(*Continued from page 143*)

For case 2

q = 78,000 B.t.u./hr.

Another quantity of interest is the thermal gradient in the earth at the center of the basin and $Z = 0$. This quantity may be estimated from the formula

$$\text{Gradient} = [T(r = 0, Z = 0) - T(r = 0, Z = R/5)][\tau_b - \tau_1]5/R$$

For case 1

Gradient = 0.485°F./ft.

For case 2

Gradient = 0.473°F./ft.

The gradient values are significant in that if one had, for example, an asphalt that would not stand more than 220°F., one would need 21.2 ft. of earth in case 2 to insulate the boiling solution from the asphalt seal, and this figure is obviously prohibitive. The answer is not significantly different for case 1. In this regard, it should be stated that case 2 is the more realistic of the two because of the k value involved.

The values of T for the 625 grid points were considered too voluminous to be included in this paper.

CONCLUSIONS

The conclusions reached were that the steady state heat losses from the bottom of the basin would be negligible compared with the rate of radio heat generation. However, the temperature gradient at the bottom center of the pool is such that the pool would have practically to be filled with insulating material in order to ensure a low enough temperature in the bottom seal so as not to soften it and cause leakage.

The basin project was discontinued before data could be obtained. No comparable work seems to have been reported to date.

BOOKS

Unit Operations of Chemical Engineering. Warren L. McCabe and Julian C. Smith. McGraw-Hill Book Company, Inc., New York (1956). 945 pages. $10.50.

This book covers the same topics as the well-known earlier work "Elements of Chemical Engineering" by W. L. Badger and W. L. McCabe, the most recent edition of which was published in 1936. Newer unit operations, such as adsorption, ion exchange, and dialysis, are not included. However, the text of all sections has been completely rewritten to incorporate the added understanding of unit operations developed in the past twenty years. Old subject matter has been eliminated or rearranged to be consistent with new material.

The level of treatment is designed for undergraduate students, but the discussion has been carried to the point where students will find an easy transition to more advanced chemical engineering texts. In addition, new approaches have been incorporated; for example, the boundary-layer concept is introduced early in the fluid mechanics study, the theory of diffusion is based on the relative-velocity method, and the discussion of the separate mass transfer operations is preceded by a study of principles common to all.

In order to provide material for a three-semester sequence for unit operations and include the developments of recent years, while at the same time maintaining an adequate treatment of theory and equipment, the authors increased the length of the book from 660 to 945 pages. This increase was due primarily to the substantial expansion of the sections on fluid mechanics and flow of heat and the general approach to mass transfer, but was also due to the enlarged coverage of the distillation, mixing, and extraction sections.

To students, teachers, and practicing engineers alike, this book should be a welcome text, especially for those accustomed to the 1936 book. Although some of the solved problems and diagrams from the previous text have been included in modified form, most are replaced by new illustrations. All the unsolved problems are new. Mass transfer coefficients have been standardized to the Drew-Colburn coefficient. As before, a discussion of pertinent equipment aug-

ments each topic covered. However, in keeping with the trend of approaching chemical engineering as a science, this book generally places more emphasis on the theoretical aspect than did its predecessor.

JOHN A. TALLMADGE

High Pressure Technology. E. W. Comings. McGraw-Hill Book Company, Inc., New York (1956). 572 pages. $11.50.

An excellent collection of the reliable information available on high pressure, this volume is a comprehensive reference on the field, as it contains both theoretical aspects and practical know-how. Mr. Comings is quick to point out that much of the present-day information concerning high pressure has been the result of experience, that is, art or craft in contrast with science. A good reference list is available for the reader who is looking for background material and more complete current information on the variety of individual subjects treated.

Chapter two, "Chemical Processes," by N. R. Shreve, and Chapter three, "Metals," by H. C. Van Ness, deal with some of the practical applications as well as the limitations that exist in the use of high pressure. Shreve, of course, points out many of the present commercial processes that employ high pressure, and Van Ness notes some of the limitations of high-pressure application due to the deleterious effects on metals. Chapters entitled "Safety," "Equipment," and "Experimental Techniques" also deal with the purely practical aspects and are useful to the researcher in the field.

The remainder of the book deals primarily with the mathematical and theoretical treatment. Excellent chapters covering such topics as pressure cylinders, thermodynamics of liquids and gases, chemical equilibria, unit operations, and reactor design as specifically related to high pressure are presented. Realizing the inherent limitations on the theoretical treatment, not only of complex systems but also of systems under the extreme conditions imposed by high pressures, the author includes much information on empirical and generalized relations.

What at first may appear to the reader as broad, unrelated subject matter is tied together in the final chapter by a thorough study of ammonia synthesis, which serves as the classic example of the successful application of high pressure in modern industry. This chapter not only relates the subject matter from the previous chapters, but it also serves to reemphasize Mr. Comings's original premise, that high-pressure application is a combination of art and science.

The book also contains several appendixes, including such items as pVT data, constants for various equations, glossary of terms used in high pressure, and a section on units and dimensions.

Because of the broad scope of the subject matter, many important points are not given complete, detailed treatment. The reader is therefore expected to have a fair understanding of chemical engineering principles.

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