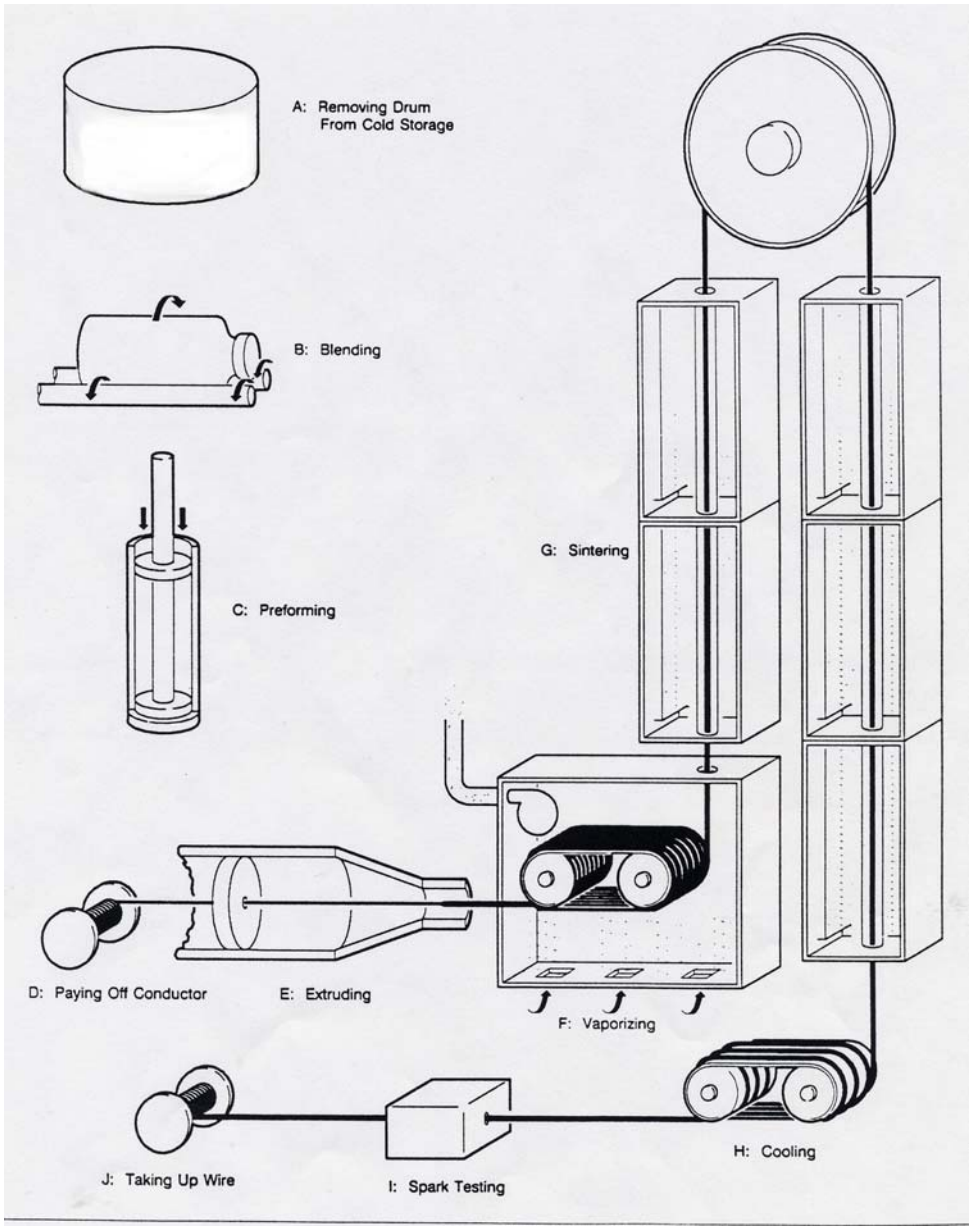
PASTE EXTRUSION OF PTFE WIRE INSULATION

Paste extrusion (also called ram extrusion) of PTFE fine powder resin is accomplished using a mechanical or hydraulic ram extruder. The diameter of the ram cylinder is sized to the desired range of wire or tubing sizes to be made. The length of the cylinder determines the maximum length of product that can be made in one “shot”. The size of Markel’s extruders range from ¾” to 4” in diameter and from 54” to 108” in length.



A.- The process starts with PTFE fine powder resin received and stored under controlled conditions to prevent the pick up of moisture.

B.- Lubricant and color pigment (when required) are blended in a tumbling process.

C.- The blended resin is compacted into a cylinder with diameter and length matching the size of the extrusion cylinder. These “preforms” are loaded into the extrusion cylinder.

D.- The conductor to be insulated is payed off from a spool through a guide tube in the extrusion cylinder.

E.- The ram, driven by mechanical or hydraulic pressure, forces the resin out of the cylinder through a die and a mandrel.

F.- The extrudate is drawn through a vaporizer where heat is used to drive off the lubricant vapors. The vapors are captured in a catalytic oxidizer and neutralized before being exhausted into the atmosphere. This part of the process is carefully monitored by the Environmental Protection Agency.

G.-Sintering (or baking) takes place in a vertical tower of cylindrical heaters. The illustration shows a horizontal extruder in which the cylinder is mounted in the horizontal position and the extrudate is pulled vertically upward through the sintering oven. It is pulled over a turn-around wheel and down to the cooling area. In vertical extrusion, the extrusion cylinder is mounted in line with the vertical sintering tower. Wire is pulled upward as in the illustration. Tubing is extruded downward through just one set of sintering ovens and taken up on a spool. Large diameter tubing is extruded down into a pan and later sintered in a large oven.

H.- The sintered product is cooled by air or water.

I.- High voltage spark testing of wire locates points of weakness in the insulation that are later removed before the wire is packed for shipment. OD measurement with a non-contact gauge is recorded and displayed to the operator and in the supervisor's office. (See "Extrusion Monitoring" in the Quality section.)

J.- The insulated wire is taken up on a spool or payed out into a drum. Splices are noted on the packing slip for each spool or drum.