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Abstract of Paper

Title: DYNAMIC ANALYSIS OF LARGE INTERCOOLERS AND TUBULAR REACTORS INSTALLED IN HIGH PRESSURE LOW DENSITY POLYETHYLENE PLANTS TOGETHER WITH AN HYPERCOMPRESSOR.

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The development of the market of large-scale LDPE plants, driven by economy of scale, requires larger and larger compressors and plants. Such extreme applications, involving ultra-high pressure piping and potentially high pressure pulsations need a very detailed dynamic analysis of the complete plant. Special attention must be paid to the vibration aspects of intercoolers and tubular reactors, which may represent the most critical part of the system because generally mounted on tall steel structures. Due to the long delivery of such components, a proper selection should be done at an early stage, when just a preliminary layout and equipment drawings are available. This implies the assessment of plant pulsation-induced forces and the subsequent definition of layout adjustments and of piping supports locations, type and supporting structures.
Keeping intercooler and reactor structures vibrations and cyclic stress within the allowable limits implies design by means of special purpose proprietary FEM codes, properly interfaced with the acoustical code and able to handle an extremely large number of degrees of freedom in a reasonable CPU time. The study must take into consideration the actual jacketed pipe configuration (i.e. concentric process and cooling medium pipes), to avoid internal vibrations, which are difficult to be monitored and may produce unexpected failures. Therefore sizing and location of the support pins for the internal pipe are among the results of the study. The procurement of the plant components may be released after the preliminary analysis and later, when the plant arrangement has been finalized, the final review should bring just minor adjustments. A proper and timely dynamic design can be made only by close cooperation between the compressor manufacturer, equipment manufacturer, end user, engineering contractor and vibration specialists.