

Finite Element Analysis and Design Modification of Heat Exchanger and Pressure Vessel for Chemical Industry

許峰碩、李春穎

E-mail: 9607535@mail.dyu.edu.tw

ABSTRACT

This report focuses mainly on the analysis of the common pressure container or heat exchanger used in the chemical plant. The formula provided by the design handbook and the design code was employed for finding the required thickness of the container wall for the heat exchanger. The geometrical model prepared by the CAD software SolidWorks was then imported into the CAE software ANSYS for further stress analysis. The internal pressure loading and temperature difference of the heat exchanger under normal operation were imposed on the finite element model. The associated boundary conditions at the supporting stands were also specified accordingly. The simulated results were not only used to validate the design formula but also to find the critical stress concentration sites. Under the condition of keeping the thickness of exchanger wall unchanged, the simulated result can give the distribution of the structural stresses, and thereby the stress concentration sites. Several effects of the local design modification were discussed. Suggestions on the design guideline were concluded and can provide engineers with useful information on the design of pressure vessels and heat exchanger tanks.

Keywords : expander, Young's modulus, tensile strength, yield strength finite element method

Table of Contents

封面內頁 簽名頁 授權書.....	iii	中文摘要.....	iv	英文摘要.....	v
誌謝.....	vi	目錄.....	vii	圖目錄.....	ix
表目錄.....	xiii	符號說明.....	xiv	第一章緒論.....	1
1.1研究動機及目的.....	1	1.2研究方法.....	2	1.3文獻回顧.....	3
1.4本文架構.....	6	第二章 壓力容器法規介紹及分析模型之選定.....	8	2.1壓力容器法規介紹及說明.....	8
2.2熱交換器種類介紹.....	9	2.3 熱交換器之圖面及操作條件確認.....	14	2.4 殼部計算公式求解.....	17
第三章 有限元素法之簡述及元素選定.....	21	3.1 有限元素法之簡述.....	21	3.2 元素之選定及說明.....	23
第四章 熱交換器有限元素分析.....	26	4.1 熱交換器實體模型建構.....	26	4.2 熱交換器網格化製作.....	28
4.3 熱交換器負載及邊界條件設定.....	30	4.4 熱交換器有限元素分析及設計改良.....	32	4.5 熱交換器位移量分析及實例驗證.....	61
第五章 結論及建議.....	70	5.1 結論.....	70	5.2建議.....	71
參考文獻.....	71				73

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