materials ageing institute



CARBON SEGREGATION PROJECT

During conformity assessment of EPR Flamanville 3 RPV, some impact tests results were below ESPN (French Nuclear Pressure Equipment Regulation) requirements. Analyses showed those values were induced by a positive carbon segregation remaining in the part. This result led to an extensive program of characterization of both positive carbon segregation and mechanical properties to demonstrate the presence of the positive carbon segregation did not induce a fracture toughness which could question the integrity of the bottom and upper head. An analysis of which heavy components installed on the existing fleet could be concerned was performed and revealed that SG primary head forged from a conventional ingot presents also a positive carbon segregation remaining in the part. In this context, EDF and FRAMATOME are undertaking a major experimental project on positive carbon macro segregation in order to improve the knowledge on carbon content distribution in heavy forged components and the associated material properties. Organizations representing utilities, NSSS vendors and other companies in the nuclear industry are interested in this project.











This project, which is a 3-year experimental program, is divided into two work packages. These two Work Packages (WP1) provide the opportunity to study the effect of carbon and quenching rate on representative components (Work package 1 – Steam Generator channel heads) and on synthetic heats (Work Package 2 – Synthetic heats). These experimental programs allow to characterize and obtain chemical, metallurgical and mechanical properties of low steel with high carbon contents.