PowdermatriX

SPARK CASE STUDY

COAT OF ARMATECH

What's the story?
Chapmans Agricultural Ltd is one of the Europe's leading suppliers of abrasion resistant wear parts for a wide range of sectors. The firm has a strong reputation for innovative products including Armatech, a powder metallurgy based coating which improves the wear resistance of metal parts used in the agricultural industry.

Armatech consists of an iron composite matrix with a large percentage of embedded hard carbides, mixed with a suspension and binding agent. It is manufactured by a relatively simple and cost effective process in which the coating is applied to the metal part in a water-based slurry followed by drying and firing in a belt furnace. The coating is competitive with similar thermally sprayed systems but us much easier to apply.

With a strong demand for such hard wearing coatings currently in existence, the question of whether Armatech could be made even more durable to meet such demands was one that a SPARK feasibility project aimed to discover.

What went on?
Initial tests carried out by Chapmans and MERI (the Materials and Engineering Research Institute at Sheffield Hallam University) suggested that the addition of certain hard phase powders could improve the performance of the coating.

A range of variables needed to be explored in order to find the material that would best fit the requirements, including the type, size and shape of the added particles, the volume fraction of addition and the compatibility with the existing material.

A short list of suitable hard phase powders was compiled and each was tested for its compatibility with the Armatech matrix. The coating microstructure was examined via electron microscopy in order to determine the level of mixing, the degree of binding into the matrix, and any deleterious effects caused by reactions with the added phase.

The effect on factors such as coating integrity, hardness and wear resistance was also measured using techniques available at Sheffield Hallam University. The results from these tests were used to produce a list of four powders that seemed most compatible with the matrix and gave the greatest improvement in wear resistance.

What happened?
Having narrowed the suitable hard phase powders down to four contenders, these were then sintered by Chapmans and assessed by MERI using lab-based abrasive wear testing procedures (which use silica to replicate the abrasive effect of soil) that will shortly form part of a new European standard for wear performance.

These initial feasibility tests have revealed one particular material to show great promise in this application, meeting all the necessary performance criteria.

This project is an excellent example of the whole concept of SPARK grants, which are awarded to companies that have exciting ideas that will help improve their industrial performance.

Thanks to the Spark Award study Chapmans has grounds to carry out further field trials using the successful additive. A PhD program, funded by EPSRC, has also been started on the basis of the results. Ultimately the tests have made possible the launch of a new product into the agricultural market place.

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