

Surge Analysis in a Centrifugal Compressor using Dimensionless Number

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Surge protection for centrifugal compression system by installing anti-surge control valve (ASCV) is basically required, and a design is mostly specified at the early phase of engineering. However, additional recycle valves piping such as hot gas bypass valve (HGBV) or cold gas bypass valve (CGBV) could be required for emergency shutdown (ESD) scenario. The design verification is highly required by performing dynamic simulation study. Due to unavailable design guideline on early phase of engineering, only late verification is provided, and it can cause to system re-design when dynamic simulation results in needs of additional protection. This study presents the compressor surge distribution map by analyzing the sensitivity parameters and establishing a new dimensionless number called “Surge Number” (Ns). The surge distribution map is introduced to classify the area of safe and unsafe regarding surge with numerical threshold values, and it is purposed to use as the preliminary guideline of inherent surge protection requirement to quickly review and alarm engineers for preparing additional protection in the early phase of engineering work.