NAN YA NYLON 6 Engineering Plastics

Flame Retardant · High Toughness · Heat Resistant ·
Impact Resistant · Moldability · Low Warpage

Introduction

As Nylon is a semi-crystalline amido, it can easily form hydrogen bonds with water molecules, and therefore it has higher moisture absorption than most resins. If Nylon particles absorb too much moisture, it will cause issues during the drying process before production and defects in the molding product. Surface deficiencies in the silver bars or air bubbles will cause a decrease in quality and the inferior material may not be recycled or reused. Hence, the pre-production drying process is the most crucial step in Nylon processing.

NAN YA NYLON 6 Engineering Plastics Characteristics

1. High toughness and excellent impact resistance.
2. Abrasion resistant and self-lubricating.
3. Good heat resistance, flame retardants, self-extinguishing.
4. Air barrier properties, excellent chemical resistance.
5. Suitable for products that require strength, precision, anti-heat deflection.

NAN YA NYLON 6 APPLICATIONS

From the above properties, it can be observed that the NAN YA NYLON 6 has a wide range of applications as listed below:

Electrical and Electronics	Home appliance external casings, home appliance connector plugs, hair dryer air outlets, circuit breakers, farming tool external casings, external casings of heaters, external casing of fans, and circuit relay external casings.
Automotive Industry	Car handles, door handles, and bicycle brake handles, bicycle rims, and pedals.
Other Industries	Gears, fan blades, reel shafts, fasteners, and external casings of motors.
Others	Racket braces, racquet frames, skates bases, connectors and luggage wheels.

♦ Drying

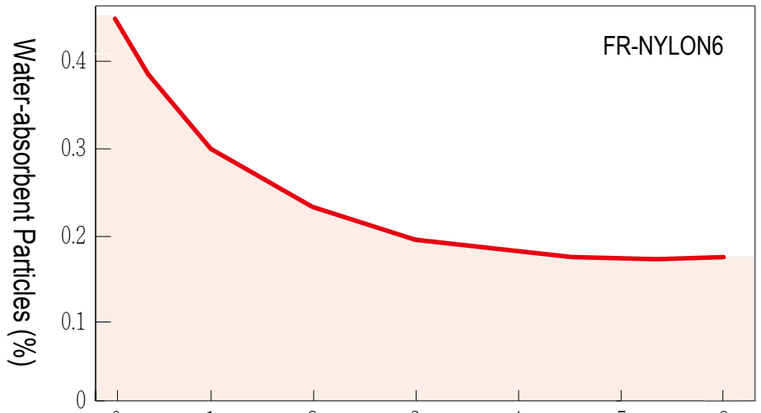
Before Nylon is molded, the Nylon plastic particles should be dried to a moisture content of less than 0.2%. When moisture content exceeds 0.2%, jet surfaces will be formed on product surfaces and spoil the exterior appearance. The relations between drying times, temperature and drying hours of NAN YA FR-NYLON 6 are provided below.

1. Recommended NAN YA FR-NYLON 6 drying temperature is 80℃ . When temperature is below 80℃ , drying results are not optimal, while at temperatures over 100℃ , drying results are optimal but improper operations will lead to yellowing or inferior product quality, so extra caution must be taken. The relations between drying temperature, drying time and moisture content of NAN YA FR-NYLON 6 ordinary grade (2110) are as provided.
2. From the table below, it can be seen that ordinary material with a moisture content below 0.5% can be dried at 80℃ for 4 hours but if moisture content reaches 0.6%, the drying will require 80℃ for 8~24 hours. So when sealing the remaining materials, the package should be sealed tightly to prevent absorption of moisture and drying issues.

Moisture Content (Moisture absorption time after opening package)	Drying Temperature (℃)	Drying Time (hrs)
0.2~0.3%(3~8hrs)	80	2~4
0.3~0.6%(8~24hrs)	80	4~8
0.6~2.0%(24hrs above)	80	8~24

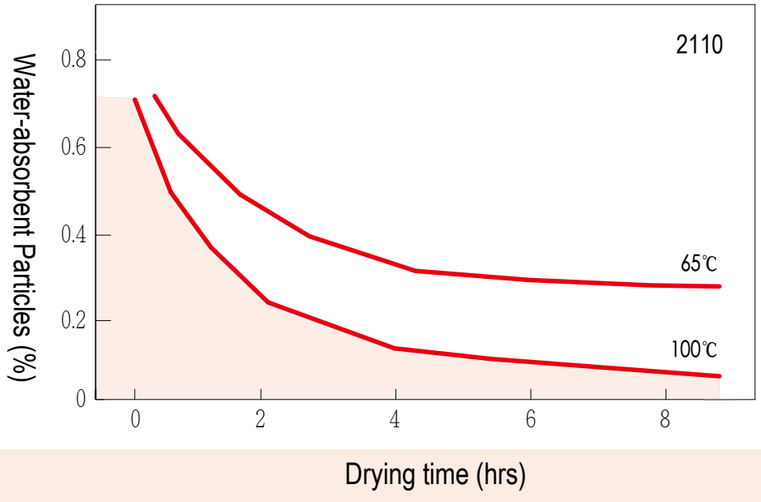
Material: 2110
Drying conditions: 80℃
Drying Method: Hot air Drying

Graph 1: Drying time and Temperature Test



Constant temperature constant moisture (23℃ 50%RH)
Indoor natural moisture absorption

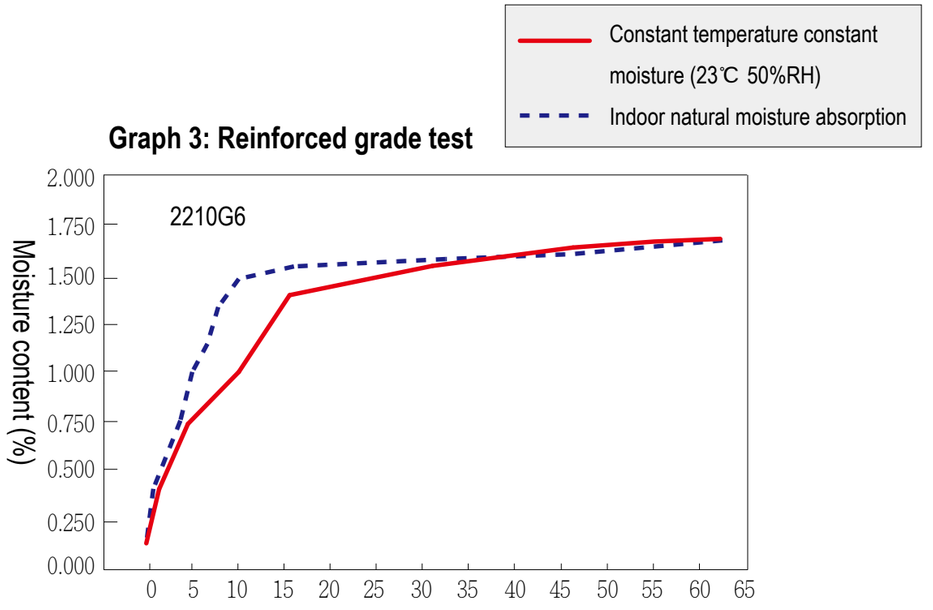
Graph 2: Drying time, Temperature and Moisture Content Test



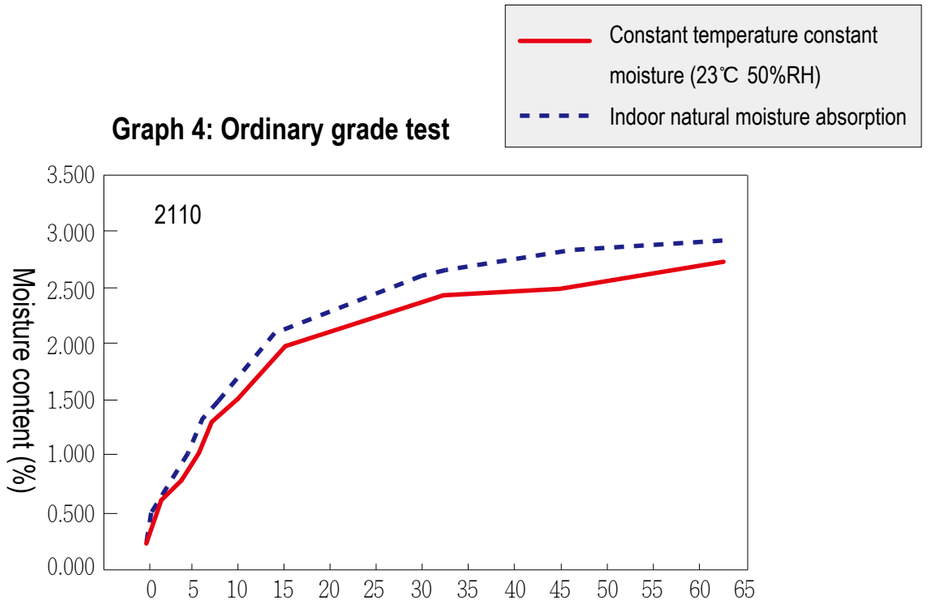
PHYSICAL PROPERTIES

3. Graphs 3 and 4 are natural moisture absorption tests on NAN YA NYLON 6 ordinary grade (2110) and NAN YA NYLON 6 fiber reinforced grade (2210G6). The tests allow an understanding of the relations between moisture absorption rate and moisture absorption days of NYLON 6 ordinary grade and fiber reinforced grade under natural absorption conditions.

Graph 3: Reinforced grade test

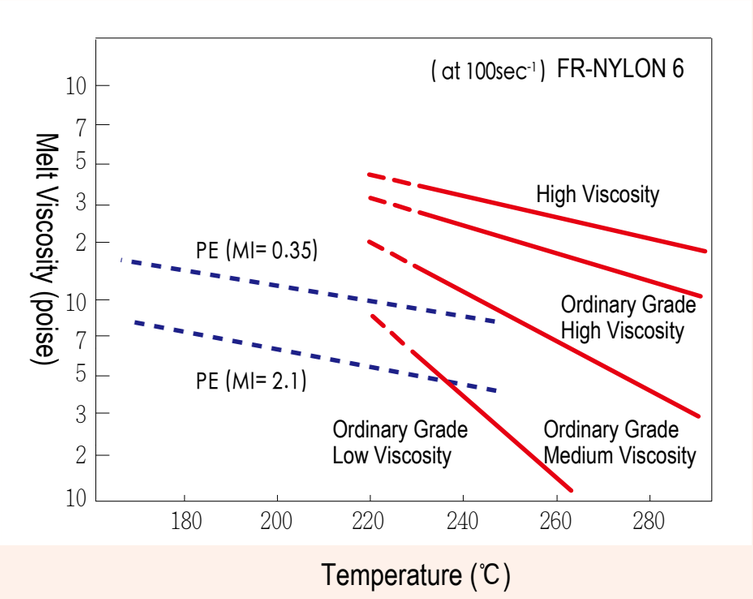


Graph 4: Ordinary grade test



♦ Molding Conditions

Table 1 lists the injection mold reference conditions, including recommended cylinder temperature settings, injection pressures, and injection speeds. NAN YA FP-NYLON 6 has a wide range of molding conditions, easy moldability and has a molding temperature range of 220℃ ~270℃ (Resin temperature refers to the direct temperature measurement of resin from the injection nozzle), so the product can be easily molded under the recommended conditions.



Graph 5: Relation of melt viscosity and temperature

Table 1: NAN YA FR-NYLON 6 Injection Reference Conditions

Models			2100	2110	2210G3	2210G6
Drying Temperature		℃	80	80	80	80
Drying Time		Hrs	4	4	4	4
Nozzle Temperature		℃	235~245	240~250	250~260	250~265
Cylinder Temperature	Front	℃	230~245	235~245	245~255	245~265
	Middle	℃	225~240	230~240	235~245	240~255
	Rear section	℃	220~230	225~235	225~240	230~245
Mold Temperature		℃	60	60	80~90	80~90
Injection Pressure		kg/cm^2	400~800	400~800	500~1000	600~1500
Screw Rotation Speed		rpm	100~160	100~160	100~120	100~120
Injection Speed		–	Fast	Fast	Fast	Fast
Molding Shrinkage (Test Thickness 3mm)		Flow %	1.4~1.8	1.2~1.6	0.3~0.7	0.2~0.3
		Vertical %	1.4~1.6	1.0~1.5	0.8~1.2	0.5~0.8

Models			2210GC	2210G9	2310	2512
Drying Temperature		℃	80	80	80	80
Drying Time		Hrs	4	4	4	4
Nozzle Temperature		℃	265~275	265~275	240~250	240~255
Cylinder Temperature	Front	℃	260~275	260~275	235~245	240~250
	Middle	℃	255~265	255~265	225~235	230~245
	Rear section	℃	245~255	245~255	220~230	225~235
Mold Temperature		℃	100~110	100~110	60	60
Injection Pressure		kg/cm^2	600~1800	600~1800	400~1000	500~1500
Screw Rotation Speed		rpm	100~120	100~120	100~120	100~120
Injection Speed		–	Fast	Fast	Fast	Fast
Molding Shrinkage (Test Thickness 3mm)		Flow %	0.2~0.5	0.2~0.3	1.0~1.5	0.6~1.4
		Vertical %	0.3~0.6	0.4~0.6	1.0~1.5	0.5~1.2

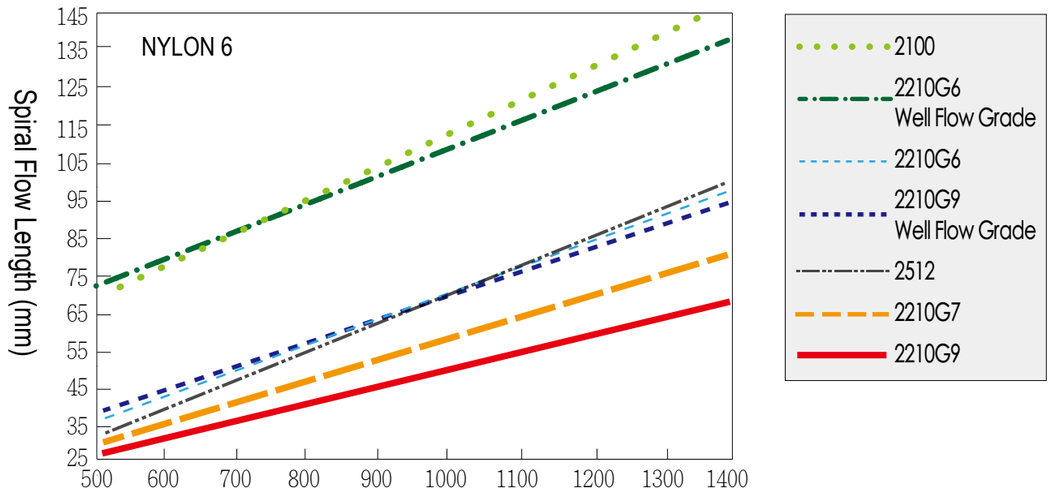
PHYSICAL PROPERTIES

♦ Flowability Characteristics

1. Graphs 6 and 7 represent the relation between injection pressure and flow length for different product thicknesses of NAN YA FR-NYLON 6 bulk models.

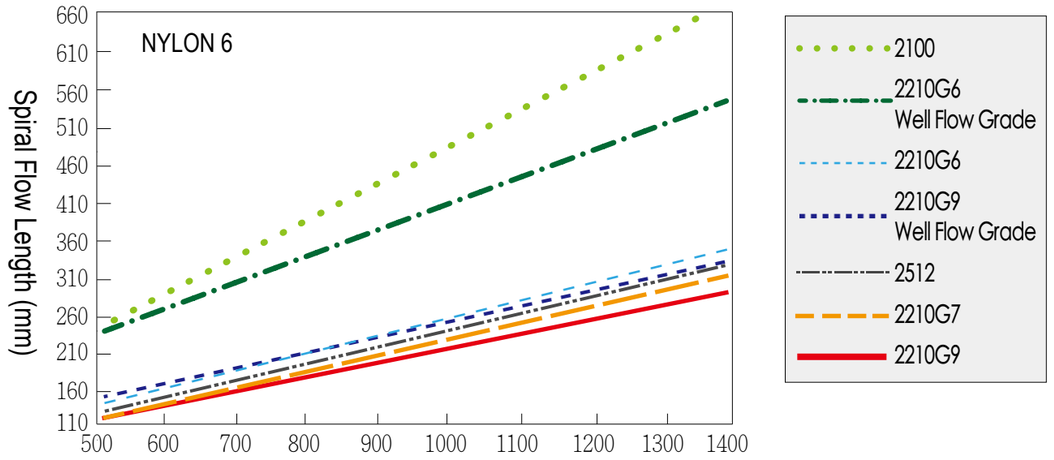
Graph 6: Influence of Injection pressure on flow length

Spiral Flow Test Thickness: 0.8mm
Mold Temperature: 50℃
Cylinder Temperature: 230, 240, 250, 255℃



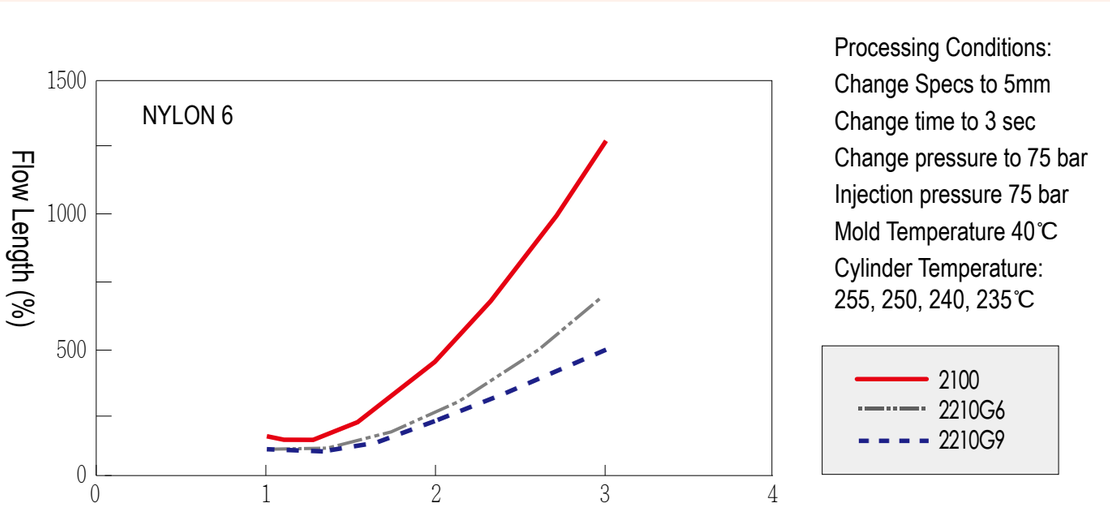
Graph 7: Influence of Injection pressure on flow length

Spiral Flow Test Thickness: 2.0mm
Mold Temperature: 50℃
Cylinder Temperature: 230, 240, 250, 255℃

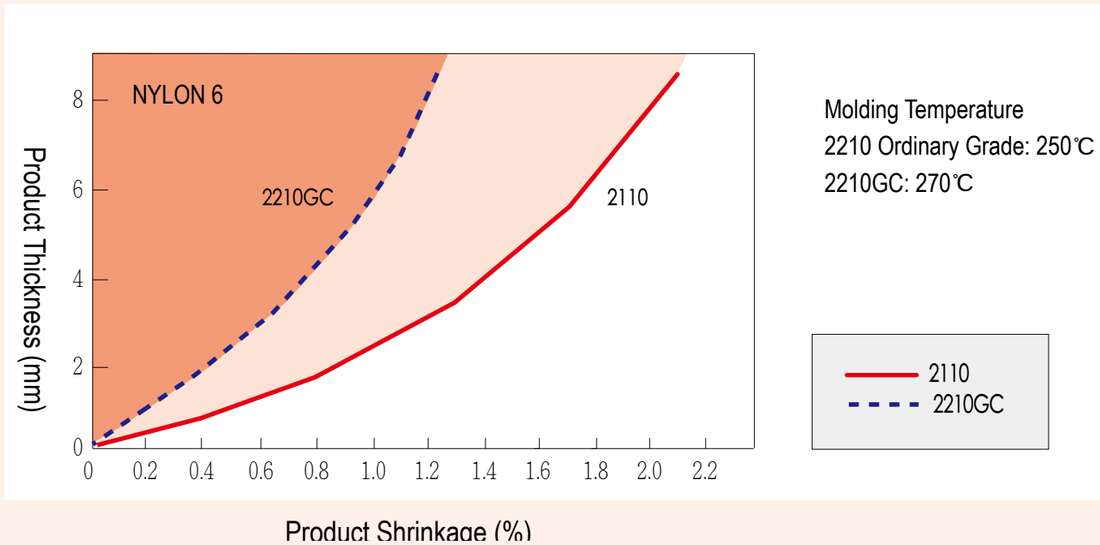


2. Graph 8 is the comparison of NAN YA NYLON 6 ordinary grade (2110) and NAN YA NYLON 6 fiber reinforced grade (2210G6, 2210G9) in the flowability of different thicknesses. For most plastic products, the thickness will have a significant impact on the flowability (L/t ratio, L: Flow Length, t: product thickness). From Graph 8, both NAN YA NYLON 6 ordinary grade (2110) and NAN YA NYLON 6 fiber reinforced grade (2210G6, 2210G9) are tested for when product thickness is increased from 1mm to 3mm. Although the increase is only 2mm, the flowability shows a significant change. This is why product designs should avoid uneven thicknesses.

3. Besides affecting flowability, product thickness will also affect product shrinkage. Products with larger thickness will have a larger shrinkage and require longer cooling time. Hence, in product designs, uneven thickness should be avoided to prevent warping of product. Graph 9 shows the relation of product thickness and product shrinkage of NAN YA NYLON 6 ordinary grade (2110) and NAN YA NYLON 6 fiber reinforced grade (2210GC).



Graph 8: Influence of Product Thickness on Flow Length



Graph 9: Relation of Product Shrinkage and Product Thickness

USES OF RECYCLED MATERIAL

Currently, use of recycled materials in molding plants is a common practice but due to different requirements of product quality, there are significant differences in the blending of material. Most engineering plastics demonstrate differences in physical properties during recycling. The causes of the differences can be summarized in Table 2 on the right.

♦ Notes for using Recycled Materials

1. The recycled materials must be dried again.
2. The materials should be mixed evenly before processing.
3. Impurities should be avoided.
4. The processing temperature should be slightly reduced.

Table 2: Reasons for Decrease in Physical Properties of Engineering Plastics

Reasons	Contents
Heat ageing of materials and breaking of reinforcing materials	Heat stability agents, colorings or reinforcing material type, and quantity
Processing Conditions	Pre-drying (Temperature and Time) Molding Temperature Molding Cycle
Impurities	Mold release agents, lubricants, dust, metallic powder, and other resins

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