The Project is related with the topics of materials engineering, methods of materials properties characterization with the use computer aided calculations and optical strain fields measurements. The main goal of the project is to develop improved, more accurate method for residual stress measurements in comparison to currently available. Residual stresses in material might be generated in the production process as well as during service. Their presence might have both positive or negative influence of materials properties. For example compressive residual stresses in layers might improve fatigue life.

The most popular method of residual stresses measurements is Mathar's method. It is the method from semi destructive group and it base on phenomena of stress relaxation resulted from small hole drilling. Residual stress calculations are made using strain measurements by means of tesometric rosettes (the sets of tensometes of defined geometry) glued around the hole. The method is standardized and there are available commercial systems allowing measurements. However, the method has some drawbacks related with the tesometers usage. Its gluing and soldering electric connections requires some experience from the operator and small non eccentricity of thr hole and rosette may have detrimental influence of measurements accuracy .

In the Project it is planned to replace rosettes usage with the modern optical measurements of displacement fields. 3D Digital Image Correlation (3D DIC) which use images registered by two camera simultaneously before and after an object deformation (in the cease of this project images before and after drilling). The observed surface should have speckle pattern usually obtained by paint spraying. 3D DIC usage will allow to obtain much larger amount of measurements points (hundreds or thousands) in comparison to Mathar's method (readings from 3 or 6 tensometers) which will give an opportunity to use so called inverse method in residual stresses calculations.

For the Project realization purposes it is planned do design and build laboratory testing stand using mini-miller head for precise drilling with the stable fixtures for cameras used for 3D DIC measurements and reliable samples mounting. It is plan to build Finite Element Method (FEM) model and computers algorithms for calculations After design in and building the set-up there are planned preliminary tests aimed for the determination of method accuracy. As the main goal the set-up and calculation algorithms are planned to be employ for residual stress measurements in materials processed by severe plastic deformation (in the way precluding cracks formation). Materials of this group posses better mechanical properties in comparison to conventional counterparts and the expected results of the project will enhance the knowledge database related with them. The proposed method might be also used in different materials where there is a need for accurate measurements of residuals stresses and its distribution.