REASON FOR UPDATE: Removed reference to 'MAGNOX'.
Fixed spec typo – Was ES_5531_2
Updated ES_5331_2 to ISSUE 4

ASSOCIATED DOCUMENTS:

1. PURPOSE

1.1 To provide a procedure for the use of EPDM 30H

2. SCOPE

2.1 This document applies to all those using and involved in the manufacturing process regarding EPDM 30H.

3. RESPONSIBILITY

3.1 The Head of Quality and Production Development is responsible for updating and communicating the details within this procedure.

4. PROCEDURE

Application

Spent nuclear fuel (waste) from the UK's power stations are transported in water-filled nuclear fuel transport flasks. The lids of these flasks are sealed to the bodies using two elastomer 'O' rings housed in rectangular grooves with seal retention features. The flasks have two additional through-wall penetrations equipped with valves. These are for water level control and to purge the atmosphere above the water. It is the 'O' rings in these valves that are usually made from EPDM 30 H. The manufacture of EPDM 30 H, testing and supply of the elastomer components manufactured from this compound is specified in document Spec. ES_0_5331_2-ISSUE 4

The compound is a radiation tested and validated material for long life service in nuclear applications.

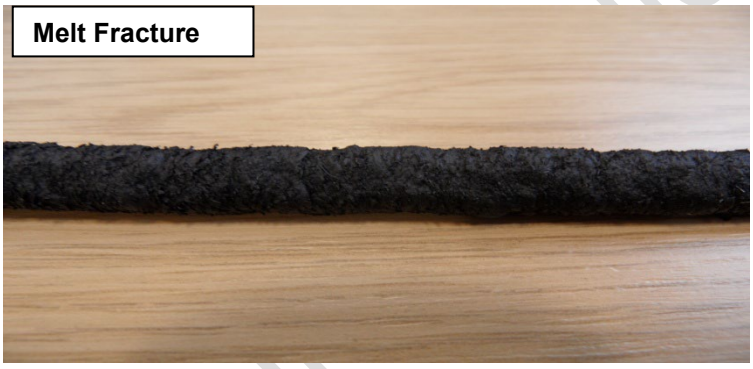
4.1 Extruder Settings and Dies

To prevent the onset of Melt Fracture the correct die and cone assembly must be used along with very specific temperatures and speed settings. See DJ for locations and settings.

The operator must be vigilant throughout the run and accept that this is a slow process.

Onset of Melt Fracture

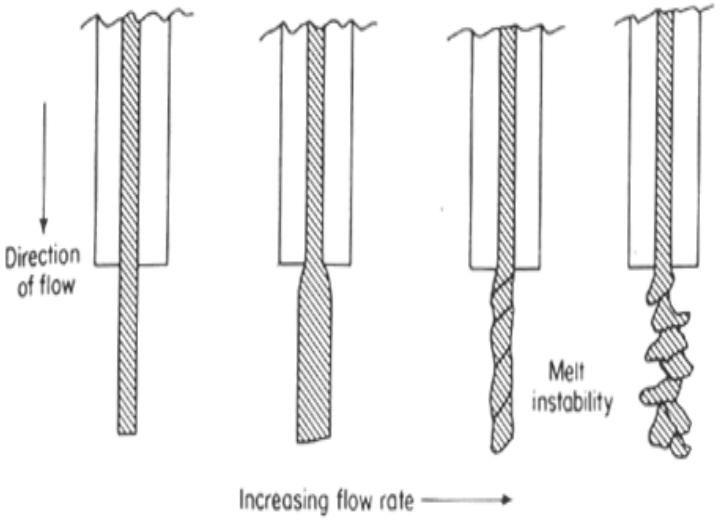
Melt Fracture



Good extrusion

Melt fracture occurs when the rubber compound is extruded above its critical shear stress.

Increasing the ram/screw speed and/or poor die design contribute to this significantly with EPDM 30H.



ZONE 1 – 60°C	**SCREW SPEED 0.1 TO 0.5 RPM**
ZONE 2 – 60°C	**TORQUE/AMPS 14**
ZONE 3 – 55°C	**BREAKER/RING RING**
ZONE 4 – 60°C	**VACUUM SET YES**
ZONE 5 – 65°C	

Once extruded, lay the extrudate on a tray covered in grease proof paper, and cover over to keep clean.

4.2 Make-Up & Moulding

Mould care:

-Ensure the mould has been 'backed off'/'relieved' (see picture) if not, take mould to toolroom to be done.

-Make sure cavity is clean

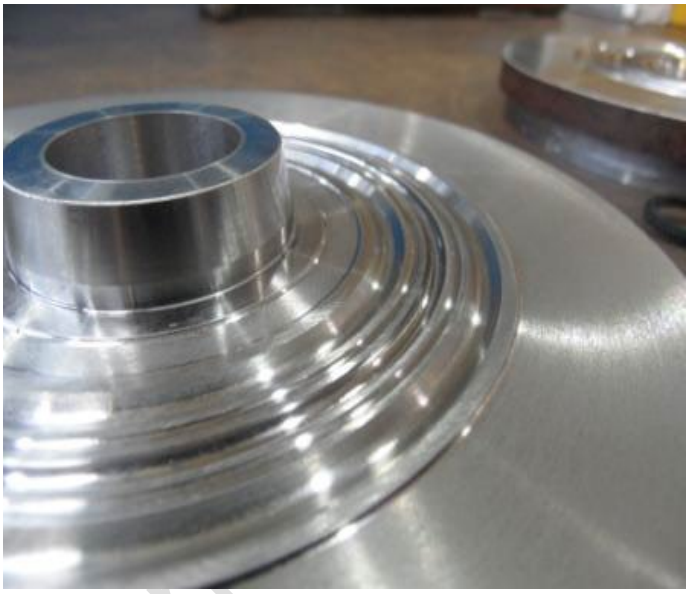
-Check mould temperature

-Apply mould release as required

-Check mould temperature

-

Do NOT start moulding until desired temperature is reached.

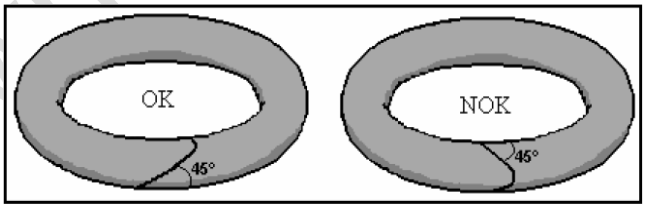


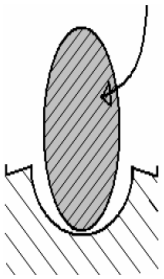
Cut to length:

-Allow to 'relax' before cut

-Correct angle of cut

-Ends must fit together well



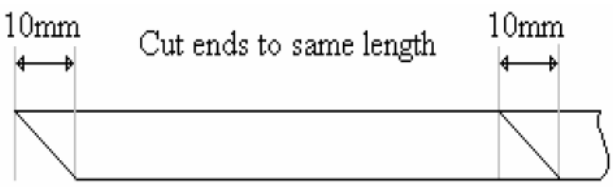


Assemble Make-up:

-Leave tail of m/u standing up away from the heat of mould until rest of m/u in place

-Join must be 90^0 to pressure

Always ensure that the make-up is free from contamination.



4.3 Moulding

All rings with a section of less than 6mm must be moulded at 10mins @ 170°C.

(Mould temperature)

Sections over 6mm should be moulded for an additional 1 min for every 1mm over the 6mm thickness.

E.g. sections between 7.01 and 8.0mm shall be moulded for 12 minutes and sections between 8.01 and 9.0mm shall be moulded for 13 minutes

Inspect seals at press. Look for backrinding, damaged mould or dirty mould, peeling, foreign material and poor surface finish etc.

4.4 Post Cure

After moulding the rings are post cured in the oven.

5 hours @ 160°C

4.5 Common Reject Causes

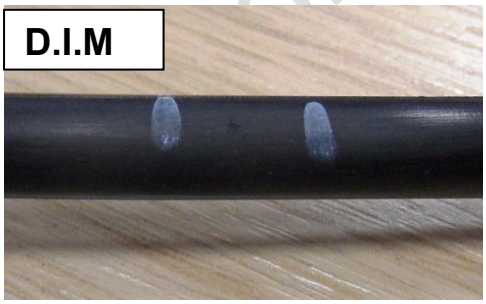
The ring shows markings on the surface, sometimes looking like tiger stripes (sharks skin). This is often made much worse when autoclaved resulting in surface peeling.

This is proven to be a direct result of Melt Fracture on the extrusion

D.I.M

Bad Join

D.I.M



Bad Join

IF IN DOUBT ASK!