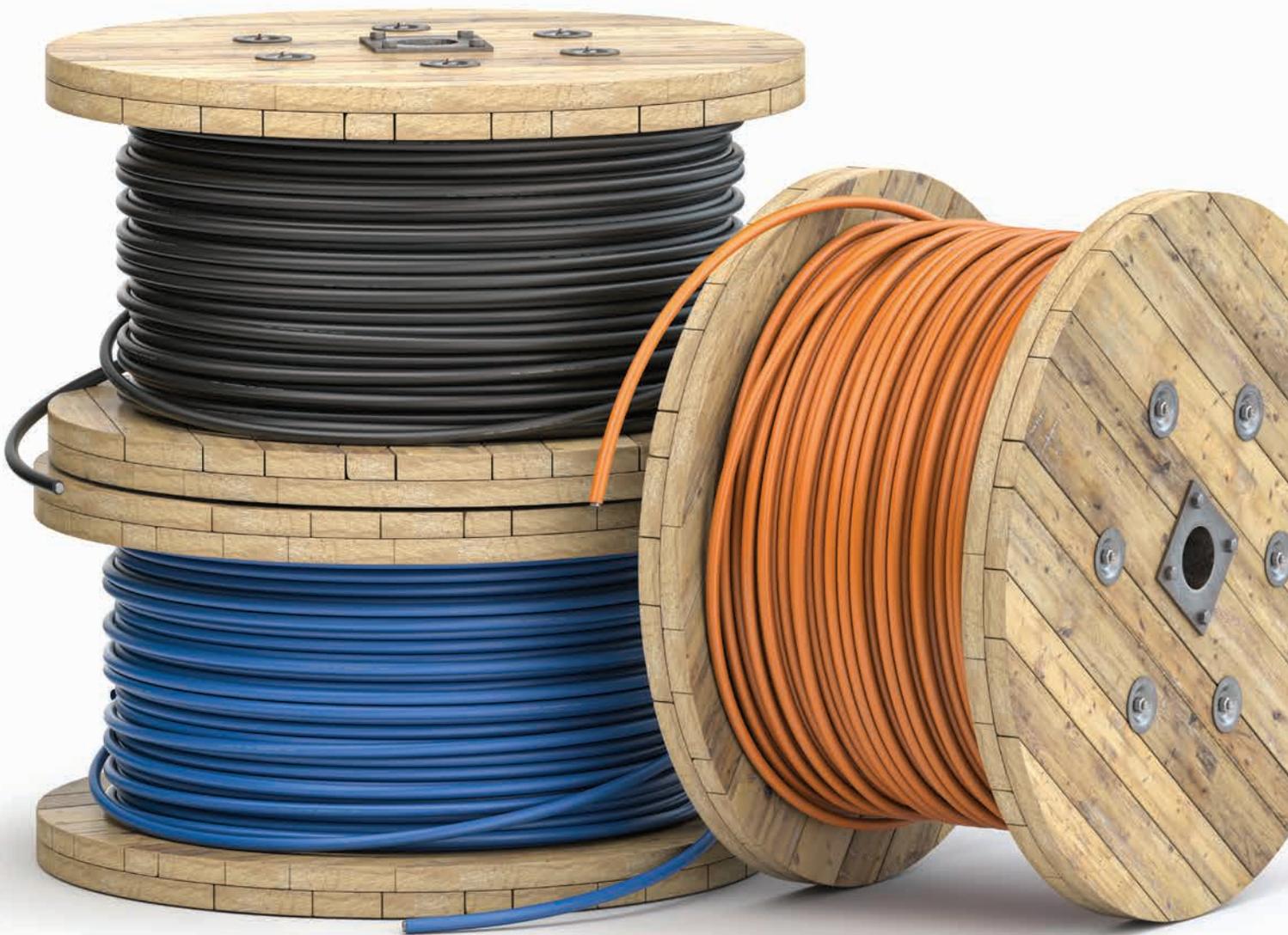


Ultramid® B27 HM 01

Wire and Cable Extrusion Processing Guide



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A. Overview

BASF Performance Polymers manufactures high performance nylon resin designed for the wire and cable industry. Ultramid® B27 HM 01 is a medium viscosity, heat stabilized, type 6 nylon homopolymer treated with a special lubricant package for improved resin extrusion and appearance. This processing guide will review the key physical properties and manufacturing process for nylon 6, and the applications and specific recommended extrusion conditions for Ultramid® B27 HM 01 in wire and cable.

1. Nylon 6 Physical Properties

All nylon resins exhibit an excellent combination of strength, flexibility, toughness and abrasion resistance. Some of the additional key characteristics of Nylon 6 polymer are as follows:

- Chemical Resistance - Resistant to grease, oil and hydrocarbons.
- Hygroscopic - Nylon 6 will gain or lose moisture depending on the environment.

Excessive moisture in the resin during extrusion will adversely affect the processing and physical properties of the finished nylon wire jacket. For this reason moisture in the resin prior to extrusion must be avoided. Following the extrusion process, moisture in the finished nylon wire jacket will act as a plastizer and will be beneficial.

- Sharp Melt Point - Nylon 6 has a sharp melt point of 220°C (428°F).
- Heat Stabilized (HS) - Heat Stabilized grades of Nylon 6 have a continuous use temperature of 120°C (250°F).
- Crystalline Development - Nylon 6 is a semi-crystalline polymer.

As the resin is cooled from the melt state, crystals will form in the nylon. Crystalline spherulites will grow in Nylon 6 from approximately 185°C to 70°C (365°F to 160°F). Crystallinity in the nylon wire jacket is determined by the quench length and quench temperature. An increase in crystallinity can provide a tighter wire jacket with increased abrasion and scuff resistance. However, the flexibility of the wire jacket will be reduced by an increase in the crystallinity of the nylon.

2. Nylon 6 Manufacturing Process

Nylon resins are polyamides and belong in the general category of thermoplastics, which means they can be melted and solidified a number of times. Nylon 6 is produced by a process called condensation polymerization. The monomer used for polymerization is caprolactam: a cyclic lactam of amino caproic acid. Caprolactam is reacted in a polymerization kettle along with water under pressure and temperature for a specified time. When the polymerization process is complete, the nylon is removed from the kettle via a melt pump and pelletized.

During the polymerization of nylon 6, not all of the monomer is converted to polymer. The residual monomer in nylon acts as a plasticizer and, depending on the product end use, desired amounts of monomer are left in the resin. For wire and cable applications, a residual monomer level ranging from 2.5% to 5.5% by weight is maintained in Ultramid® B27HM 01. This level will satisfy all of the requirements as specified by UL for THHN type conductors.

During the manufacturing process, moisture is introduced into the polymer in the monomer extraction and pelletizing steps. At the end of the manufacturing process, nylon pellets are dried under special conditions to remove excess moisture. Between 0.05% and 0.17% moisture by weight is suitable for extrusion and can be expected of packaged Ultramid® B27 HM 01.

3. Ultramid® B27 HM 01 Applications

ULTRAMID® B27 HM 01 Nylon is recognized by Underwriters Laboratories for use in Wire & Cable jackets such as THHN, THWN and similar constructions. This resin carries a rating for 105°C temperatures and Gasoline and Oil Resistant II.

B. Extrusion Processing Guide

1. Material Handling

All nylon is hygroscopic which means that it will absorb or release moisture depending on the nature of the environment it is exposed. High temperatures with high humidity will accelerate the moisture gain in the resin or jacket. Equilibrium moisture levels in nylon 6 is as follows:

Percent Relative Humidity	Equilibrium Moisture
20	0.80%
40	2.00%
50	2.70%
60	3.60%
80	5.70%
100	9.80%

Prior to extruding the resin, ensure that excessive exposure to the atmosphere is avoided to prevent moisture pick up. Nylon pellets should not be exposed to the atmosphere for more than 45 minutes. This is especially critical during hot and humid weather.

The packages used for Ultramid® resins are airtight and moisture proof. The packages should be inspected prior to opening to insure integrity of the liner. The liner neck is specially designed and should be used to insert the vacuum wand for delivery of resin to the machine hopper or desiccant hopper. If for any reason the vacuum process from the container should

be discontinued, the liner neck should be rolled up and sealed with tape to prevent any moisture absorption.

During periods of cold weather, packages should be stored at room temperature prior to opening. This will prevent the possibility of condensation of moisture on cold pellets if opened in a humid environment.

2. Drying

Desiccant dryer systems are generally required to ensure that the low moisture content of the Ultramid® B27 HM 01 as received is preserved. The desiccant dryer system will also preheat the nylon resin to improve the transition of pellets to a melt state and decrease the extruder power and torque requirement.

The desiccant dryer air should be controlled to a maximum of 65°C (150°F). Continuous exposure to hot air in excess of 65°C (150°F) may extract residual monomer from the pellets and should be avoided. The desiccant dryer supply air should be maintained at a dew point of -40°C (-40 °F).

3. Extrusion

The extruder transforms the nylon pellets plus any color concentrate into a homogeneous melt and delivers the melt to the crosshead at a consistent rate. Pellets in the feed hopper are gravity fed into the initial section of the extruder screw (feed zone), which conveys the material through the heated barrel. The recommended barrel temperatures will achieve a good initial melting of the resin before the nylon enters the compression zone.

The hopper area of the extruder should be cooled to prevent bridging of pellets in the feed hopper. The exit temperature of the feed throat cooling water should be warm to the touch, approximately 27 to 43°C (80-110°F). Should the feed throat be too cold, condensation of moisture in the feed hopper can result.

The central portion of the extruder screw (compression zone) compresses and completes the melting of the nylon pellets. The compression zone compensates for the change in bulk density of the nylon from pellets to melt. In this section of the screw, the successive volume per flight of the screw is being decreased.

The final portion of the screw (metering zone) delivers the extrudate to the crosshead at a consistent rate. The volume per flight in the metering zone is constant and has the smallest channel depth in the screw. The compression ratio of the screw is the ratio of the volume of one feed section flight to the volume of one metering section flight.

A screen pack is not required to process nylon, they are suggested in order to prevent foreign contamination from reaching the die and help maintain sufficient extrusion head pressure. A 60-80-100 US mesh screen assembly is typically used. The coarse screen placed on the upstream side of the breaker plate.

3.1 Extrusion Temperature Profile

Although some shear heating of the nylon will occur during extrusion, external barrel heaters are needed to maintain appropriate nylon melt temperature. An extruder will have at least three and more commonly five heat zones. Downstream

of the extruder barrel, heaters must also be used on the flange adapter, crosshead and die to maintain the desired melt temperature. Each heat zone must be controlled to maintain the desired setpoint.

Several different types of temperature profiles are used successfully with Ultramid® B27 HM 01 to achieve the desired melt temperature and output rate. Several examples of extruder profiles, intended to deliver a 270°C (520°F) melt temperature are as follows:

Zone	Gradual Temperature Profile °C (°F)	Humpback Temperature Profile °C (°F)	Reverse Temperature Profile °C (°F)
Zone 1 (Hopper)	250°C (480°F)	250°C (480°F)	288°C (550°F)
Zone 2	260°C (500°F)	274°C (525°F)	282°C (540°F)
Zone 3	265°C (510°F)	282°C (540°F)	277°C (530°F)
Zone 4	271°C (520°F)	271°C (520°F)	271°C (520°F)
Zone 5	271°C (520°F)	271°C (520°F)	271°C (520°F)
Flange/Head/Die	271°C (520°F)	271°C (520°F)	271°C (520°F)
Comment	Most commonly used profile	Melt will occur earlier in barrel	Forces melt early in barrel before compression zone. Feedthroat cooling necessary

Melt temperature of the resin at the die will have a direct effect on the drawdown and quality of the finished wire jacket. For jacketing of all common building wire sizes, melt temperatures of between 260 and 288°C (500 and 550°F) is recommended. The melt temperature should be increased with increasing line speed. Typical tandem extrusion melt temperatures are given in the following table:

Line Speed	245 m/min (800 fpm)	310 m/min (1000 fpm)	370 m/min (1200 fpm)	460 m/min (1500 fpm)	610 m/min (2000+ fpm)
Melt Temperature (°C)	265	270	277	282	288
Melt Temperature (°F)	510	520	530	540	550

Lower extrusion melt temperatures may be used with a co-extrusion process due to the lower drawdown ratios used.

3.2 Extrusion Screw Design

Extruder and extruder screw design is critical for the optimum processing of nylon 6. A minimum Length/Diameter (L/D) ratio of 20:1 is necessary for consistent delivery of nylon melt in wire and cable applications. A L/D ratio of 24:1 is preferred and more commonly used.

Metering screws are successfully used for nylon extrusion provided a suitable compression ratio is available. A compression ratio of 3.5 to 4.1 is needed to compensate for the change in nylon bulk density from pellets to melt. A lower compression ratio may result in entrapped air in the melt and cause skips or canoe splits on the wire jacket. A compression ratio of 4.1 is optimum for Ultramid® B27 HM 01. The transition section of the screw should be 4 to 5 screw diameters and the metering section should be 40% of the overall flighted length.

A barrier screw can also provide consistent delivery of nylon melt in wire and cable applications. The barrier screw incorporates a second barrier flight in the transition section of the screw. The barrier flight is effective in preventing un-melted nylon and entrapped air from reaching the metering section of the screw. The compression ratio of barrier screws for nylon extrusion is typically 3.0. Barrier screws have been successfully used to eliminate skips or canoe splits in wire jacketing extrusion.

3.3 Instrumentation

Control of barrel temperatures is important in order to obtain consistent nylon melt from the extruder. Fluctuations in barrel temperatures in the feed zone can affect the location of initial nylon melt. Fluctuations in barrel temperatures in the metering zone may result in nylon melt of different viscosities. Both conditions will cause variability in the output of the extruder and load on extruder drives.

A melt temperature indicator should be installed in the melt stream between the breaker plate and crosshead. The melt temperature can vary significantly from the barrel temperatures. A melt temperature indicator is helpful in maintaining consistent melt temperature.

The ammeter will indicate variation in the power demand of the extruder drive. A variation in the drive power is an indication of varying melt viscosity or cycling of the length of the melt zone. Screw speed indication will permit quick re-establishment of extrusion condition following shutdown.

An extruder pressure gauge is a good method to confirm consistent extrusion conditions and extruder output. Any change in extruder screw speed or resin melt viscosity will be indicated by changes in head pressure of the extruder. The pressure gauge should be installed between the breaker plate and crosshead.

4. Crosshead and Tooling

A minimum extruder head pressure of 20 bar (300 psi) is recommended in order to maintain a constant nylon melt delivery rate. Crosshead flow passages of 3mm (1/8 inch) are commonly used in nylon extrusion to achieve the needed head pressure. Both adjustable and self-centering type crosshead designs are successfully used in nylon wire and cable extrusion.

Fixed center tubing style tooling is most commonly used in nylon jacketing of building wire. In the tubing style extrusion, the nylon melt exits the die as a tube and is drawn down to the final size with good intimate contact with the primary insulation. The primary insulation can be extruded with either pressure or tubing style tooling. Pressure style extrusion of the primary

PVC insulation in THHN type products is generally preferred as it will provide a more round surface on stranded conductors and better adhesion to solid conductors.

The draw ratio is the ratio of the area of the annular die opening to the area of the finished jacket. The preferred draw ratio for Ultramid® B27 HM 01 is between 8:1 and 12:1. For high speed and circuit size wire jacketing, draw ratios of 20:1 and higher have been successfully utilized. The higher draw ratios generally require higher melt temperatures (275 to 288°C/225 to 250°F) to maintain a smooth jacket surface finish.

The die opening, the clearance from pin to die, should be at least 0.4 mm (15 mils). The minimum recommended land length of the die is 6 mm (1/4 inch). Vacuum on the crosshead is essential to achieve a tight nylon jacket with tubing style extrusion. The level of vacuum should be adjusted to keep the cone on nylon no longer than 6 mm (1/4 inch) for circuit size wire, and no longer than 9 mm (3/8 inch) for large gauge wire. The pin should always be set flush with the end of the die.

5. Quench Practices

Quench of the molten nylon jacket will have a strong influence on the tightness, physical properties and appearance of the wire jacket. The final crystalline structure and moisture absorption of the nylon jacket is controlled by the quench length and temperature:

With An Increase in Crystallinity:

The nylon jacket shrinks tighter affording a better bond to the PVC. Clarity of the jacket becomes frosty and opacity is evident.

- Tensile Strength, Stiffness, Hardness and Cut-Through Resistance - Increases.
- Percent Elongation, Impact Resistance and Coefficient of Friction - Decreases.

With An Increase in Moisture Absorption

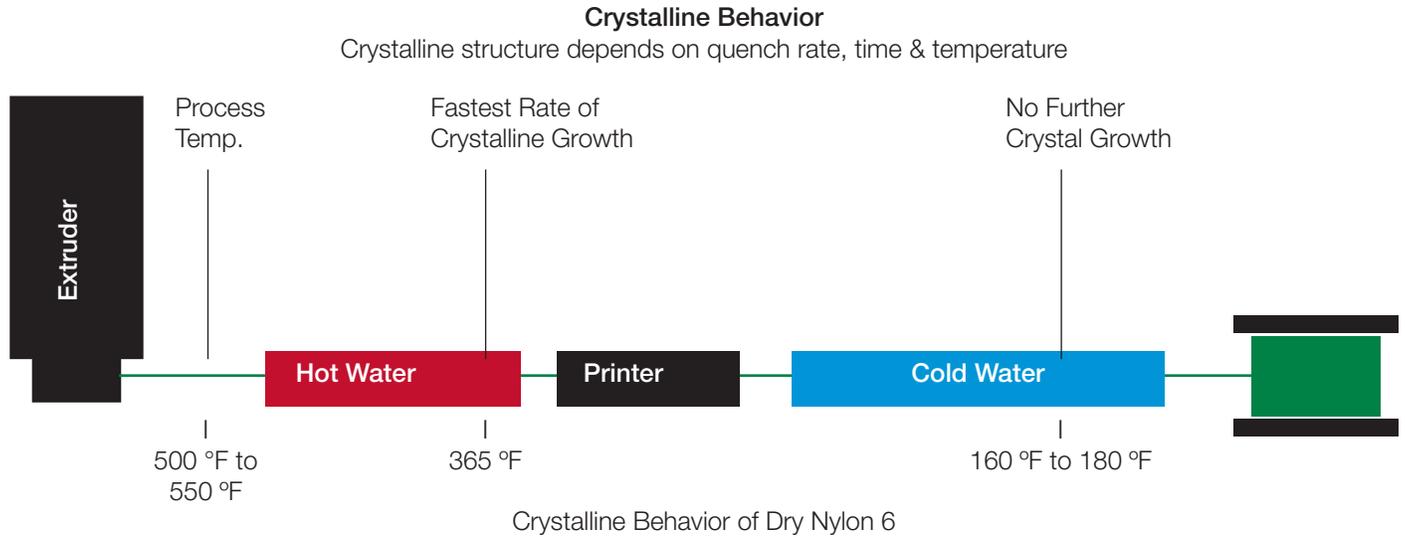
- Tensile Yield Strength, Hardness, Abrasion Resistance and Cut-Through Resistance - Decreases.
- Elongation, Coefficient of Friction - Increases.

The distance between the exit of the die and the initial water quench of conductor should be kept relatively short. This air gap is typically maintained at between 15 to 60 cm (6 to 24 inches).

An initial quench of warm water (first bath length 1 to 4 m³ to 12 ft.) should be used with water temperatures of 27 to 38°C (80 to 100°F). This quench temperature will promote sufficient jacket shrinkage resulting in a tight nylon jacket and good initial moisture absorption. Nylon jackets should contact the quench water evenly and remain under water. This will prevent an uneven crystal growth in the nylon jacket and increase moisture absorption.

The remainder of the quench water system should use cooler water (21 to 27°C/70 to 80°F) to accomplish heat removal from the conductor. If the conductor heat is not removed prior to spooling on the take up reel, radial stress during re-reeling could result in jacket cracking. Jacketed wire should be approximately room temperature when wound on a take up reel.

The following diagram illustrates the crystalline growth behavior of nylon wire jacketing through the quench process.



6. Wire Handling

Wire on stem pack or reel should be at or slightly warmer than room temperature. If wire is very warm (> 55 °C/130 °F) on the initial take-up, the wire may take a “set” on the reel. Additional stress on the nylon jacket may occur after the conductor has cooled on the reel. Additional water may be sprayed on the wire during take-up to further enhance moisture absorption. Reels can be stored for 1 to 2 days to allow time for additional moisture absorption from the environment.

For re-spooling/package operations look to minimize stress on the conductor and nylon jacket. Check alignment of wire in payoff cones and on rollers to eliminate sharp contact points. Slow the speed of re-spooling lines if possible to reduce stress on the conductor. Warm wire on reels prior to payoff to increase flexibility of the jacket and insulation on the conductor.

The dimensions of reels used for wire storage and shipment must be sized to minimize excessive stress on the conductor insulation and jacket. A rule of thumb is the reel drum diameter should be at least 16 times the outside diameter of the conductor. Refer to the following table as a guide for minimum drum diameter for intermediate and large gauge wire.

Wire Gauge	Approximate Conductor Outside Diameter, inch (cm)	Minimum Reel Drum Diameter, inch (cm)
2 AWG	0.38 in. (1.0 cm)	6 in. (15 cm)
1 AWG	0.43 in. (1.1 cm)	8 in. (20 cm)
1/0 AWG	0.47 in. (1.2 cm)	8 in. (20 cm)
2/0 AWG	0.52 in. (1.3 cm)	10 in. (25 cm)
3/0 AWG	0.57 in. (1.5 cm)	10 in. (25 cm)
4/0 AWG	0.62 in. (1.6 cm)	10 in. (25 cm)
250 MCM	0.73 in. (1.9 cm)	12 in. (30 cm)
300 MCM	0.78 in. (2.0 cm)	12 in. (30 cm)
350 MCM	0.83 in. (2.1 cm)	14 in. (36 cm)
400 MCM	0.88 in. (2.2 cm)	14 in. (36 cm)
500 MCM	0.97 in. (2.5 cm)	16 in. (40 cm)
600 MCM	1.06 in. (2.7 cm)	18 in. (46 cm)
750 MCM	1.17 in. (3.0 cm)	20 in. (50 cm)
1000 MCM	1.30 in. (3.3 cm)	22 in. (56 cm)

7. Troubleshooting Guide

Problem / Defect	Cause	Solution
LOSS OF OUTPUT (NO SCREW RPM)	ELECTRICAL	CHECK POWER SUPPLY, CHECK TEMPERATURE PROFILE.
	MECHANICAL	CHECK DRIVE KEY, DRIVE BELTS, SHAFT COUPLING, & GEAR BOX.
	FROZEN VELOCITY BLOCK SECTION (CROSSHEAD ADAPTER)	WARNING – HIGH HEAD PRESSURE!! MAINTAIN TEMPERATURE IN VELOCITY BLOCK TO 550° F. MAINTAIN PRESSURE GAUGE CALIBRATION.
	SCREEN PACK CLOGGED	WARNING - HIGH HEAD PRESSURE !! REPLACE SCREEN PACK, MAINTAIN PRESSURE GAUGE & CALIBRATION.
LOSS OF OUTPUT (WITH SCREW RPM)	RESIN SUPPLY OUT	RENEW RESIN SUPPLY. RAISE REAR ZONES 50 - 100° F; ADJUST FEEDTHROAT WATER TEMPERATURE TO 80 - 100° F.
	FEED SECTION BRIDGE	OPEN HEAD, MOVE SCREW 6"; REPLACE SCREW, ATTEMPT BLEED. REMOVE SCREW & CLEAN.
LOSS OF CROSSHEAD VACUUM	CLOGGED VACUUM TRANSDUCER	CLEAN OR REPLACE TRANSDUCER.
	CLOGGED VACUUM LINES	CLEAN OR REPLACE VACUUM LINES.
	CLOGGED VACUUM FILTER OR PUMP	CLEAN OR REPLACE FILTER, CLEAN PUMP.
	X-HEAD ENTRANCE BAFFLE OVERSIZE	CHANGE X-HEAD ENTRANCE BAFFLE.
OFF-CENTER JACKET	CONDUCTOR MIS-ALIGNMENT THROUGH CROSSHEAD TOOLING	ALIGN CONDUCTOR THROUGH TOOLING; AVOID CONTACT WITH TIP ID.
	COLD SPOT AROUND TOOLING	CHECK HEAD TEMPERATURE AROUND TOOLING; REPLACE HEAD HEATER IF NEEDED.
	WORN TOOLING	REPLACE TOOLING.
	CONTAMINATION / DEGRADATION IN CROSSHEAD & TOOLING	CLEAN CROSSHEAD CAVITY AND ALL INTERNAL TOOL PARTS.
EXTRUDATE SURGING	WORN SCREW AND / OR BARRELL	REBUILD OR REPLACE SCREW / BARRELL. USE FINER MESH (TO 150) SCREENS.
	INSUFFICIENT BACK PRESSURE	CHANGE TEMPERATURE PROFILE TO HUMPBACK PROFILE.
	SCREW DESIGN (NEW INSTALLATION)	USE 40% METERING SCREW WITH 4:1 CR OR BARRIER MATTOX MIXING SCREW.
	EXCESS MOISTURE IN RESIN PELLETS	EMPTY AND REPLACE RESIN SUPPLY. CHECK DESICCANT DRYER OPERATION, MAINTAIN DEWPOINT @ -20° F MAXIMUM.
FOAMY EXTRUDATE	ENTRAPPED AIR IN EXTRUDATE (LOW EXTRUDER BACK PRESSURE)	CHANGE TEMPERATURE PROFILE TO HUMPBACK PROFILE. USE FINER MESH (TO 150) SCREENS. USE BARRIER MATTOX MIXING SCREW OR 40% METERING SCREW WITH HIGHER COMPRESSION.
	INSUFFICIENT CROSSHEAD VACUUM	INCREASE VACUUM; CLEAN VACUUM LINES AND TRANSDUCER OR VACUUM PUMP; CHANGE X-HEAD ENTRANCE BAFFLE.
HORSE-COLLAR (INDICATES A LOOSE JACKET)	LOW TOOLING DRAW-DOWN RATIO	INCREASE TOOL SIZE (HIGHER DRAW-DOWN).
	LOW SUBSTRATE PVC TEMPERATURE	SHORTEN DISTANCE BETWEEN EXTRUDERS; ENCLOSE WIRE LINE BETWEEN EXTRUDERS.
	CRYSTAL STRUCTURE IN JACKET	INCREASE AIR-GAP; USE HOT WATER INITIAL QUENCH (110° - 140° F).
	EXCESS NYLON JACKET THICKNESS	MAINTAIN JACKET THICKNESS WITHIN SPECIFICATION LIMITS.
	OFF-CENTER NYLON JACKET	MAINTAIN CONCENTRICITY TO WITHIN .002".

Problem / Defect	Cause	Solution
CANOE SPLITS & CONE BREAKS	CONTAMINATION / DEGRADATION IN CROSSHEAD & TOOLING	CLEAN CROSSHEAD CAVITY AND ALL INTERNAL TOOL PARTS.
	CONDUCTOR MIS-ALIGNMENT THROUGH CROSSHEAD TOOLING	ALIGN CONDUCTOR THROUGH TOOLING; AVOID CONTACT WITH TIP ID.
	COOL VELOCITY BLOCK SECTION HEAT (CROSSHEAD ADAPTER)	MAINTAIN TEMPERATURE IN VELOCITY BLOCK TO 550° F. CHOOSE TEMPERATURE PROFILE TO CORRESPOND WITH OUTPUT RATE.
	ENTRAPPED VOLATILES OR AIR IN EXTRUDATE	CHANGE TEMPERATURE PROFILE TO HUMPBACK PROFILE.
	HOT FEED THROAT SECTION	USE BARRIER MATTOX MIXING SCREW OR 40% METERING SCREW WITH HIGHER COMPRESSION.
	EXCESS MOISTURE IN RESIN PELLETS	MAINTAIN FEEDTHROAT COOLING TO 80 - 110° F.
NYLON CRACKING (LONGITUDINAL)	BROKEN GUIDER TIP	CHECK DESICCANT DRYER OPERATION, MAINTAIN DEWPOINT @ -20° F MAXIMUM.
	CONTAMINATION / DEGRADATION IN CROSSHEAD & TOOLING	REPLACE GUIDER TIP.
	WORN CONTACT POINT ON DOWNSTREAM EQUIPMENT (SHEAVE, ROLLER, QUENCH TANK BOTTOM LINER, ETC.)	CLEAN CROSSHEAD CAVITY AND ALL INTERNAL TOOL PARTS.
	OFF-CENTER NYLON JACKET	INSPECT AND REPAIR OR REPLACE, AS NEEDED.
NYLON CRACKING (LONGITUDINAL & CIRCUMFERENTIAL)	EXCESSIVE BUILT-IN STRESS IN JACKET	MAINTAIN CONCENTRICITY TO WITHIN .002".
	LOW MOISTURE ABSORPTION	DECREASE TOOL SIZE (LOWER DRAW-DOWN); DECREASE AIR-GAP; INCREASE MOISTURE ABSORPTION DURING / AFTER EXTRUSION.
	FROZEN CONDUCTOR	QUENCH UNDERWATER WITH LONGER QUENCH LENGTH.
CONDITIONED FLEXIBILITY TEST FAILURE	EXCESSIVE BUILT-IN STRESS IN JACKET	WARM CONDUCTOR PRIOR TO DE-REELING.
	LOW MOISTURE ABSORPTION	DECREASE TOOL SIZE (LOWER DRAW-DOWN); DECREASE AIR-GAP; INCREASE MOISTURE ABSORPTION DURING / AFTER EXTRUSION.
	EXCESS NYLON THICKNESS	QUENCH UNDERWATER WITH LONGER QUENCH LENGTH.
	OFF-CENTER NYLON JACKET	MAINTAIN JACKET THICKNESS WITHIN SPECIFICATION LIMITS.
FLAME TEST FAILURE	EXCESS NYLON THICKNESS	MAINTAIN CONCENTRICITY TO WITHIN .002".
	PVC AND / OR NYLON OFF-CENTER	MAINTAIN JACKET THICKNESS WITHIN SPECIFICATION LIMITS.
		MAINTAIN CONCENTRICITY TO WITHIN .002".
		INCREASE CROSSHEAD VACUUM.
	LOOSE NYLON JACKET	CLEAN VACUUM LINES AND / OR TRANSDUCER OR VACUUM PUMP.
		CHANGE X-HEAD ENTRANCE BAFFLE.
	INCREASE AIR-GAP.	
	INCREASE TOOL SIZE (HIGHER DRAW-DOWN).	
	LOW MOISTURE ABSORPTION DURING & AFTER EXTRUSION	QUENCH UNDERWATER WITH LONGER QUENCH LENGTH.
	PVC FORMULATION	CHECK PVC FOR FR & PLASTICIZER LEVELS.



We create chemistry

BASF – a partner you can rely on

With over 80 years of experience in polyamides, BASF is truly a partner you can rely on. We work closely with our customers to identify their needs, and we constantly strive to strengthen their competitive advantage.

We combine our know-how, products and services in one highly effective global network. We never stop asking what we can do to involve our partners in the best possible way. That is how we help our customers to be more successful.

When it comes to nylon jacketing of wires and cables, we possess a high degree of technical expertise and can offer competent technical support. Ultramid® provides excellent properties and consistent product performance.

Visit us at www.nylon.basf.us

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