

TECHNICAL DATA SHEET

TYPE: HL-200

Section 1: Description

HL-200 is a processing aid with super high molecular weight. Compared with general processing aid, it can largely reduce using dosage or increase filling level. It can be widely used for rigid PVC products such as PVC profile, PVC pipes, PVC foaming products, etc.

Section 2: Product benefits

- Super high molecular weight and viscosity
- Endow PVC products with higher melt strength and tensile strength
- Faster fusion
- Improve surface quality

Section 3: Technical specifications

| Specification | Test standard | Competitor | HL-200 |
|----------------------------------|-------------------|--------------|--------------|
| Appearance | -- | White powder | White powder |
| Bulk density(g/cm ³) | GB/T 1636-2008 | 0.47 | 0.45±0.10 |
| Sieve residue (30 mesh)(%) | GB/T 2916 | 2.0 | ≤2.0 |
| Volatile content (%) | ASTM D5668 | 1.50 | ≤1.50 |
| Intrinsic viscosity (η) | GB/T 16321.1-2008 | 6.8 | 13.00-15.00 |

Section 4: Basic formulation for following tests

Mixing equipment type: SHR-5A from Zhang Jiagang Beier Machinery Co., Ltd

Mixing condition: 50Hz, 120°C emptying

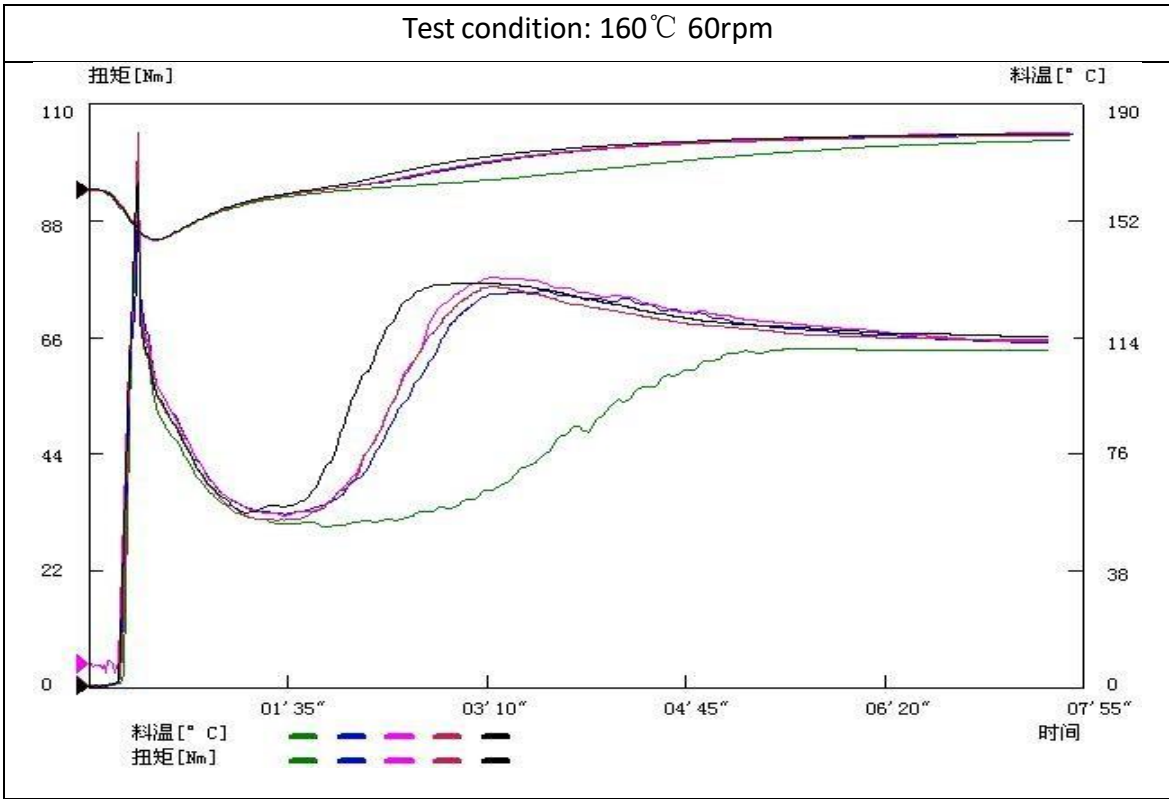
Volume: 5L

| Ingredients | 0# | 1# | 2# | 3# | 4# |
|-------------|---------|------------|--------|----|----|
| | Control | Competitor | HL-200 | | |

| | | | | | |
|---------------------------|--------|--------|--------|--------|--------|
| PVC (K-65) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Ca-Zn stabilizer | 2.80 | 2.80 | 2.80 | 2.80 | 2.80 |
| PE wax | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| TiO ₂ (Rutile) | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| MBS impact modifier | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| CaCO ₃ (PCC) | 8.00 | 8.00 | 8.00 | 8.00 | 12.00 |
| other competitor | -- | 1.00 | -- | -- | -- |
| Processing aid HL-200 | -- | -- | 1.00 | 0.60 | 1.00 |

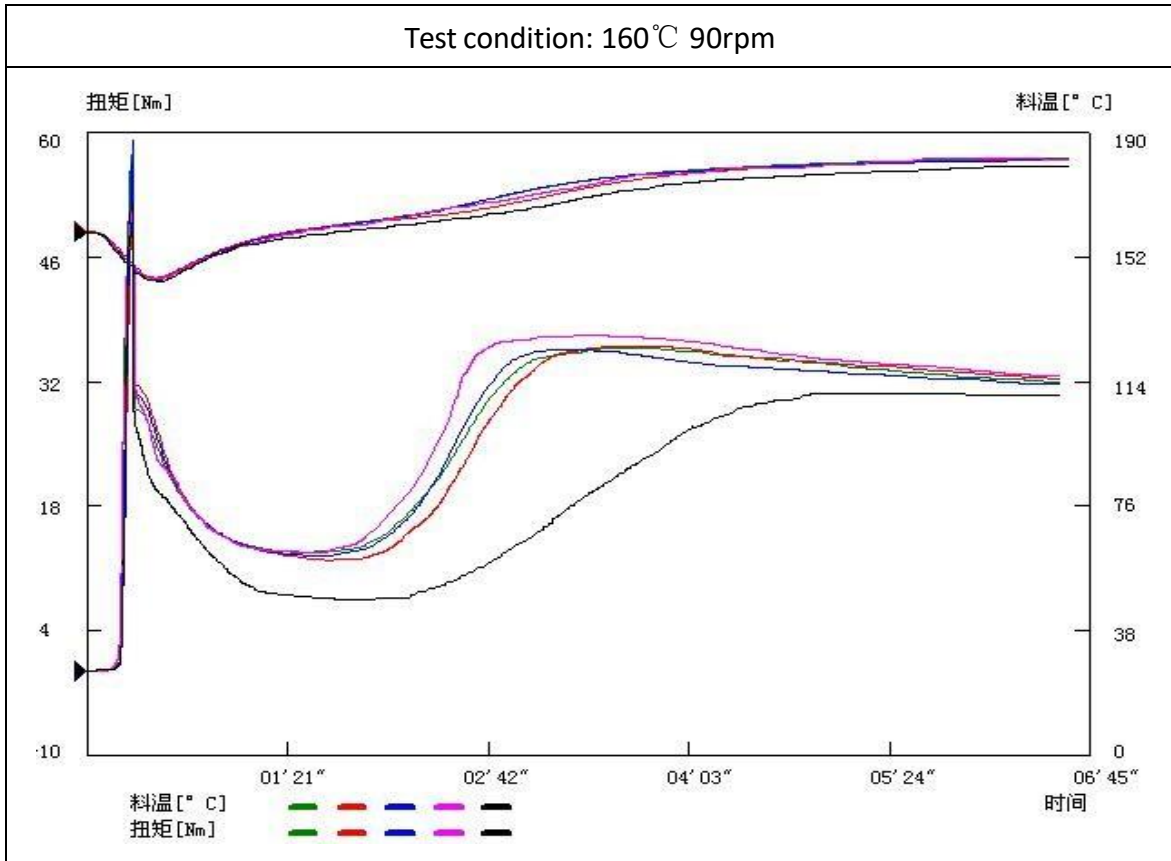
Section 5: Fusion property comparison

Test equipment type: RM-200C torque rheometer from Harbin Hapro Electrical technology Co., Ltd
 Volume: 60ml



| Type | Fusion data | Fusion time (S) | Fusion torque (Nm) | Equilibrium torque (Nm) |
|------|-------------|-----------------|--------------------|-------------------------|
| | 0# Control | 283 | 45.3 | 62.7 |

| | | | |
|--|-----|------|------|
| 1#other competitor (1.0phr)+CaCO ₃ (8phr) | 152 | 71.2 | 63.7 |
| 2# HL-200 (1.0phr)+CaCO ₃ (8phr) | 139 | 73.9 | 64.8 |
| 3# HL-200 (0.6phr)+CaCO ₃ (8phr) | 150 | 71.6 | 64.0 |
| 4# HL-200 (1.0phr)+CaCO ₃ (12phr) | 148 | 71.4 | 63.9 |



| Type | Fusion data | Fusion time (S) | Fusion torque (Nm) | Equilibrium torque (Nm) |
|--|-------------|-----------------|--------------------|-------------------------|
| 0# Control | | 293 | 33.2 | 29.6 |
| 1#other competitor (1.0phr)+CaCO ₃ (8phr) | | 157 | 35.5 | 31.2 |
| 2# HL-200 (1.0phr)+CaCO ₃ (8phr) | | 150 | 37.1 | 31.9 |
| 3# HL-200 (0.6phr)+CaCO ₃ (8phr) | | 159 | 35.2 | 31.5 |
| 4# HL-200 (1.0phr)+CaCO ₃ (12phr) | | 155 | 36.0 | 31.8 |

Section 6: Mechanical properties comparison

Test method:

- 1 Make plate with compound on double-roller mill under 185°C for 5min.
- 2 Then retain 6 min in curing press at 185°C
- 3 According to the following test standards and test conditions, prepare samples and obtain test results.

| Specification Type | Charpy impact strength (KJ/m ²) | Tensile strength (MPa) | Elongation at break (%) | Vicat softening point(°C) | Hardness shore D |
|--|---|------------------------|-------------------------|---------------------------|------------------|
| Test Condition | 0°C | 23°C, 10mm/min | 23°C, 10mm/min | 5Kg, 120°C/h | 23°C |
| Test standard | GB/T 1043 | GB/T 1040 | GB/T 1040 | GB/T 1633 | GB/T2411 |
| 0# Control | 11.0±0.21 | 42.0±0.2 | 125.7±1.5 | 82.0±0.20 | 82.4±0.21 |
| 1#other competitor (1.0phr)+CaCO ₃ (8phr) | 11.8±0.23 | 42.4±0.3 | 136.2±2.0 | 82.2±0.23 | 82.8±0.27 |
| 2# HL-200 (1.0phr)+CaCO ₃ (8phr) | 12.5±0.28 | 43.2±0.4 | 138.4±2.0 | 82.8±0.26 | 83.2±0.29 |
| 3# HL-200 (0.6phr)+CaCO ₃ (8phr) | 12.0±0.25 | 42.6±0.3 | 136.1±1.8 | 82.3±0.23 | 82.8±0.27 |
| 4# HL-200 (1.0phr)+CaCO ₃ (12phr) | 11.9±0.23 | 42.5±0.3 | 135.7±1.8 | 82.4±0.25 | 82.8±0.26 |

Section 7: Surface gloss comparison

Test standard: ASTM D2457

Test condition: 45°

| Type | Gloss of PVC extruded sheet |
|--|-----------------------------|
| 0# Control | 20.2±0.8 |
| 1#other competitor (1.0phr)+CaCO ₃ (8phr) | 27.0±1.2 |
| 2# HL-200 (1.0phr)+CaCO ₃ (8phr) | 30.4±1.0 |
| 3# HL-200 (0.6phr)+CaCO ₃ (8phr) | 28.0±1.1 |
| 4# HL-200 (1.0phr)+CaCO ₃ (12phr) | 27.9±1.1 |

Section 8: Melt strength of PVC compound

For the melt strength, we can think it is the tensile strength of PVC compound melt,

reference on the method of tensile strength test, we try to the following two methods:

1) We add a tensometer onto the foamed bar between the extruder and tractor, when the extrusion speed and tensometer are steady, and then record tension value:

melt strength = tension value / the cross sectional area of foamed bar

2) We add a tensometer onto the foamed bar between the extruder and tractor, then stop the main motor and keep hauling speed to pull cut the foamed bar, and then record the biggest tension value during the process:

melt strength = biggest tension value / the cross sectional area of foamed bar

| Melt strength (KPa) | | |
|--|----------|----------|
| Test method | Method ① | Method ② |
| 0# Control | 29.3±0.1 | 58.0±0.3 |
| 1#other competitor (1.0phr)+CaCO ₃ (8phr) | 31.2±0.5 | 62.3±0.8 |
| 2# HL-200 (1.0phr)+CaCO ₃ (8phr) | 34.3±0.7 | 70.5±1.2 |
| 3# HL-200 (0.6phr)+CaCO ₃ (8phr) | 31.8±0.4 | 64.2±0.8 |
| 4# HL-200 (1.0phr)+CaCO ₃ (12phr) | 31.7±0.3 | 63.8±0.8 |

Section 9: Product application

HL-200 can be widely used for rigid PVC products such as PVC pipes, PVC profile and PVC foaming products.

Section 10: Packaging and storage

20kg/bag: PP valve bag with PE liner

500kg/sack: PP bag with PE liner

It should be stored in cool and dry surroundings, with shelf life of two years, it can be still used if qualified by inspection after shelf life.