The paper presents a reliability assessment of a widely used protection system of large power squirrel cage induction motors. In conjunction with published field induction motors Failure data this assessment effort is based on a integrated predictive analysis using three methods: (1) a Fault Tree Analysis (FTA) that allows to identify and then quantify the initiating failure cause weighting factors; (2) an Event Tree Analysis (ETA) that allows to predict the protection system probability outcomes following an external disturbance and (3) a Failure Mode Effect and Criticality Analysis (FMECA) that will help set the stage for developing a preventive maintenance program fit to keep up the induction motor protection system reliability at the required level with particular attention given to aggressive environmental factors such as found in cement plants