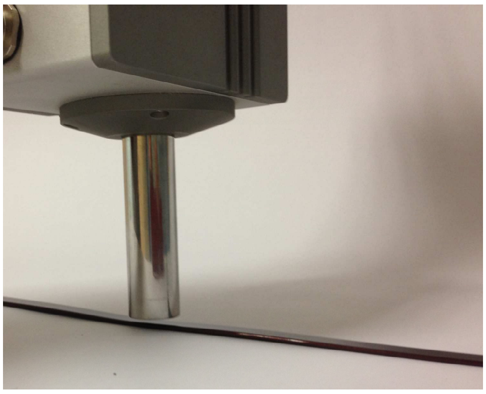
NEWTECH
WIRE INSULATING MACHINES

ON FLAT WIRE



Obviously this problem does not apply to flat wire or large sizes above 3mm, where you can read directly on the conductor and at a very reasonable cost. Needless to say that we did not want to develop a system with the unacceptable limitation of working only with rectangular wire or big sizes.

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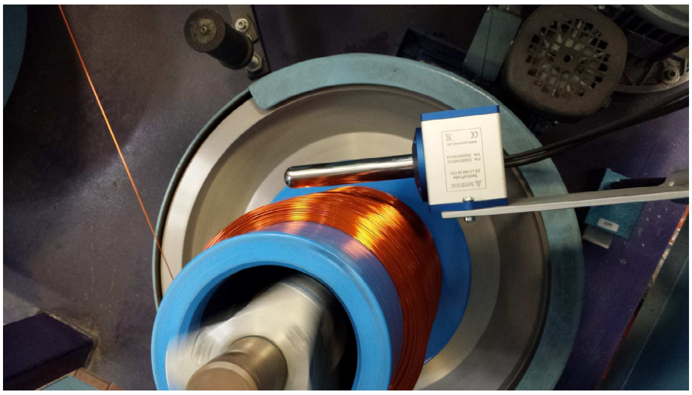
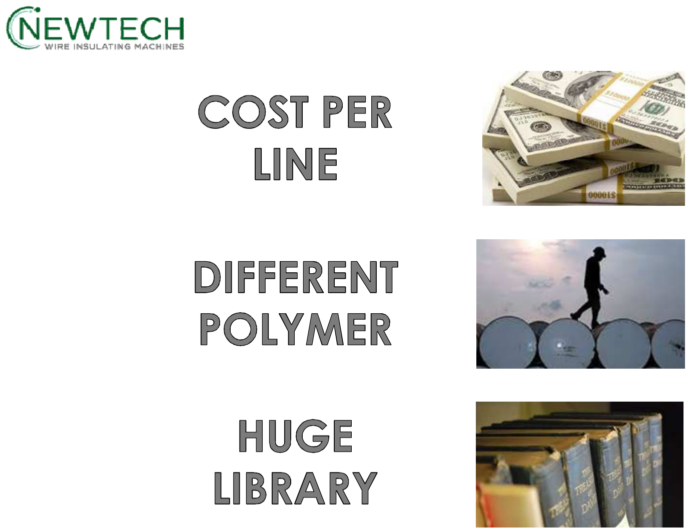
BOBBIN READING



Therefore the only possible solution to read a small surface with reasonable cost is to read it on the bobbin. In this way the surface is by far large enough and the signal very strong.
The first tests on this solution were successful enough to give us confidence in the positive outcome of the project

We presented the project during Dusseldorf Wire Fair in 2012 introducing it to the public and receiving good feedbacks from the magnet wire producers. It confirmed our idea that introducing an in-line quality control system to monitor the wire degree of curingwould fulfill a real market need.



Our presentation was attended by numerous representatives of the magnet wire industry with whom we had detailed discussion on the potential application.
The main concern of the industry representatives were the cost per line and the number of different polymers which could require too large a library to make the model reliable.
Later I will explain how we had overcome these difficulties.

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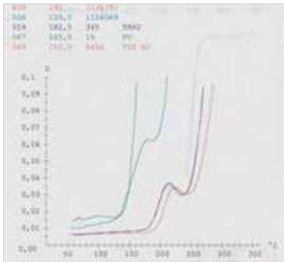
LABORATORY INSTRUMENT
TAN DELTA



As we explained earlier what we actually read with our instrument are the changes in the molecular structure of the polymer as it cures, in other words we read the degree of polymerization.
In order to reach the functionality required it was necessary to develop a model able to transform the data coming from the spectroscopy into quality parameters.
The most common polymerization parameter used in the enamel industry is the tangent delta which is easy to obtain and is familiar for the operators.

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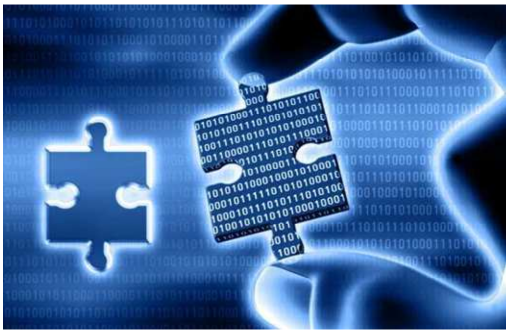
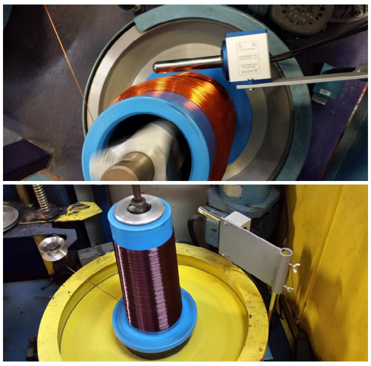
ALGORITHM DEVELOPMENT



Therefore we had to develop, with the help of mathematics, a correlation between what we were actually reading ,the degree of polymerization, and the dang delta which is based on the dissipation factor of a conductor covered with an insulating enamel.
The polymerization model from the chemical theory gave us important hints on how to structure our research but only with a long experience and testing a countless number of samples we could reach our goal.

During this part of our system development the contribution of Elantas Italia was of great importance. Dr. Biondi with patience and great cooperative spirit provided us with most of the relevant wire samples and she was our gracious hostess in Ascolito test our initial prototype on a real enameling plant in order to understand the behavior of the system in an industrial environment and its response to the variation of the production parameters.

TEST PROTOTYPE



The prototype was able to read the bobbin spectra for two subsequent days with limited influence of signal noise and a very good quality of the acquisition. Varying the production speed allowed us to change the tangent delta of the enamel.

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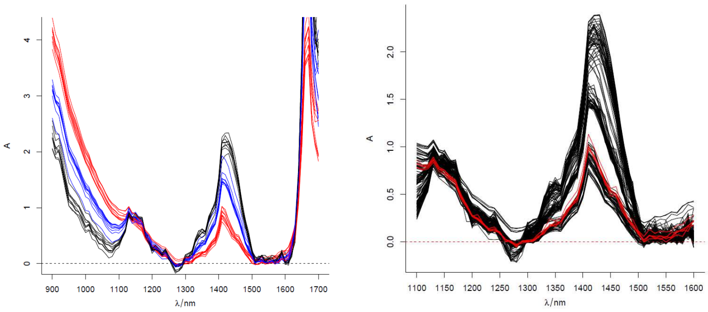
DIFFERENT SPECTRA



It was immediately easy to see that the spectra changes with the degree of polymerization and that the changes are geometrically visible.
Unfortunately this was not enough to create a stable, reliable and repeatable transformation model. Our research faced the most difficult part with the creation of a wide library of spectra of enamels with different tangent delta.

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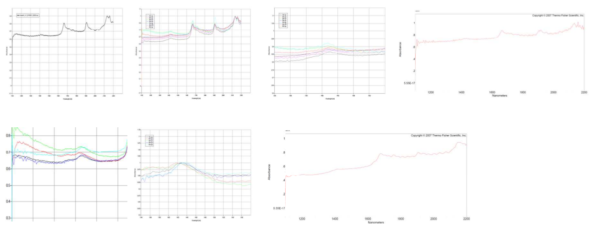
DIFFERENT TEST

661/42A

255/44



We moreover had to do it with all the enamel families in order to build a model able to recognize the polymerization grade of every type of varnish.
These spectra were used to build the most reliable and efficient algorithm which automatically and in real time transforms the spectroscopy data into tangent delta figures.