To find an approximate expression for $\int I\,dh$

Differentiating Eq (3.1) gives:

$$0.1\phi\frac{dI}{dh}+I=0$$

$$\therefore\quad \frac{d(0.1\phi I)}{dh}-I\frac{d(0.1\phi)}{dh}+I=0$$

$$\therefore\quad \frac{d(0.1\phi I)}{dh}=(0.1\phi'-1)I$$

$$\therefore\quad 0.1\phi I=\int(0.1\phi'-I)I\,dh$$

$$=(0.1\phi'_m-1)\int I\,dh$$

using the first mean value theorem and where ϕ'_m is a value of ϕ' within the range of integration. If some approximate value is assumed for ϕ'_m it follows that:

$$\int I\,dh\simeq 0.1\phi I/(0.1\phi'_m-1) \qquad (5A)$$

BOOK REVIEWS

Convective Boiling and Condensation

J. G. Collier

The first edition of John Collier's book on convective boiling and condensation has been the recognised authoritative text in this area since its publication in 1972. This, the second edition, retains the general format of the original edition, and the changes in the text have not resulted in any significant increase in length; the original 421 pages has expanded to 435 pages.

There are twelve chapters; following an introduction there are two chapters on two-phase flow, six chapters on boiling, a chapter on condensation, and finally two chapters on aspects common to both boiling and condensation. The greater part of the introductory chapter concerns the flow patterns that occur in two-phase pipe flow. The following two chapters on two-phase flow are primarily concerned with the prediction of pressure drop in pipes and pipe fittings. Most established methods are presented; the new edition covers some of the more important developments since 1972.

Almost half of the book (6 or 12 chapters) concerns boiling. It is on this topic that I believe this text is without equal, both in relation to the technical coverage and the text's 'readability'. The first of these chapters, An Introduction to Convective Boiling, covers basic aspects of the boiling process; bubble growth, nucleation sites, bubble dynamics, pool boiling, heat transfer regimes, boiling maps and so forth.

The next chapter, 'Subcooled Boiling Heat Transfer', has changed little since the first edition; the latest reference is 1968. Similarly the following chapter, 'Void Fraction and Pressure Drop in Subcooled Boiling', has only been modestly amended, although the next chapter, 'Saturated Boiling Heat Transfer', has been more significantly updated.

There are two chapters on critical heat flux; the first of these concerns vertical uniformly heated tubes (the simplest case) and the second, more complex geometries. The latter chapter has been considerably updated.

The chapter on condensation covers most aspects of this topic of interest to the well informed condenser designer, starting from droplet nucleation, through accommodation coefficients, Nusselt's laminar film theories and so forth to dropwise condensation. The section on 'Pressure Drop in Condenser Tube Banks' seemed too superficial, but I write with a specialist interest in that area.

The final two chapters are concerned with conditions influencing the performance of boiling and condensing systems, and multicomponent boiling and condensation. This latter chapter replaces the previous final chapter, 'Two-component Two-phase Heat Transfer'. The new chapter will be of more industrial interest.

Each chapter concludes with a number of problems (the solutions are available from the author) and eight of the chapters have a numerical example. SI units are used throughout. The general presentation of the text is first class, with bold type and clearly presented tables and figures.

The text, the Preface states, is intended for the design engineer in the power plant and process industries. It will also be of interest and use to university staff and research workers concerned with processes involving change of phase. It is recommended.

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