored at 50°C
Dry Time Stability - Case Study 2

Dry Time Stability

Weeks stored at 50°C

Dry Time (hours)

LPR76
LPR 100
STD
Yellowing - Case Study 2

Yellowing (b - Values)

Weeks stored at 50°C

b-value

LPR76
LPR 100
STD
### White Alkyd Enamel - 20% water

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grind</td>
<td></td>
</tr>
<tr>
<td>LOA 70% solids</td>
<td>6.17</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>1.33</td>
</tr>
<tr>
<td>Bentone SD1 (no activator)</td>
<td>0.17</td>
</tr>
<tr>
<td>HS Disperse 10 mins</td>
<td></td>
</tr>
<tr>
<td>Add under agitation</td>
<td></td>
</tr>
<tr>
<td>LDA 154 (Dispersing agent)</td>
<td>0.50</td>
</tr>
<tr>
<td>TiO₂</td>
<td>17.26</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>2.51</td>
</tr>
<tr>
<td>Grind to &lt;10 µ, wash tank with</td>
<td></td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.05</td>
</tr>
<tr>
<td>Let Down</td>
<td></td>
</tr>
<tr>
<td>MOA 60% Solids</td>
<td>26.61</td>
</tr>
<tr>
<td>12% Zr Drier (Hex-cem)</td>
<td>0.54</td>
</tr>
<tr>
<td>8% Co Drier</td>
<td>0.28</td>
</tr>
<tr>
<td>5% Ca Drier</td>
<td>0.90</td>
</tr>
<tr>
<td>Mix 5 mins low speed</td>
<td></td>
</tr>
<tr>
<td>Anti-skin (OMG Skino #2)</td>
<td>0.21</td>
</tr>
<tr>
<td>Mix 30 mins low speed</td>
<td></td>
</tr>
<tr>
<td>Mineral spirits</td>
<td>7.85</td>
</tr>
</tbody>
</table>

### Emulsion Intermediate

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOA 60% solids</td>
<td>25.00</td>
</tr>
<tr>
<td>Mineral Spirits</td>
<td>14.00</td>
</tr>
<tr>
<td>Defoamer (LAF 121)</td>
<td>0.50</td>
</tr>
<tr>
<td>LPR 76 Polysaccharide</td>
<td>5.50</td>
</tr>
<tr>
<td>Water</td>
<td>55.00</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
</tr>
<tr>
<td>% Resin Solid</td>
<td>15.00</td>
</tr>
</tbody>
</table>

### Paint Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
<td>403.4</td>
</tr>
<tr>
<td>% Pigment</td>
<td>18.47</td>
</tr>
<tr>
<td>Pigment:Binder ratio</td>
<td>0.623</td>
</tr>
<tr>
<td>% Resin Solids</td>
<td>27.44</td>
</tr>
<tr>
<td>% Pigment Volume</td>
<td>5.35</td>
</tr>
<tr>
<td>PVC</td>
<td>15.56</td>
</tr>
</tbody>
</table>
Gloss Stability - Case Study 3
Dry Time Stability - Case Study 3

![Graph showing dry time stability](image-url)

- STD
- LPR76
- LPR 100

Weeks stored at 50°C

Time in Hours

0 1 2 4
Yellowing - Case Study 3

Yellowing (b-values)

- STD
- LPR 76
- LPR 100

Weeks stored at 50°C
LPRT enables –

• VOC compliance < 300 g/L with standard alkyd resins
• Reduction of cost with no reduction in quality
• Potential improvement in colour acceptance
• Improved dry time protection - LPR 100
• Reduced yellowing in some systems - LPR 100
End of Part 1
ColourFalk Zerø
Zero VOC Universal Colourants
ColourFal Zerø™ Universal Colorants

Innovative technology provides an elegant solution to VOC Free tinting challenges

• Patented sustainable chemistry
• Contains raw materials made from renewable resources
• Binder-free technology
• Humectants that eliminate dry out and prevent freezing at -15°C
• Optimized for performance across binders used in decorative paint
• Ideal rheology for flow and stop-on-demand
Tinting System Problems

- Limited compatibility
- Drying in nozzle
- Dripping
- Flocculation/Rub up
- Automation
- Settling
- Viscosity drop on tinting
- Poor freeze/thaw stability
Compatibility/Colour Acceptance
Compatibility - Colour FalZerø

- Acrylic
- Alkyd (LOA, MOA)
- Alkyd emulsions (water-in-oil and oil-in-water)
- Styrene acrylic
- PVA
- Pliolite
- Polyurethane
Impact:

• leads to blockage
• expensive machine maintenance
• Mis-tints/waste
• Inefficient colour system use

Solutions:

• mechanical – moistening pads (inefficient)
• chemical – correct humectant (EcoFlo)
Impact:

- Waste
- Mis-tints
- Regular cleaning required

Solutions:

- Mechanical - drip catching pads
- Chemical - regulated viscosity for stop and flow
Drip/Drying Demo

http://www.youtube.com/user/FalconChemicals

Settling
Automation
Corob, Italtinto, Hero, Fast & Fluid etc.
Viscosity Drop

Waterborne Exterior Low Lustre Deep Base

Viscosity Drop (KU)

Black, Magenta, Yellow Oxide, Red Oxide, Phthalo Green, Medium Yellow, Organic red, Phthalo Blue

- ColourFal Zero™
- Other Zero VOC
- Conventional Colourant
Viscosity Drop

Interior Acrylic Latex Eggshell Deep Base

<table>
<thead>
<tr>
<th>Color</th>
<th>ColourFam Zero™</th>
<th>Other Zero VOC</th>
<th>Conventional Colourant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>12</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Magenta</td>
<td>10</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Yellow Oxide</td>
<td>8</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Red Oxide</td>
<td>15</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Phthalo Green</td>
<td>13</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Medium Yellow</td>
<td>12</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Organic red</td>
<td>11</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Phthalo Blue</td>
<td>10</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>
Full range of Organic and Inorganic pigments e.g. PY42, PY74, PY184, PBk7, PG7, PO73, PR101, PR122, PR188, PR254, PR255, PV 19, PV23, PB15:1, PB15:3, PW6, PG7, etc

Range of natural Iron Oxides (semi-transparent)
• Zero Voc
• Zero APEO
• Truly Universal Colourant system
• Freeze/Thaw stable
• Non-settling
• Non-drip
• Non-clog
End of Part 2
LORAMA STAIN TECHNOLOGY
Sustainable Technology

• Intermediate Vehicle

• VOC Free technology platform

• Allows the formulation of superior water based Stains
• Enables solvent based stain performance
• Emulsified non-volatile organic base in a water borne emulsion
• Interior or Exterior use
• 90% renewable resource base
Stain Technology

- Easy to apply
- Excellent penetration
- Longer open time
- No visible lap marks
- Re-wets for easy repair
- Better control of stain application
- Minimal grain raising
- Soap & water clean up

Competitor W/B Stain vs Lorama Stain
Typical Stain Formulation

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>% Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>30 – 50</td>
</tr>
<tr>
<td>Thickener/Defoamer</td>
<td></td>
</tr>
<tr>
<td>Lorama Stain Technology</td>
<td>20 – 50</td>
</tr>
<tr>
<td>Resin—optional</td>
<td>10 – 30</td>
</tr>
<tr>
<td>e.g. acrylic, PUD, alkyd</td>
<td></td>
</tr>
<tr>
<td>Pigment Concentrate</td>
<td>2 – 10</td>
</tr>
<tr>
<td><strong>Stain Technology</strong></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Non-volatile content</td>
<td>90%</td>
</tr>
<tr>
<td>Colourant Compatibility</td>
<td>Universal &amp; w/b colourants (e.g. ColourFalZero)</td>
</tr>
<tr>
<td>Defoamers</td>
<td>No special recommendation</td>
</tr>
<tr>
<td>Thickeners</td>
<td>No special recommendation</td>
</tr>
<tr>
<td>VOC</td>
<td>Zero</td>
</tr>
</tbody>
</table>
# Performance - Stain Technology

Dry Time/Lapping
Recoat/Topcoat time

approx. 30 minutes
2 hours

<table>
<thead>
<tr>
<th>QUV Data (1500 hrs)</th>
<th>ΔE Control</th>
<th>ΔE Exposed</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUV-A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorama Stain (+ Acrylic+)</td>
<td>1.42</td>
<td>1.27</td>
<td>0.15</td>
</tr>
<tr>
<td>W/B Interior Stain*</td>
<td>1.72</td>
<td>2.49</td>
<td>0.77</td>
</tr>
<tr>
<td>W/B Exterior Stain*</td>
<td>0.98</td>
<td>1.09</td>
<td>0.11</td>
</tr>
</tbody>
</table>

*commercial products

*Carboset 510
- Wood
- Mulch
- Concrete/Cement
- Clay Plaster
- Porous surfaces
- Arts & Craft
- Wiping Stains
- Porch & Deck Stains
- Floors & Cabinets
- Log Homes
- Patios & Walkways
Rheofal 101 – Preactivated for low/medium polarity systems
Rheofal 102 – Preactivated for high polarity systems
Rheofal 301 – Organo clay for w/b systems

• 1:1 replacement for existing organo clays; no change to formulation or procedures
• Paint properties remain the same; viscosity, dry time, sag resistance, gloss levels, gloss retention
• No need of activation solvents.
• Improved viscosity stability after mechanical shear
Rheofal 101

Control

Rheofal 101 @ 0.5% w/w  250µ
Rheofal 102

Control

Rheofal 102 @ 0.4% w/w
>600μ
Colloidal-clays

Falgel 60 - Colloidal clay for matt/semi-matt w/b paints

Falgel 90 - Colloidal clay for gloss w/b paints

• Work best in conjunction with cellulosic thickeners
• Improved sag resistance
• Excellent syneresis control
• Effective anti-splatter characteristics for roller application
• Sag resistance even after dilution with water
• Cost effective
Control diluted 60% with water

0.5% Falgel 60 added then diluted 60% with water
Falamine Plus - pH Stabiliser

Proprietary alkanolamine blend

- 1:1 replacement for existing pH stabilisers e.g. amines, ammonia, NaOH and KOH
- Low odour
- Longer pH stability
- Improved scrub resistance vs ammonia/NaOH/KOH
- No effect on colour acceptance of the tinting system.
- Improved formaldehyde scavenging properties vs other amines (Formaldehyde free, low odour emulsions)
- High performance
LAF 121 - Silicone free anti-foam for s/b systems

LDA 100 - Pigment dispersant for organics and inorganics

LDA 154 - Pigment dispersant for organics and inorganics
Lower acid value than LDA 100

LDA 160 - Pigment dispersant for organics and inorganics, anti-settling agent

LDA 320 - Pigment stabiliser, anti-settling agent, colour developer
Partner by-your-side approach by

• Joint technical exchange
  – Lehvoss, Lorama and customer
• Transition support
• Training of personnel (production/store)
• Trouble shooting
• Logistics support
• Regular business/planning reviews
Our commitment to our environment is strong and we are pleased to announce that:

LPR76, InkRes33 and our similar polysaccharide resins are exempt from REACH regulation.

These polysaccharide resins are classified as Hydrolyzed starch, EINECS No. 232-436-4. This classification can be found in the exemption from the obligation to register list contained in Annex IV of REACH regulation (EC No 1907/2006). Therefore these substances do not need to be registered.
Thank you