Mitsui Chemicals
MITSUI CHEMICALS,INC.
http://www.mitsuichem.com
Shiodome City Center 1-5-2, Higashi-Shimbashi, Minato-ku, Tokyo 105-7117, Japan

Technical Literature I-07

AURUM® Wire Extrusion Coating Conditions

1. Predrying

AURUM® requires predrying before molding. Good results will be obtained if the water in the resin is reduced to several hundred ppm, or preferably 100 ppm or below. The proper drying time is as follows:

200℃	5 hr, or
189℃	10 hr, or
150℃	20 hr

It recommended that in drying, pellets be placed in a shallow container to a thickness o not more than 50 mm and dried by use of a dryer of the hot air circulation type.

2. Extrusion Conditions

2-1 Extrusion Temperature

To prevent the thermal decomposition, gelation and other trouble of the resin during extrusion, the temperature of the extruder should be set to the upper limit of 420℃ as a rule of thumb. It should be noted that the extrusion of #400 and #450 is generally conducted at 400℃ or 410℃.

2-2 Extrusion Pressure

The proper inlet pressure of the die is 30 to 50 kg/cm2, but good results will be obtained at a little higher level. Especially if foaming occurs during extrusion, the pressure should be set at a little higher level. There are the following methods for raising the pressure of the die:

(1) Lowering the temperature of the extruder.
(2) Lowering the temperature of the die.
(3) Increasing the output rate.

2-3 Standard Wire Coating Conditions

Extruder screw	20mm⌀ - 40 mm⌀ L/D= 15 - 22, compression ratio = 2 - 3
Barrel temp. Crosshead temp. Die temp.	390 - 410℃ 410℃ 400℃
Screw rpm Line speed	10 - 40 rpm 30 - 100 m/min
Conductor preheating temp. Conductor diameter Coating thickness	100 - 200℃ 0.2 - 3.0 mm 100 - 200 μm

Cooling at the outlet of the die should be conducted slowly (air cooling). In the case of rapid cooling, a decline in the physical properties may be caused owing to the effect of residual stress/strain. Further, it is recommended that a filter be used in extrusion to prevent unsatisfactory extrusion from being caused by dust or gelatinous materials.

3. Suspension of Extrusion

AURUM® is a resin having high heat resistance. However, care should be taken because when AURUM® is left in melted condition for a long time, it may gelate, causing the trouble of damaging the screw.
Make sure that the time of suspension of extrusion will not exceed 30 min. If extrusion has to be suspended for a longer time than that, be sure to purge the inside of the system and lower the cylinder temperature to 360℃ to 370℃.

4. End of Extrusion

It is common practice to purge the inside of the system with a polyethylene resin having a melt flow index of 2 or so. However, to make cleaning after disassembly easy, the use of *Super Purge X and Y Agents*, the purging agents developed by Mitsui Chemicals is recommended. (Refer to the attached document.)

5. Cause of Unsatisfactory Extrusion and Corrective Measures

5-1 Foaming

Water in AURUM®:
If the predrying of AURUM® as described above is not adequate or subsequently AURUM® absorb moisture in transit or in the hopper, foaming will take place. It is recommended that dried pellets be put into a hopper of the closed type while they are hot or a hopper dryer be used. Care should be taken because the moisture absorption

of AURUM® proceeds rapidly as can be seen from the moisture absorption curve in the attached document. Any cooling operations before the charging of pellets into the hopper should be avoided because such cooling operations will cause the moisture absorption of AURUM®.

Entrapment of air:
When the deformation of pellets takes place abruptly particularly in the course of the melting of the resin in the cylinder, the air present between the pellets that should normally be vented to the hopper side will be entrapped and enter the coating layer. This trouble tends to be resolved by increasing the rotational speed of the screw.

Decomposition gas:
The resin remaining particularly between the screw end to the nozzle end in an extruder may decompose and foam in rare cases. It is also possible that decomposition gas may also be emitted when the temperature inside the extruder exceeds 420ºC in some areas as the areas are heated locally due to an inappropriate location of the temperature sensor or an inappropriate heating or thermal insulation method.

5-2 Surging

Empirically, when the cylinder temperature in the feed zone fluctuates, surging occurs. Setting the rotational speed to a little higher level (generally preferably the same rotational speed as the cylinder diameter (mm): for example, if the cylinder diameter is 40 mm, the rotational speed should be 40 rpm) will stabilize the temperature distribution in the cylinder and make plasticization easy owing to heat of shear.
Especially at the time of the start-up of extrusion, it is possible to stabilize the feed zone and produce good results of subsequent extrusion by increasing the rotational speed sufficiently to make use of the release of heat of shear. (The point is to keep the C1 temperature at the time of start-up to 380 to 390ºC for a small-diameter cylinder and approximately 370º for a cylinder with a diameter of 40 mm or above.)

5-3 Crystallization

When the temperature inside the cylinder falls below the melting point (388ºC) locally after the resin has been melted, crystallization takes place, causing troubles such as excessive torque, plugging and entry of solid matter into the coating layer. Especially since the area near the die is apt to cool, adequate care has to be taken to ensure thermal insulation.