THE DARMSTADT ADVANCED ABRASION MACHINE (DAM)

- The Darmstadt machine differs, in that the abrasive surface - a “doughnut” of concrete - is static, whilst the test samples (three, mounted at 120 degree spacings) are mounted on sample holders which spin around a central vertical shaft.

- A motor spins the sample holders up to a specified number of revolutions per minute - between 140rpm and 720rpm - at which point the sample holder is released and freefalls into contact with the doughnut.

- The samples continue to spin under their own momentum, decelerating to a stop. The contact point of the sample is a circle within the doughnut.

- At the end of the test, the test sample is examined. Any opening of less than 5mm in any direction is deemed a pass. Any opening of more than 5mm is considered a fail.

- Critics point out that:

To date, few machines of the new specification have been delivered and are operating; consequently, there is no data to verify the reliability, consistency and repeatability of the latest iteration of the Darmstadt machine (all such claims of superior reliability, compared to the Cambridge machine, purportedly being based on previous versions of the Darmstadt device, spanning different iterations).

The abrasive surface is only cleaned after each test sequence and not continuously cleaned while samples are under test; consequently, from the instant the test samples make contact they start to leave debris. This means that, from the very first revolution, each sample could encounter debris from the sample ahead of it within one third of a revolution. From the second revolution, debris is accumulating from all three test samples, potentially affecting the coefficient of friction and influencing abrasion performance.

Testing is limited by the design capabilities of the apparatus. There is no means of identifying whether a sample which passes the test with no opening whatsoever at the maximum speed at which the device can spin (720rpm) would fail at only marginally higher speeds. Since the proposal is only to test materials at one of the three speeds, borderline performance which might exhibit critical, catastrophic failure at only slightly higher speeds, or foreseeable conditions of use which might cause garments to fail in less strenuous test conditions, will not be detected.

WG9 decided to drop the CAM from the revision to the standard and to support a switch to the DAM, which was claimed to provide more accurate data (despite no version of the newest iteration of the DAM existing at the time the decision was taken, to validate this assertion!).

The assertion that the CAM is unreliable is disputed, however, by several experts and test houses, who have data which indicates the contrary. Consequently, WG9's decision is being challenged.

Note: PVA-PPE Group commissioned testing on four CAMs, operated by four different test houses, using control fabrics supplied by us, and found that three of the machines gave good correlation. In the case of the fourth machine, however, the results were up to 300% higher than those generated at the other three labs on the same control fabrics! It is suspected that this laboratory's data might be the original cause of concerns and criticisms levelled at the CAM.

A void in knowledge is that no comparative testing has apparently been done on the DAM with samples which pass the CAM test. A significant question mark therefore hovers over whether the DAM test is as stringent a method, more demanding, or less severe than the CAM test.

It is important to establish this comparison, otherwise the situation could arise whereby the highest, AAA classification recognised in the proposed revision might in fact be significantly lower than either Level 1 or Level 2 in the current version of the standard. This would mean motorcyclists' wearing clothing, bearing EN 17092 certification, which is less protective than products which are currently on the market, bearing EN 13595-1:2002 certification, whilst believing they are wearing equivalent protection.

From test data which already exists, however, on materials which it is understood have already been tested on a single DAM of the latest specification, and which have previously been tested on several CAMs owned and operated by other test houses across the world; indications are that the Cambridge machine is better suited to evaluate higher-performing materials, whereas the Darmstadt machine is better suited to lower-performing constructions. Another way of expressing this is that one would not use a yardstick to measure small dimensions; one would use a micrometer - but a micrometer would be entirely unsuitable for measuring large objects.

Consequently, the nature of changes to the proposed new version of the standard, combined with the European parliament's decision that all motorcyclists' clothing is PPE and must therefore be tested and certified, suggests that both CAM and DAM test methods are needed in the standard and that additional performance classes above AAA might be required: possibly AAAA (4A) and AAAAA (5A), equivalent to the current Level 1 (or French protocol Level 1) and Level 2 respectively.

This would provide manufacturers with a continuation of the existing benchmarks to work to - a challenge which several companies have met by producing products which are progressively lighter, thinner, more flexible and more breathable than their earlier certified models - whilst providing consumers with the choice of whether to choose these or to opt for lighter, lower-performing products which have none the less been tested and offer an independently verified level of protection.