

INTRODUCTION

The reliable operation of the individual elements of a system has taken on extremely great significance as a result of the rapid increase in both the capacity and complexity of the systems which involve vast amounts of capital expenditure. The heat exchanger is one of the components occurring most frequently in a system.

The book focuses on tube heat exchangers which contribute significantly to economic efficiency in the power station circuit. It covers sophisticated heat exchangers subjected to high operating loads from whose design and construction valuable information has been gathered. This information has been condensed here for the technically interested reader.

The first chapter deals with heat exchangers for power stations. It gives basic recommendations on the admissible loads, corrosion and erosion stresses, and on the main component assemblies. The basic process engineering rules and recommendations are also presented. Such information could therefore be valuable not only to young engineers but also to those with practical experience who might find ideas to improve a system through reading it.

The second chapter goes into the details of the fundamental elements which make up a heat exchanger or a pressure vessel. The deformation equations are given and explained so that the basic physical data of a stress analysis can be derived for a heat exchanger or pressure vessel subjected to internal pressure and thermal stress. The combination of the individual force method elements via the compatibility condition in the individual sections is specified to allow simple programming. The purpose of this chapter is to provide more basic information about the elementary components of the pressure vessel and to present the mathematical formulation in a clear manner.

The third chapter concentrates on some specific details relating to the design of a tubesheet. The tubesheet is a typical component of a heat exchanger which requires particular attention due to the geometrical inhomogeneity in the section to be tubed.

The penultimate fourth chapter discusses the dimensioning of the various flange constructions in detail. Even today, a correctly designed flange joint is still unfortunately not a matter of course. The reason for this is the complexity of the joint which is subjected to the interaction of all the elements and also the fact that the design codes are in some cases simplified in a technically inappropriate manner. The gasket represents the additional unknown factor. It can have different sealing properties despite identical geometrical dimensions. The method of production and the material processing during production play a decisive role. Although the reliability of the entire plant during operation and during the start-up and shutdown procedures depends on the tightness of the heat exchanger connection, the problems relating to this connection are only seldom treated systematically and critically. This analysis covers both the flange design and the flange installation because these elements are directly interlinked. A correctly designed flange will leak if not correctly installed and vice versa. Attention is drawn to the fact that the deformation behavior of flanged covers differs fundamentally from the behavior described in the design codes and must therefore be treated separately.

The fifth and final chapter of the book also deals with a problem given little attention in the relevant literature and that is the problem of reliably fastening the tubes in the tubesheets. The authors have carried out very extensive work in this field. The invention of the process to hydraulically expand tubes into tubesheets and its introduction throughout the world are proof of this. The quality of the tube/tubesheet joint frequently determines the operating reliability of expensive and sophisticated process systems. Therefore it should be given due attention. All currently used methods of fastening tubes in tubesheets are set out and the advantages and disadvantages of each discussed.

The book was purposely restricted to those topics which can offer the reader new facts, the latest information gained through practical experience, or new solutions.