



# NAN YA PP Engineering Plastics

Mechanical Properties · Water Resistant · Heat Resistant ·

Electrical Properties · Weather Resistant · Low Specific Gravity · Moldability





## Introduction

Reinforced PP has properties such as low cost, high moldability, balanced mechanical properties, excellent electrical properties, water resistance, and heat resistance. But due to different product structure designs and product thickness, the strengths, orientation, shrinkage and product warpage should also be considered. As raw material supplier, with relevant laboratory equipment and conditions, our company has provided reference laboratory statistics for client consideration.

## NAN YA PP Engineering Plastics Characteristics

1. Low Specific Gravity and low Water Absorption.
2. Low-cost and high Moldability.
3. Excellent Water Resistance and Heat Resistance.
4. Balanced Mechanical properties.
5. Excellent Electrical properties.
6. Weather Resistance and Hydrolysis Resistance.
7. Conforms to UL 94 V-0 Flammability Standards.

# NAN YA PP APPLICATION

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

<b>Electrical and Electronics</b>	External casing of home appliances, Kitchen Hood Casings, Pump Casings, Controller Casings, Home appliance components, Insulation boards of home appliances, motor casings, and Blower casings.
<b>Automotive Industry</b>	Dashboard and Interior panels.
<b>Other Industries</b>	Lamp shade, Hoses, Fan blades and Covers.
<b>Others</b>	Microwave utensils and Christmas light decorations



## PHYSICAL PROPERTIES



### ◆ Low Specific Gravity

As PP has a low specific gravity, low water absorption rate and ease of moldability, it is commonly accepted and used.

Specific Gravity Reference Table is on the right:

### ◆ Drying

As PP has low water absorption, pre-production drying for ordinary grade PP will seem less of significance as compared to NYLON series and polyester series.

But for models with mixture of additives or fibers, if the model is used without drying process, the product appearance will not be desirable. Therefore before processing, the PP material should be dried to ensure surface dryness of plastic particles and to produce quality products.

Dryness Reference Table is on the right:

### Specific Gravity Reference

Material Type	Specific Gravity
PP	0.9-0.91
PC	1.2
PET	1.38-1.39
PBT	1.31
PA6	1.12-1.14
PA66	1.13-1.15

(Compared among ordinary grades)

### Dryness Reference Table

Drying Temperature	Drying Time	Drying Purpose
100°C	1-2 hrs	To remove moisture from plastic particle surface and to prevent moisture from affecting product surface.



## PHYSICAL PROPERTIES

### ◆ Molding Conditions

Table 1 lists the injection mold reference conditions, including recommended cylinder temperature settings, injection pressures, and injection speeds for NAN YA Reinforced PP. As PP has a wide range of molding processing conditions, besides mold temperatures should not be too high, cylinder temperature settings are not as stringent. PP will not be affected by changes in molding conditions and result in significant changes in physical properties or appearance. To ensure client convenience in NAN YA Reinforced PP and to ensure quality, we have provided suitable molding conditions for reference.

**Table 1: Injection Reference Conditions**

Reinforced PP		3210T6	3210T8	3317
<b>Drying Temperature</b>	°C	100		
<b>Drying Time</b>	hrs.	1-2		
<b>Nozzle Temperature</b>	°C	190-210	190-210	185-200
<b>Cylinder Temperature</b>	<b>Front</b>	°C	185-200	185-200
	<b>Middle</b>	°C	175-190	175-190
	<b>Rear section</b>	°C	165-185	165-185
<b>Mold Temperature</b>	°C	50-60	50-60	40-50
<b>Injection Pressure</b>	kg/cm <sup>2</sup>	400-800	400-800	400-800
<b>Screw Rotation Speed</b>	rpm	140-180	140-180	180-200
<b>Injection Speed</b>	–	Fast	Fast	Fast
<b>Molding Shrinkage (Test Thickness 3mm)</b>	Flow %	0.8-1.4	0.7-1.0	1.2-1.6
	Vertical %	0.7-0.9	0.2-0.4	0.8-1.2

Reinforced PP		3219M3	3210G4	3210G6
<b>Drying Temperature</b>	°C	100		
<b>Drying Time</b>	hrs.	1-2		
<b>Nozzle Temperature</b>	°C	190-210	190-210	195-220
<b>Cylinder Temperature</b>	<b>Front</b>	°C	180-200	185-205
	<b>Middle</b>	°C	175-190	180-190
	<b>Rear section</b>	°C	170-180	170-180
<b>Mold Temperature</b>	°C	40-50	50-70	50-70
<b>Injection Pressure</b>	kg/cm <sup>2</sup>	400-800	400-900	400-1000
<b>Screw Rotation Speed</b>	rpm	180-210	180-210	185-210
<b>Injection Speed</b>	–	Fast	Fast	Fast
<b>Molding Shrinkage (Test Thickness 3mm)</b>	Flow %	1.1-1.5	0.2-0.4	0.2-0.4
	Vertical %	0.8-1.2	0.5-0.8	0.5-0.8

# PHYSICAL PROPERTIES

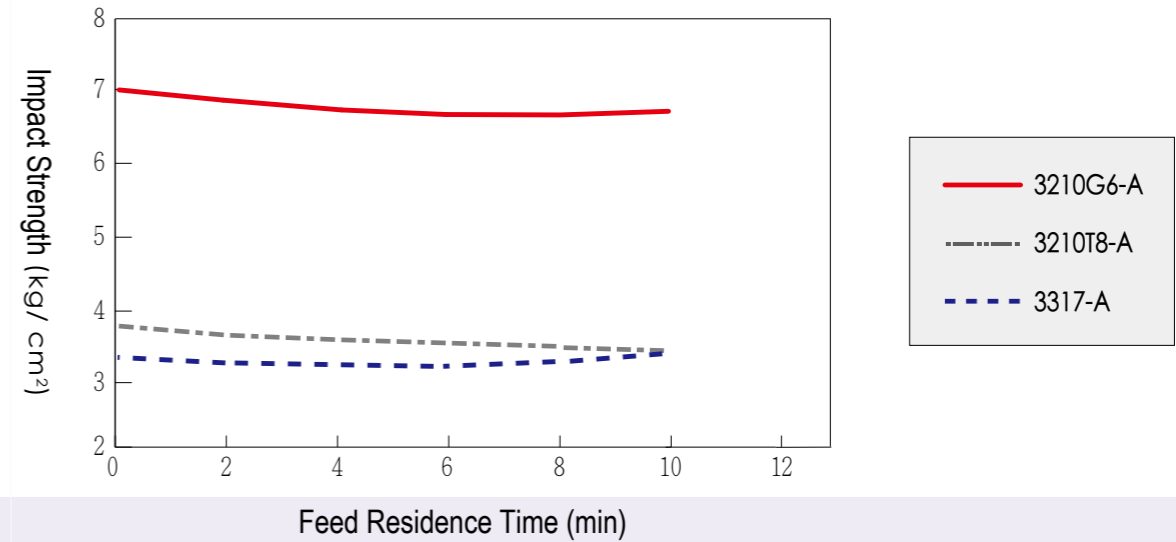
## ◆ Heat Stability Characteristics

The ease of processing for materials is determined by the heat stability of the material. When we use injection molding, production may be halted due to different abnormalities, causing plastic materials to be left within the cylinders. Materials with poor heat stability may decompose and suffer decrease in quality. Under such conditions, besides expending time to clean the cylinders, molding conditions may also be affected due to pyrolysis of materials. These issues may be avoided with PP molding. From Graph 1, the products made from 3 different models with 10 minutes residence time retain their original impact strength, demonstrating the heat stability of PP.

## ◆ Flowability Characteristics

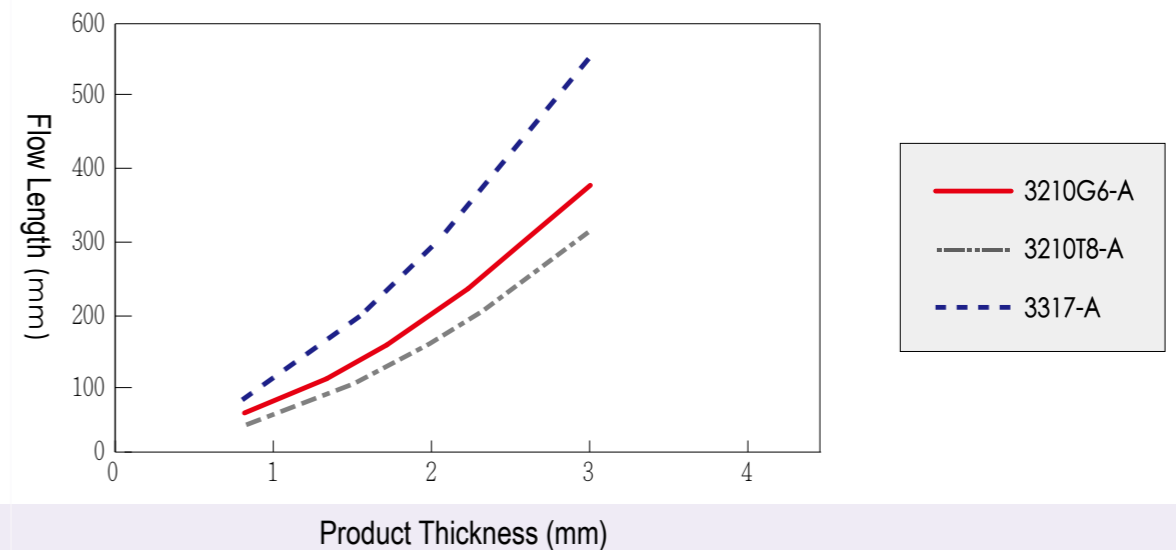
For most plastics, product thickness will have a significant impact on the flowability (L/t ratio, L: Flow Length, t: product thickness). Therefore during the designing of the products, attention must be paid to product thickness and changes in reinforcing ribs to prevent uneven thickness and warpage situations. Graph 2 shows the trend of PP in product thickness.

Molding Machine: ENGEL Injector  
Processing Temperature: 205, 200, 190, 185°C



Graph 1: Residence test

Injection Machine: KM Injector  
Processing Temperature: 195, 190, 180, 175°C  
Mold Temperature: 40°C  
Injection Pressure: 50bar



Graph 2: Product thickness and flowability test

## PHYSICAL PROPERTIES

### ◆ Recycling Characteristics

Recycled materials refer to the inferior products or residue materials in the pipeline that are crushed into particles for ease of recycling. But due to pollution issues during recycling, the physical properties of recycled material quality will decrease and the material will suffer color changes due to pollution and heat pyrolysis of resin. These are the common issues of recycled materials. Below are precautions to be taken during recycling:

1. Recycled material in the mixture should be below 20%, or as low as possible.
2. Avoid recycling materials that have long residence times or have suffered pyrolysis and color changes due to high temperatures.
3. Ensure material feed cylinder remains free of pollution during recycling.
4. Check the crushing machine before using to avoid impurities or mixing.
5. The container holding recycled materials should be clean and should be capped to prevent pollution from dust or impurities.
6. During crushing, powder particles may be formed and should be filtered to prevent the pyrolysis of the powder from causing defective products.
7. When changing materials, the initial material from nozzle should not be used to prevent mixing of materials.
8. Recycled materials should be dried before using.

The aforementioned precautions should be taken to ensure cleanliness and reduce pollution so that quality of the recycled material may be ensured and production may be completed smoothly.

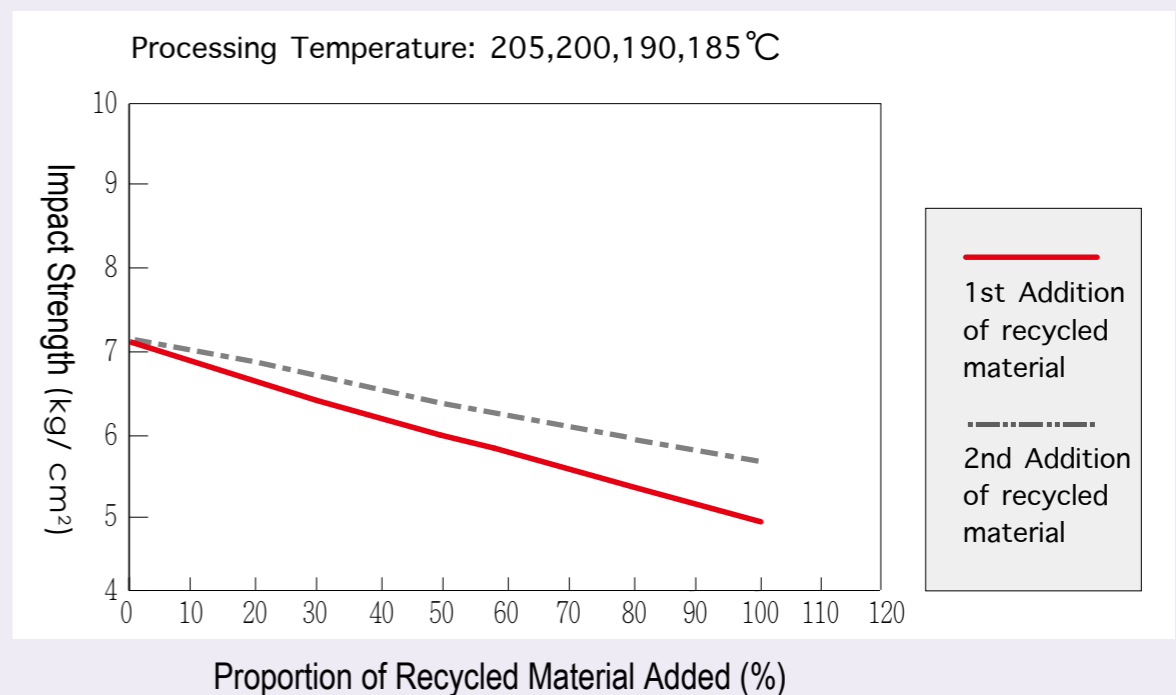
### Note:

Under normal conditions, when using recycled materials, the biggest impact will be on the reinforced flame resistance grade and flame resistance grade. Improper operations or carelessness during recycling will be major causes for reduction in physical properties, therefore 3 common causes for abnormalities are provided:

1. Using large machinery to produce small products.
2. Cylinder temperatures are too high.
3. Abnormal residence time.

During NAN YA PP Recycling Tests, due to excellent heat stability of the PP material, the ordinary grade and 3210TX series are not affected much during recycling. But fiber reinforced PP also suffer a significant drop in physical properties with the increase in recycled material proportion and recycled times like other fiber reinforced materials. Graph 3 shows recycling property of NAN YA PP-3210G6.

Graph 3: NAN YA PP-3210G6 recycling test



# PHYSICAL PROPERTIES

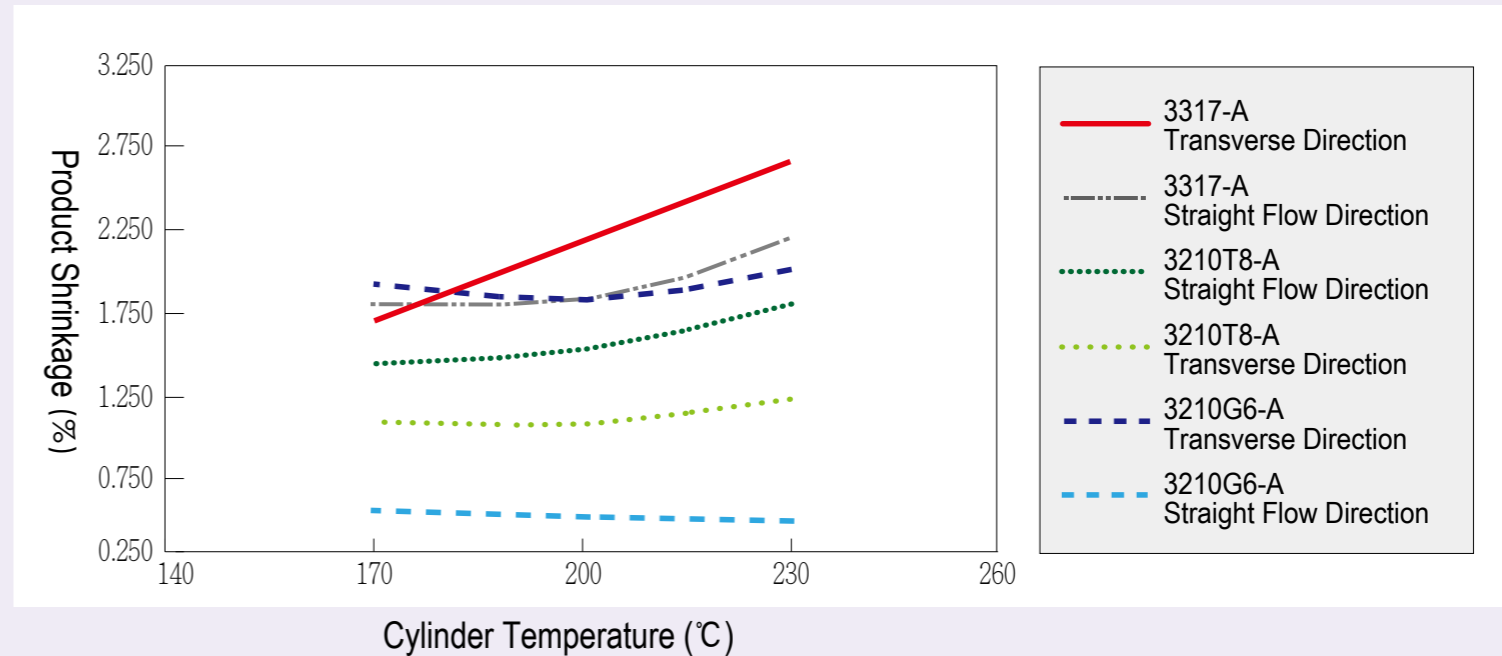
## ◆ Shrinkage Characteristics

As PP is a crystalline material, it has a large shrinkage rate. The Shrinkage rate will change with different processing conditions, changes in mold temperatures and product thickness. During product design or mold design, these factors should be taken into consideration. Below is the research of major factors influencing PP Shrinkage.

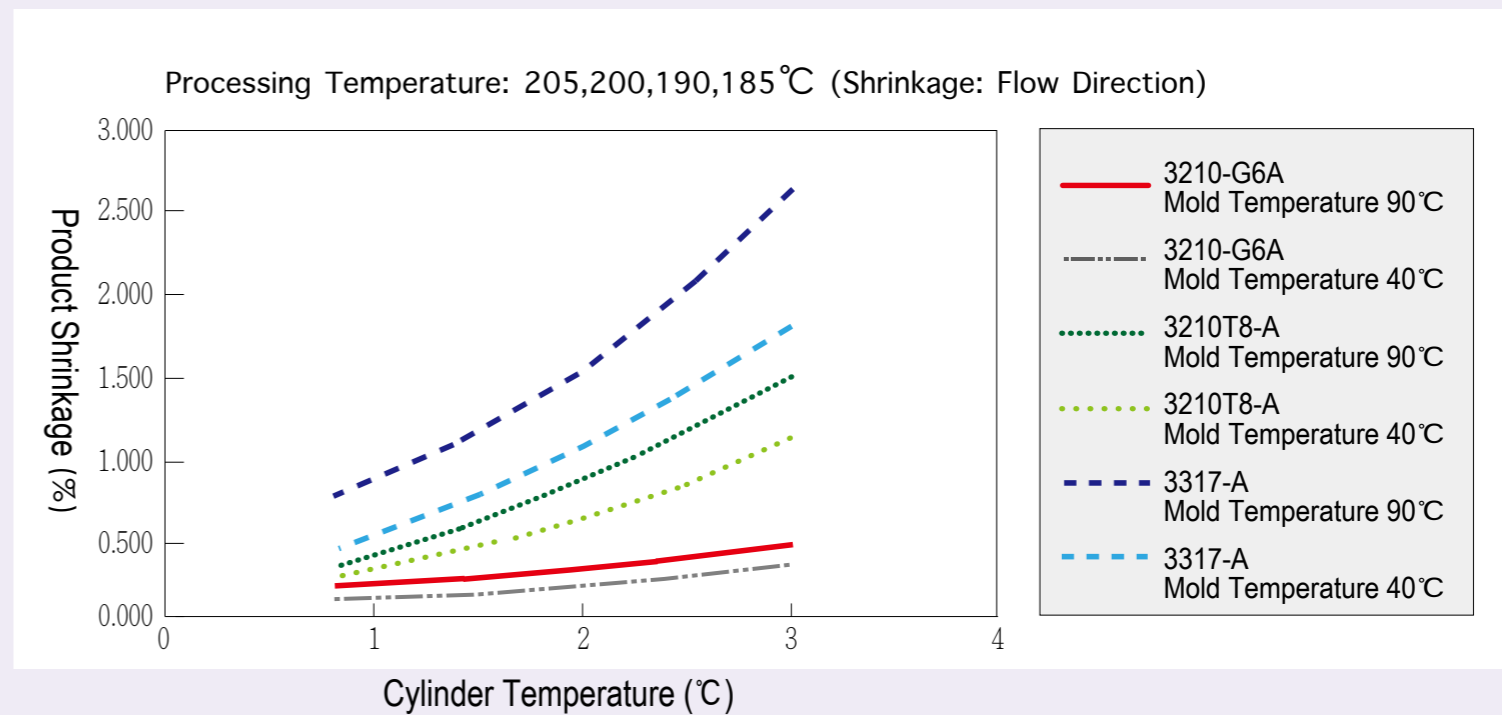
Graph 4: Relation of Cylinder Temperature and Product Shrinkage

Graph 5: Relation of Product Thickness and Product Shrinkage, the influences of mold temperature on product shrinkage may also be observed.

Due to differences in client products and different requirements, the provided information is only for reference. If clients require product development or application, please contact NAN YA PLASTICS CORPORATION.



Graph 4: Relation of cylinder temperature and product shrinkage



Graph 5: Relation of product thickness and product shrinkage





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