In order to reduce the economic costs of pipeline construction projects and for offering a good combination of strength and toughness for efficient transportation of large quantities of hydrocarbon products under high pressure, High Strength Steels (HSS) such as API 5L X70 to X120 are used recently in the construction of pipeline systems for the large oil and gas projects. The commonly utilized models for the reliability evaluation of the HSS pipelines may lead to some conservatism regarding the used data. This paper aims to evaluate the system reliability of HSS pipelines with combined corrosion and cracks defects. Therefore, two failure modes as the plastic collapse and fracture are considered. The effect of different correlations under the term of the strain-hardening exponent that depends on the yield to ultimate tensile strength (*Y/T*) ratio is investigated. The reliability index of HSS pipelines is evaluated separately for each failure mode using the subset simulation technique. Herein, the tensile strength proprieties of the HSS pipelines are taken into consideration, while the applied methodology utilizes novel probabilistic models to predict the burst pressure for the plastic collapse failure mode. The steels toughness is taken as equal to the minimum requirement for both the ductile and the brittle fracture arrest applied in the HSS pipelines. Moreover, the reliability of the system with multiple failure modes is evaluated to show the mutual existence effect of crack and corrosion defects on pipeline safety