Control of Air Pollution Sources, J. M. Marchello, Marcel Dekker, Inc., New York, 1976. 630 pages. $54.50.

The book has extensive breadth covering topics from air quality regulations and management to reviews of air pollution control systems which are installed. The book would be acceptable to a wide audience, both technical and non-technical as an introduction to the broad subject of air pollution and air pollution control. Approximately one-half of the book is devoted to air quality regulations, air quality management and reviews of current problems and control techniques in the transportation, power generation, manufacturing, metals processing, chemicals, petroleum and food industries. This material is well suited for non-technical people. It is also material which is dated since changes are inevitable.

The material on control of air pollution sources covers most methods for particulate and gaseous control. It will be most easily comprehended by engineers or engineering students who have been exposed to fluid mechanics, thermodynamics, heat transfer and separation processes. In general the material is directed more toward an introduction to the techniques, fundamentals and applications of air pollution control equipment and processes. The serious practitioner of air pollution control would in general find the treatment inadequate to effect the design of a control system. References to more comprehensive material are, however, identified.

Development of the various topics initiates at different levels of complexity. Because of the wide number of physical and chemical processes involved in air pollution control, there has to be a compromise between depth of coverage and total pages in the book. There are a few pages where additional editing is needed. For example a portion of an example problem solution is found on page 84 in another section (Section D). It should be on the previous page. Some material that should be in Section D is located ahead of the section on the previous page.

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ERRATUM

In "Regimes of Fluidization for Large Particles" by N. M. Catipovic, G. N. Jovanovic and T. J. Fitzgerald [*AIChE J.*, **24**, 543 (1978)], Equation (5) should read:

$$u_{mf} = \frac{\mu}{d_p \rho_g} \left\{ \left[(33.7)^2 + 0.0408 \frac{d_p^3 \rho_g (\rho_s - \rho_g) g}{\mu^2} \right]^{1/2} - 33.7 \right\} \quad (5)$$

LETTERS TO THE EDITOR

To the editor:

On the Solution of a Mathematical Model Describing Hyperfiltration, Field Flow Fractionation and Crystallization Systems

In an article which appeared in this journal some time ago, Nakano et al. (1967) considered nonlinear one dimensional hyperfiltration in a batch cell. For the special case of a perfectly rejecting membrane ($B = 0$) in their notation, the dimensionless concentration distribution $C(\tau,X)$ satisfies the following linear differential equation.

$$\frac{\partial C}{\partial \tau} = \frac{\partial C}{\partial X} + \frac{\partial^2 C}{\partial X^2} \quad (15)$$

The initial and boundary conditions on $C(\tau,X)$ are

$$C(0,X) = 0 \quad (16)$$

$$C(\tau,0) + 1 + \left(\frac{\partial C}{\partial X} \right)_{X=0} = 0 \quad (17)$$

$$C(\tau,\infty) = 0 \quad (8)$$

Here, τ refers to dimensionless time and X to dimensionless distance from the membrane; the nomenclature as well as the equation numbers are from the article by Nakano et al. (1967). Equation (52) of Nakano et al. (1967) which they indicate as having been derived by Dresner (1964) is exact only for $X = 0$ and it should be written

$$C(\tau,0) = 1 + \tau - (1 + \tau/2) \operatorname{erfc}(\sqrt{\tau}/2) + \sqrt{\tau/\pi}\, e^{-\tau/4} \quad (52)$$

Furthermore this equation can be derived from Smith et al. (1955), which was published nine years before Dresner (1964). Fortunately, Nakano et al. used their equation (52) only at $X = 0$ and showed that it was in excellent agreement with their series solution of the more general nonlinear problem.

Since the local concentration distribution for the linear problem may be of some interest, and since the same equations (15) to (17) and (8) describe colloid concentrations in Field Flow Fractionation during the early stages of relaxation in the stop-flow experiments of Yang et al. (1977), it is worthwhile to report the complete exact solution of these equations here. Interestingly the same partial differential equation and initial and boundary conditions describe the concentration distribution in a crystal growth application (Smith et al. (1955), Wilcox (1964)). In this application the equations describe the local concentration in the solid phase during single phase solidification from the melt. From Smith et al. (1955) by setting their parameter k equal to zero or from Wilcox (1964), $C(\tau,X)$ may be obtained as

$$C(\tau,X) = \frac{1}{2}(1 - X + \tau)e^{-X} \operatorname{erfc}\left(\frac{X-\tau}{2\sqrt{\tau}}\right) - \frac{1}{2}\operatorname{erfc}\left(\frac{X+\tau}{2\sqrt{\tau}}\right) + \sqrt{\frac{\tau}{\pi}}\, e^{-\left(\frac{X+\tau}{2\sqrt{\tau}}\right)^2} \quad (1)$$

Equation (1) in this work satisfies equations (15) to (17) and (8) of Nakano et al. (1967) and reduces to the proper expression for the wall concentration reported by them and by Raridon et al. (1966), and by Gill et al. (1971). Equation (1) can be used to test the local behavior of the series methods reported by Nakano et al. (1967) and by Dang and Gill (1970) for nonlinear problems.

ACKNOWLEDGMENT

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Clarkson College of Technology

Reply:

The solution given by Dressner [i.e. Equation (52), Nakano et. al. (1967)] is an asymptotic solution to Equation (15) for $X = 0$. Thus it provides a correct expression for the surface concentration which, for practical purposes, is all one needs to know in a hyperfiltration cell problem. This limitation was stated clearly in Dressner's work (1964). It is therefore incorrect for the author to state "Fortunately, Nakano et. al. used their equation (52) only at $X = 0$ . . .", since we were fully aware of the limitation of the Dressner solution and fortuity did not play a part in our using the expression.

The author's contribution is to point out the existence for an analytical solution to a diffusion problem (given by Equations (16), (17), (18) and (8) which incidentally is not the problem considered by Nakano et. al.

Chi Tien
Department of Chemical Engineering and Materials Science
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To the Editor:

Concerning a previous Journal article, Catipovic, N. M., et al., "Regimes of Fluidization for Large Articles," [*AIChE J.*, 24, 543 (1978)], Equation number (5) is given incorrectly. It appears as follows:

$$Umf = \frac{\mu}{dp\rho g}\left[(33.7)^2 + 0.0408\,\frac{dp^3\rho g(\rho s - \rho g)g}{\mu^2}\right] - 33.7$$

The article from which it was taken, Wen, C. Y., and Y. H. Yu, "A Generalized Method of Predicting the Minimum Fluidization Velocity," [*AIChE J.*, 12, 610 (1966)], gives the equation as follows:

$$(N_{Re})mf = \sqrt{(33.7)^2 + 0.0408\,N_{GA}} - 33.7$$

where

$$(N_{Re})mf = \frac{dp\rho gUmf}{\mu}$$

$$N_{GA} = \frac{dp^3\rho g(\rho s - \rho g)g}{\mu^2}$$

or

$$Umf = \frac{\mu}{dp\rho g}\left[\sqrt{(33.7)^2 + 0.0408\,\frac{dp^3\rho g(\rho s - \rho g)g}{\mu^2}} - 33.7\right]$$

This latter equation is based on two correlations developed by Wen and Yu for particle sphericity and bed void fraction. These correlations are then applied to the standard Ergun equation for minimum fluidization.

Sincerely yours,

David E. Clough
Assistant Professor
Sheila R. Payne
Graduate Student
Department of Chemical Engineering
University of Colorado

Reply:

The remark by Clough and Payne regarding our article "Regimes of Fluidization for Large Particles" [*AIChE J.*, 24, 543 (1978)] is correct. Equation (5) was printed incorrectly due to a typing error. However, the proper form of the equation by Wen and Yu was used throughout the paper, which can be checked easily on the small graph on Figure 4, showing u_{mf} as function of d_p.

Note has been made of this in "Erratum."

N. M. Catipovic
T. J. Fitzgerald
G. N. Jovanovic
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Oregon State University

To the Editor:

Reference is made to the paper "Flow of Slurries in Pipelines" by Turian and Yuan [*AIChE J.*, 23, 232 (1977)]. It has been found that Figures 8 and 9, which are intended to illustrate the flow regimes for slurry flow for the particular cases of 1 and 2 inch pipelines, are incorrect. The correct flow regime diagrams for the systems in question are shifted downwards as shown in Figure 1 of this note. It should be emphasized

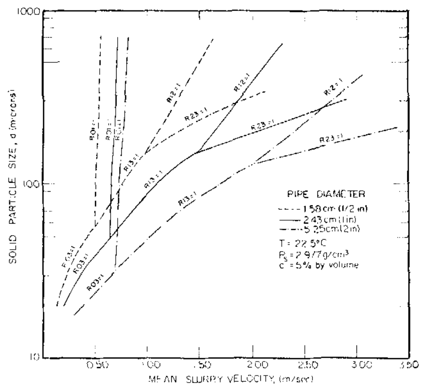

Fig. 1

that Figures 8 and 9 were merely used for illustrative purposes, and the fact that they are incorrect does not affect the main results in the paper nor does it invalidate them. In addition, it is possible to generalize these flow regime plots by replacing the d-v curves using dimensionless plots of $N_{Re}{}^2 C_D$ vs. $N_{Re_w}{}^2$ (Figure 2), since it can be

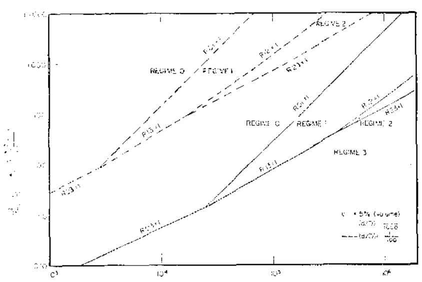

Fig. 2

shown that the regime numbers R_{mn} are functions of the dimensionless groups $[C, d/D, N_{Re_w}, N_{Re_w}{}^2 C_D]$. This follows from the fact that the dimensionless groups $[v^2/Dg(s-1)]$ is equal to $(4/3)(d/p)^3 N_{Re_w}{}^2 (N_{Re}{}^2 C_D)^{-1}$.

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