# Development and validation of an automated NDE approach for testing welded joints in plastic pipes (TestPEP)

Plastic pipes have many advantages over pipes made from metals or concrete, such as good chemical resistance, low weight, low cost, and longer predicted service life, and are already used extensively for the transport of gas, water and chemicals. However, their use in more safety critical applications is limited by the fact that there is currently no validated inspection system available to evaluate the joints. Pipeline leakage does not only cause high repair costs but can also result in disastrous environmental consequences and even in loss of life.

The project team, which involved 17 organizations from seven countries, is currently developing and validating inspection equipment and techniques for both butt fusion (BF) and electrofusion (EF) joints in polyethylene (PE) pipes.

Picture of the AXIS-HS small spot XPS instrument by KRATOS Analytical Ltd. used in the project.
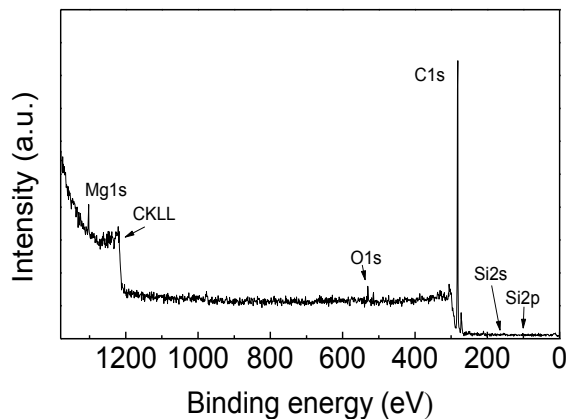
Typical XPS survey spectrum of a typical fractured weld having a low contamination level of talc, obtained by Al radiation.

Consorzio Catania Ricerche through its Laboratorio Superfici ed Interfasi (SperLab) participated to the Project for the characterization of talc and sand contaminated welds by small spot X ray Photoelectron Spectroscopy (XPS). XPS, also known as Electron Spectroscopy for Chemical Analysis (ESCA) is a widely used technique to investigate the chemical composition of surfaces.

XPS has been employed to quantify actual talc and sand contamination level in PE welds, after mechanical rupture. Mechanical test results on welds containing deliberate talc and sand contaminations have been compared with XPS results to develop flaws acceptance criteria. Flaws acceptance criteria concurred to the assembly and assessment of complete prototype system. TestPEP has been completed in April 2013 leading to the development of an automated non-destructive evaluation (NDE) of welded joints in plastics pipes.