

Identifying Manufacturing Issues with Factory Grade® Technology



Manufacturing Molding Issue Identified with IMCORP Factory Grade® Technology

HIGHLIGHTS

OVERVIEW

Manufacturing molding issues and workmanship issues are identified with the Factory Grade® technology.

CHALLENGE

Identifying root cause of substandard performance of premolded dead-front T-bodies in an efficient and effective manner.

RESULTS

Utility client partners with IMCORP to ensure quality and educate installers on how to identify manufacturing defects with immediate, evidence-based feedback before failure.

After days of unproductive effort, a utility could not locate the failures caused by a destructive VLF (Very Low Frequency) test and the energization window was closing for the new cable system feeding a critical industrial customer. The utility asked IMCORP to help. The initial assessment with our Factory Grade® technology pinpointed three pre-molded 750kcmil T-body style terminations in two different locations which showed evidence of insulation ruptures. The T-bodies were installed in a 'hammerhead' configuration with two 750kcmil T-bodies connected to either end of a 1000kcmil T-body. In addition to locating the multiple fault locations, the IMCORP Factory Grade® assessment also identified multiple 1000kcmil hammerheaded T-bodies that were failing to meet the manufacturer's minimum performance standards. With agreement from the utility and the manufacturer, the three faulted 750kcmil and 1000kcmil T-body sets and an additional 1000kcmil T-body exhibiting substandard performance were sent to IMCORP's lab for dissection and root cause analysis.

Based on the evidence received, all the 750kcmil T-bodies showed anomalies in the inner surface in line with the top mold fill ports. The substandard performance for the 1000kcmil T-bodies was likely due to workmanship issues at the cable cutbacks (non-radial and jagged cutbacks, knife cuts/gouges) in the cable insulation. The molding issue was later verified by the manufacturer, who took the appropriate corrective actions. Our Factory Grade® technology then verified the entire cable system met the manufacturer's performance standards. The case is yet another example of IMCORP partnering with utility clients to ensure quality and educate installers on how to identify defects with immediate evidence-based feedback before failure.



The Manufacturers' Standards



Component Standard	Testing Frequency	Thresholds* Sensitivity	Thresholds* Voltage
Terminations IEEE 48	50/60 Hz	5pC	≤ 1.5 U _o
Joints IEEE 404	50/60 Hz	5pC	≤ 1.5 U _o
Separable Connectors IEEE 386	50/60 Hz	5pC	≤ 1.3 U _o
MV Extruded Cable ICEA S-97/94-682/649	50/60 Hz	5pC	≤ 4.0 U _o ^A
HV / EHV Extruded Cable ICEA S-108-720	50/60 Hz	5pC	≤ 2.0 U _o

* No partial discharge should be observable above the sensitivity threshold up to the voltage threshold
^A200 V/mil

Table I: Manufacturers' Standards

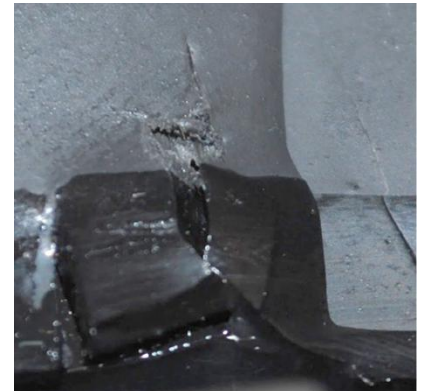


Figure 1: Anomaly found inside surface at the mold injection port one of the unfaulted 750kcmil T-bodies (left picture, yellow circle). The anomaly appeared to be a U-shape crack completely penetrating the semiconducting material (Faraday cage). Note the damage/crack continued into the insulation material but had not failed yet.

[1] IEEE standards are classified as:
 • Standards: documents with mandatory requirements.
 • Recommended practices: documents in which procedures and positions preferred by the IEEE are presented.
 • Standard Guides: documents in which alternative approaches to good practice are suggested but no clear-cut recommendations are made.