

Application Note

Differentiating types of Nylon (PA, Polyamide) in the production environment used for manufacturing automotive components

For any manufacturing organisation, the words “product recall” are two of the most feared and emotive ones that exist. The impact of a product recall goes far beyond the initial replacement costs as loss of image, reputation and market share all need to be considered. But, when safety and potential loss of life is at stake a product recall is sometimes the only solution.

Effective quality control / quality assurance of the raw materials used in automotive components are an essential part of any modern manufacturing organisation. Increasingly thermoplastic materials make up a significant portion of the components used within today’s vehicle; both inside and outside as well as under the bonnet. Yet, many of these materials - which can have a large range of mechanical properties (and prices) - can be visually indistinguishable from each other, especially as most arrive at the manufacturing facility in the form of granules and pellets. So, aside from the label on the 25Kg sack, how can you be sure that the material that you have been sent is a) the correct material that has been specified for the component and b) the correct material that you have ordered on your supplier?

A quick and efficient way to characterise incoming raw materials is to use the identiPol QA2 which measures the thermal and mechanical properties of a couple of plastic pellets to produce a ‘fingerprint’ of the material that can then be compared to either a library of known plastics (PET, PC, PA6, PA66 etc.) or to previously processed ‘good’ material. The system has been designed to be used by non-technical staff and offers either a quick identity of the type of plastic or a Pass / Fail indication when compared to previous batches.



The identiPol QA2

Material Identification

The Identification mode of the identiPol QA2 can be used to confirm the identity of a thermoplastic material by comparing several thermophysical properties measured whilst a few granules are heated against a values of known material stored within the system’s library. The measured properties are:

Amorphicity - a measure of the degree of orientation of the polymer chains.

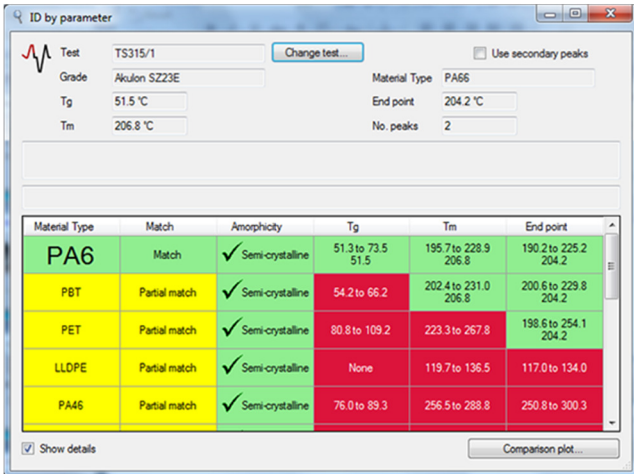
Glass transition temperature - the temperature at which non crystalline material starts to become mobile and soften.

Melting point temperature - the temperature at which crystalline material starts to melt.

End point temperature - the temperature at which the plastic loses mechanical integrity.

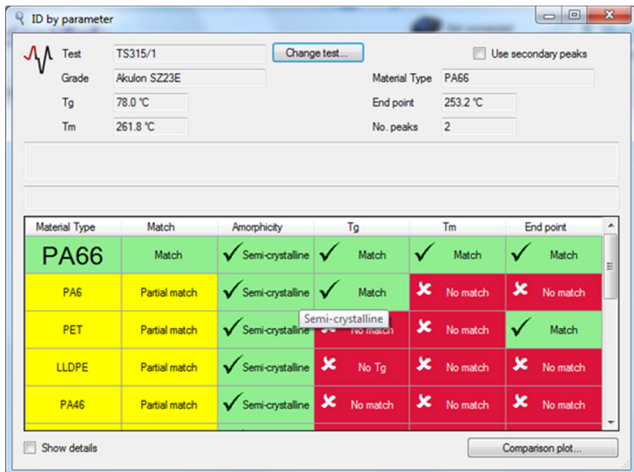
These values are automatically determined by the system software and no operator intervention is required. The measured values are then compared to a library of known plastic types

Following the test the software displays a table of the closest match(es) to the unknown. The table below shows that a material shipped as Akulon S223E, a PA66 Polyimide, has been identified as the cheaper PA6.



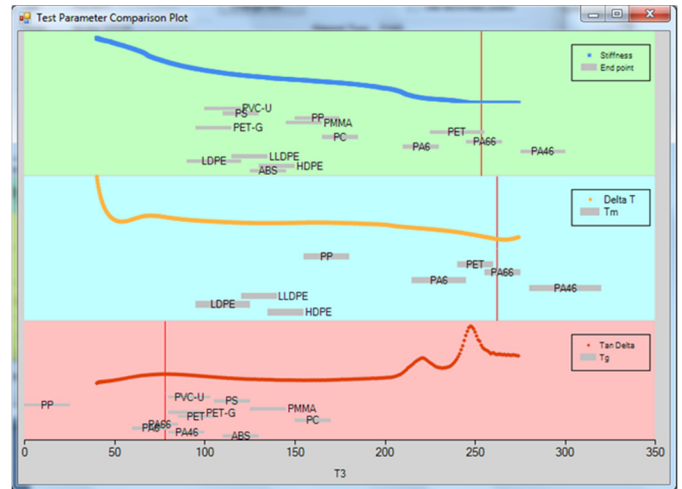
Identification Mode - the material is identified as PA6

A second sample, from an alternative source, gives a positive identification of the correct grade of PA66



Identification Mode—the material is identified as PA66

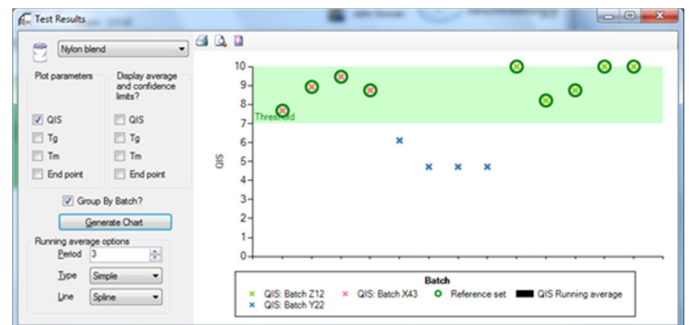
For most purposes this short (typically under 15minutes) test is sufficient to enable manufacturing staff to illuminate rouge material – or organisations – from the supply chain. Should further evaluation of the material be necessary, it is possible to view the raw data used in the determination of the plastics identity.



The thermophysical data used to identify an unknown

Material Quality Assurance

The identiPol QA 2 can also be used in Confirmation mode where the results are compared to previously processed good batches of material. Having established a 'baseline' by running 10-15 tests of known good material, the latest material is assigned a score (QIS Value) based upon how similar it is to the good material. The QIS value ranges from 0 (totally different) to 10 (identical), typically any value of 7 and above is indicative of an acceptable material. This produces an objective Pass / Fail result for the factory floor.



QIS values for various batches of a Nylon blend

The results above, for a Nylon blend show easily those batches that fall in the Pass (green region) and those that Fail (white region) and provide a fast visual indication to manufacturing personnel regarding the quality and consistency of the material being received from suppliers.

In conclusion, although the identiPol QA2 cannot eliminate the potential for a product recall, it will reduce the risk of this event significantly for thermoplastic materials used in the manufacture of automotive components.