

# ***Calculator Programs For Chemical Engineers***

## ***Volume II***



***Edited by the Staff of Chemical Engineering***

# **Calculator Programs for Chemical Engineers**

## **Volume II**

Edited by  
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Program Translations by  
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# Preface

*Chemical Engineering* is proud to present this second volume of calculator programs for chemical engineers. As in the first volume, all of the programs in this book can be run on the Texas Instruments TI-59 and the Hewlett-Packard HP-67 and HP-97, and quite a few can be handled by the Texas Instruments TI-58. (As well, all the Hewlett-Packard programs can be run on the HP-41C machines.)

The programs included in the two volumes of *Calculator Programs for Chemical Engineers* have all been published in *Chemical Engineering*—but are offered here, and in the first volume, not only in the original calculator language as listed in the magazine article, but with a translation, so that both HP and TI versions are available.

The purpose of the two-book series is to present a library of programmable calculator programs specifically designed to solve chemical engineering problems. Most of the programs offered are design oriented—such as those for sizing control valves, rating heat exchangers, and designing multistage evaporators—while others are included for use in solving such everyday operation tasks as determining flame temperature or optimizing reactor agitation.

The thirty-four programs contained herein run the gamut of useful applications of chemical engineering principles, from engineering mathematics, physical-properties correlations, and engineering economics to fluid flow, and heat and mass transfer. And an introductory article presents a listing of published calculator programs (from all sources, not just from *Chemical Engineering*) of interest to chemical engineers.

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# **Section I**

## **Introduction**

Published calculator programs for chemical engineers





# Published calculator programs for chemical engineers

Here is a bibliography of programmable-calculator programs of interest to ChEs, that are available in the literature.

And, many of the Chemical Engineering programs that are listed here have been translated, so that both HP and TI versions are now available. These program listings appear in either this book or the first volume of *Calculator Programs for Chemical Engineers*. The footnotes following the "Calculator" listing below indicate this information.

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*John R. Garrett, Cost Associates International\**

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□ Programs for hand-held programmable calculators are an extremely valuable asset to an engineer who needs to produce a result or solution in a short period of time, or who has to solve the same basic problem many times.

However, the time required to develop and debug any program always requires more time than is needed for a manual solution, because results of any new program must be verified by checking against a manually derived result.

Engineers are already aware of the increased productivity that is made possible by the calculator; many subscribe to a users' library of programs, sponsored by a hardware vendor or a programming club. The following bibliographic listing does not replace these libraries, but is intended to serve as an additional source to help the engineer determine if someone has already produced a program that could be useful to him or her.

The following listing is divided into two main categories—one for advanced calculators such as the HP-67/97 and the TI-58/59, and the second for calculators having less capability or flexibility. Within these two main categories, I have attempted to classify programs according to general areas of interest. This is very diffi-

\*At the time of writing this article, the author was a Senior Cost Engineer for Diamond Shamrock Corp.

cult to do in many cases, and the reader must be aware that some programs are applicable in more than one category.

In the listing, the title of the article is given first, and the author second (reversing the usual bibliographic-citation form). In some cases, the title has been expanded to include program subject matter, as a further guide to the user. The citation also lists the particular programmable calculator to which the program listing is applicable.

The engineer who is doing a literature search will find many titles that sound as though they contain program listings, but which actually contain an abstract or a computational method. Consequently, all of the following listings have been personally verified by me as containing actual calculator programs (except for a small number labeled "narrative").

I hope that by using this list, other engineers and technical personnel can eliminate a great deal of research time, and increase their personal knowledge and individual productivity.

As an aside, in addition to the principal use of this list, many main-frame and minicomputer programmers could easily translate the program algorithms into sub-routines for a larger software package.

## Programs for principal engineering calculators

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### Petroleum refining

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Title	Author	Calculator	Reference
Solving Engineering Problems on Programmable Pocket Calculators: Stripping and Flashing. 1. Binary Distillation 2. Multicomponent Flash	Robert F. Benenati	HP-67/97 <sup>c</sup>	<i>Chem. Eng.</i> , Vol. 84, Mar. 14, 1977, pp. 129-132. (See Piping for Part 1)
Streamline Flash Computations with a Calculator Program	Sohrab Mansouri	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Aug. 27, 1979, pp. 99-101
Flash Vaporization Computations for Plant Operations Eased	R. Franklin Parker and I. Harvey Oliver	HP-67/97	<i>Oil &amp; Gas J.</i> , Vol. 77, Dec. 17, 1979, pp. 76-79
How Steam Alters V-L of Crude	T. A. Abdel-Halim	TI-58/59	<i>Hydrocarbon Process.</i> , Vol. 59, Jan. 1980, pp. 115-119
Hand Calculator Program Speeds Flash Calculations	I. Harvey Oliver	HP-67/97/ 41C	<i>Oil Gas J.</i> , Vol. 78, Mar. 31, 1980, pp. 130-132

Originally published March 7, 1983.

## Petroleum refining (continued)

Title	Author	Calculator	Reference
Speed of Hand-calculator Programs can be Improved	Stephen T. Kostecke	HP-67/97	<i>Oil Gas J.</i> , Vol. 78, Aug. 11, 1980, pp. 107-110
Shortcut Distillation Program Aids Design	Henry Y. Mak	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Oct. 20, 1980, pp. 138-141
Shortcut Program for Multicomponent Distillation	Mark Kesler	TI-58/59 <sup>b</sup>	<i>Chem. Eng.</i> , Vol. 88, May 4, 1981, pp. 85-88
Calculator Eases Flash Calculations	Chandra P. Verma	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Apr. 27, 1981, pp. 148-150
Rapid Calculator Solutions: ASTM/TBP; Other Probability Plot Problems	Torn D. Denchfield	HP-67/97	<i>Oil Gas J.</i> , Vol. 79, Apr. 27, 1981, pp. 179-184
Crude Dehydration/Desalting Calculations	Van B. Tran	HP-41C	<i>Oil Gas J.</i> , Mar. 15, 1982, pp. 76-79
Calculator Program Finds Petroleum Fraction Viscosities Over Wide Temperature Range	Gidion M. Barnea	HP-67/97	<i>Oil Gas J.</i> , Vol. 80, May 10, 1982, pp. 148-150

## Pipeline design and use

Programmable Calculator Speeds Pipeline Span Computations	A. Marks	HP-67/97	<i>Oil Gas J.</i> , Vol. 76, Jan. 9, 1978, pp. 106-107
Hand-held Calculator Programs for Frequently Used Formulas Part 1: Williams-Hazen Pressure Drop	W. J. Turner	HP-67/97	<i>Pet. Eng. Int.</i> , Vol. 51, May 1979, pp. 84-90
Programmable Calculators Speed Gas-line Calculations	R. F. Parker	HP-67/97	<i>Oil Gas J.</i> , Vol. 77, May 7, 1979, pp. 67-72
Estimating Products Line Commingling	A. Marks	HP-67/97	<i>Oil Gas J.</i> , Vol. 77, Nov. 19, 1979, pp. 109-110
Pipeline Liquid Flow Problems Solved by Calculator	R. R. Burnett	HP-67/97	<i>Oil Gas J.</i> , Vol. 77, Nov. 19, 1979, pp. 134-152
Equation Programmed to Prompt: Weymouth	Dennis Cook	TI-58/59	<i>Oil Gas J.</i> , Vol. 77, Dec. 10, 1979, pp. 103-108
Equations Speed Permafrost-area Line Analysis	G. G. King	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Dec. 15, 1980, pp. 80-84
Program Solves Line Flow Equation	Kurt P. McCaslin	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Jan. 19, 1981, pp. 83-84
Equation Predicts Buried Pipeline Temperatures	Graeme G. King	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Mar. 16, 1981, pp. 65-72
Programs Speed Line Hydraulics	Lawrence K. Thummel	HP-41C	<i>Oil Gas J.</i> , Vol. 79, Apr. 20, 1981, pp. 76-85
Calculator Can Ease Pipeline Surge Analysis—Part 1	Mike Hein	Narrative, see next item	<i>Oil Gas J.</i> , Vol. 79, Aug. 10, 1981, pp. 100-106
Analyzing Line Surge with Hand-held Calculator—Part 2	Mike Hein	HP-41C	<i>Oil Gas J.</i> , Vol. 79, Aug. 17, 1981, pp. 128-134
Gas Pipeline Program Computes Five Variables	Steven R. Moore and Robert D. Huff	TI-58/59	<i>Oil Gas J.</i> , Vol. 80, Mar. 8, 1982, pp. 195-198
Programmable Calculator Uses Equation to Figure Steady-state Gas-Pipeline Flow	E. Holmberg	TI-58/59	<i>Oil Gas J.</i> , Vol. 80, Apr. 26, 1982, pp. 126-128

## Insulation

Calculator Program Analyzes Insulated Pipe	S. L. Barritt	HP-67/97	<i>Heat./Piping/Air Cond.</i> , Vol. 50, Mar. 1978, pp. 65-70
Program Calculates Heat Transfer through Composite Walls	Calvin R. Brunner	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, June 16, 1980, pp. 119-122
Calculating Heat Loss or Gain by an Insulated Pipe	Frank S. Schroder	HP-67/97 <sup>b</sup>	<i>Chem. Eng.</i> , Vol. 89, Jan. 25, 1982, pp. 111-114
Heat Loss Through Insulated Steam Lines	J. G. Kloepfer and S. Dykstra	TI-58/59	<i>Oil Gas J.</i> , Vol. 80, Feb. 22, 1982, pp. 146-154

## Pumps

New Program Speeds Up Selection of Pumping Unit	Mark Seaman	TI-58/59	<i>Oil Gas J.</i> , Vol. 77, Nov. 12, 1979, pp. 226-229 (see next item)
New Program . . . Unit—A Correction	Mark Seaman	TI-58/59	<i>Oil Gas J.</i> , Vol. 77, Dec. 10, 1979, pp. 102
Rapid Calculation of Centrifugal-pump Hydraulics	W. Wayne Blackwell	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Jan. 28, 1980, pp. 111-115
Calculator Program Computes Centrifugal Pump Efficiency	A. Marks	HP-67/97	<i>Oil Gas J.</i> , Vol. 78, Dec. 22, 1980, pp. 62-64
Gas Calculations Aid Submersible Pump Selections	John Beavers, others	TI-58/59	<i>Pet. Eng. Int.</i> , Vol. 53, July 1981, pp. 69-85

## Sanitation, environment, and safety/health

Sizing Force Mains for Economy	Louis Dancs	TI-58/59 & HP-67/97	<i>Water Sewage Works</i> , Vol. 124, Mar. 1977, pp. 84-86
Hydraulic Computations for Small Programmable Calculators	Thomas E. Croley II	TI-58/59 & HP-67/97	<i>Water Sewage Works</i> , Vol. 124, Nov. 1977, pp. 64-71
Computer Program for Open Channel Flow Calculation	Ralph Finch	TI-58/59	<i>Water Sewage Works Ref. Issue</i> , Vol. 125 Ref., 1978, pp. R:22-30

## Sanitation, environment, and safety/health (continued)

Title	Author	Calculator	Reference
Predicting Sulfide in Force Mains	Karl E. Kienow and Kenneth K. Kienow	HP-67/97	<i>Water Sewage Works</i> , Vol. 125, Dec. 1978, pp. 48-49
Relative Humidity from Psychrometric Data	Åke Sison Stenius	HP-67/97	<i>Tappi</i> , Vol. 62, Apr. 1979, pp. 87-88
Programmed Approach to Water Mass Analysis	George R. Spencer, Jr.	TI-58/59	<i>Pollut. Eng.</i> , Vol. 13, Feb. 1981, pp. 30-33
The Hand-held Programmable Calculator and the Occupational Safety and Health Practitioner: 1. TLV for Mixtures—Additive Effects. 2. TLV for Mixtures—Additive Effects: Liquid Source. 3. Time Weighted Average Exposure. 4. Time Weighted Average Exposure with Excursion Test. 5. Duct Sizing Calculations. 6. Computing Noise Dosage. 7. Converting Octave Band Sound Levels to A, B, or C Weighted Sound Pressure Levels. 8. Combining and Subtracting Sound Pressure Levels. 9. Cumulative Summing. 10. P Chart Computation. 11. C Chart Computation. 12. Pareto Analysis. 13. Work Injury Experience. 14. Concentration of an Air Contaminant from Sampling or Laboratory Data.	Leo Greenberg	TI-58/59	<i>Am. Ind. Hyg. Assoc. J.</i> , Vol. 42, Mar. 1981, pp. 165-177
Oxygen Transfer Parameter Estimation: 1. Complex Method. 2. Linearization Method	M. K. Stenstrom, others	TI-58/59	<i>ASCE, J. of Environ. Eng. Div.</i> , Vol. 107 (2), Apr. 1981, pp. 379-397
Psychrometric Analysis with a Programmable Calculator	Bernard N. DeWitt	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 53, May 1981, pp. 59-62
Solve Psychrometric Problems with a Programmable Calculator	Theodore Atwood	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 53, Dec. 1981, pp. 77-80
Industrial Wastewater Treatment Plant Model	Kenneth A. Chacey and William S. McAvoy	HP-41C	<i>Pollut. Eng.</i> , Vol. 14, June, 1982, pp. 25-28

## Piping

Solving Engineering Problems on Programmable Pocket Calculators	Robert F. Benenati	HP-67/97 <sup>c</sup>	<i>Chem. Eng.</i> , Vol. 84, Feb. 28, 1977, pp. 201-206 (see Refining for Part 2)
Versatile Calculator Program Eases Piping Design	Larry L. Simpson	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Jan. 29, 1979, pp. 105-109 (see next item)
Versatile Calculator Program Eases Piping Design—Comment/Reply	Earle C. Smith	Narrative	<i>Chem. Eng.</i> , Vol. 86, Sept. 10, 1979, p. 5
Design Weld-neck Flanges Fast	John Stippick	TI-58/59	<i>Hydrocarbon Process.</i> , Vol. 59, May 1979, pp. 201-204
Steam Flow in Steel Pipes	T. S. Bryan and N. T. McLaury	HP-67/97	<i>Tappi</i> , Vol. 62, June 1979, pp. 91-92
Finding Economic Pipe Diameters Using Programmable Calculators	Neil Nebeker	TI-58/59	<i>Plant Eng.</i> , Vol. 33, June 14, 1979, pp. 150-153
Calculator Program Slashes Piping Analysis Time	M. Hassouneh and H. Bhaumik	HP-67/97	<i>Oil Gas J.</i> , Vol. 77, Oct. 29, 1979, pp. 167-172
Pressure Loss Through Valves	Kishan Bagadia	HP-67/97 and TI-58/59	<i>Plant Eng.</i> , Vol. 33, Oct. 31, 1979, p. 81
Friction Head Loss in Pipe	Kishan Bagadia	HP-67/97 and TI-58/59	<i>Plant Eng.</i> , Vol. 33, Oct. 31, 1979, p. 82
Analyze Fire Water Network by Calculator	H. Bhaumik	HP-67/97	<i>Oil Gas J.</i> , Vol. 77, Dec. 31, 1979, pp. 182-189
Versatile Program for Pressure-drop Calculations	James M. Meyer	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Mar. 10, 1980, pp. 139-142
Program Finds Pressure Drop Through Pipe and Fittings	Barry L. Roth	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Mar. 24, 1980, pp. 168-170
Calculator Solves Pipe Flow Problems	Chandra P. Verma	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, July 28, 1980, pp. 183-184
Pipe Friction Head Loss	Robert Bursey	TI-58/59	<i>Tappi</i> , Vol. 63, Nov. 1980, pp. 159-160
Program Calculates Two-phase Pressure Drop	W. Wayne Blackwell	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Nov. 24, 1980, pp. 116-124
Calculation of Drop Leg Performance	S. J. Dougherty	HP-67/97 <sup>a</sup>	<i>Tappi</i> , Vol. 63, Dec. 1980, pp. 115-116
Equations Speed Permafrost-area Line Analysis	G. G. King	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Dec. 15, 1980, pp. 80-84
Program Solves Line Flow Equation	Kurt P. McCaslin	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Jan. 19, 1981, pp. 83-84
Piping Flexibility Analysis with a Programmable Calculator	Alfred D'Ambra	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 53, May 1981, pp. 68-75
Program Sizes Pipe and Flare Manifolds for Compressible Flow	Paul Kandell	TI-58/59 <sup>b</sup>	<i>Chem. Eng.</i> , Vol. 88, June 29, 1981, pp. 89-93
Solve Fluid Flow Problems with a Programmable Calculator	Theodore Atwood	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 53, Sept. 1981, pp. 159-165
Calculating Two-phase Pressure Drop	W. Wayne Blackwell	TI-58/59 <sup>b</sup>	<i>Chem. Eng.</i> , Vol. 88, Sept. 7, 1981, pp. 121-125
Pipe Branch Reinforcement Calculations	Alfred D'Ambra	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 54, Feb. 1982, pp. 87-90

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Title	Author	Calculator	Reference
Program Predicts Pressure Drop for Steam Flow	Calvin R. Brunner	TI-58/59 <sup>b</sup>	<i>Chem. Eng.</i> , Vol. 89, Feb. 22, 1982, pp. 97-99
Sizing Condensate-return Lines	W. Wayne Blackwell	TI-58/59	<i>Chem. Eng.</i> , Vol. 89, July 12, 1982, pp. 105-108

## Energy

Estimating Nuclear Fuel Cycle Cost Using a Hand-held Programmable Calculator	O. Wesley Taylor	TI-58/59	<i>Power Eng.</i> , Vol. 84, Feb. 1980, pp. 58-61
Using a Programmable Calculator for Energy Analysis	Gregory A. Specht	TI-58/59	<i>Plant. Eng.</i> , Vol. 34, Nov. 13, 1980, pp. 139-143
Estimate Solar Collector Size with a Programmable Calculator	M. D. Syed, others	TI-58/59	<i>Heat./Piping/Air Cond.</i> , Vol. 53, May 1981, pp. 81-85

## Operations and maintenance

Finding Volume in Partially Filled Tanks	Erminio Santi	HP-67/97	<i>Chem. Eng.</i> , Vol. 86, June 18, 1979, pp. 144-147
Program Calculates Volumes of Partly Filled Vessels	W. Wayne Blackwell	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, June 2, 1980, pp. 131-134
A Better Way to Balance Turbomachinery	L. Fielding and R. E. Mondy	TI-58/59	<i>Hydrocarbon Process.</i> , Vol. 60, Jan. 1981, pp. 97-104

## Economic/financial

Fuel Savings in the Lime Kiln	S. Jagannath	TI-58/59	<i>Tappi</i> , Vol. 61, June 1978, pp. 83-84
Performing Cost-effective Analysis for Alternative Interceptor Sewer Designs	Karl E. Kienow and Kenneth K. Kienow	HP-67/97	<i>Water Sewage Works</i> , Vol. 125, Oct. 1978, pp. 43-48
Steam Savings in Multiple Effect Evaporator Systems	S. Jagannath	TI-58/59	<i>Tappi</i> , Vol. 61, Nov. 1978, pp. 123-124
Economics of Boiler Feedwater Heating	S. Jagannath	TI-58/59	<i>Tappi</i> , Vol. 62, Feb. 1979, pp. 89-90
Calculating Boiler Efficiency and Economics	Terry A. Stoa	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, July 16, 1979, pp. 77-81
Calculator Program Speeds Up Project Financial Analysis	David M. Kirkpatrick	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Aug. 27, 1979, pp. 103-107
Hand-held Calculator Programs for Frequently Used Formulas: Discounted Cash Flow Projection with Price and Cost Escalation	W. J. Turner	HP-67/97	<i>Pet. Eng. Int.</i> , Vol. 52, Apr. 1980, pp. 76-94
Converting From Mechanical to Electrical Drives: The Looped Pointer Programming Method	S. Jagannath	TI-58/59	<i>Tappi</i> , Vol. 63, Nov. 1980, pp. 143-144
Program Calculates Stock-Options Tax	Ed Oxner	HP-67/97	<i>EDN</i> , Vol. 26, Feb. 4, 1981, p. 87
Calculators Quickly Find Tier 1 Revenue, Volume, WPT	Frank W. Lewis and Dipak K. Sinha	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, March 16, 1981, pp. 80-84
Calculator Program Finds Present Value and Rate of Return on Investment Opportunities	Rene Santos	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Dec. 21, 1981, pp. 62-68
Calculator Program Aids Well Cost Management	Carey J. Doyle	TI-58/59	<i>Oil Gas J.</i> , Vol. 80, Jan. 18, 1982, pp. 111-116

## Instrumentation and process control

Program Calculates Orifice Sizes for Gas Flow	William H. Mink	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Aug. 25, 1980, pp. 91-94
TI-59 Program for Root Locus	G. Franklin	TI-58/59	<i>Electron. Eng.</i> , Vol. 53, Feb. 1981, pp. 25-27
Orifice Gas Flow Calculated Without Tables	Randy Freeman	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Mar. 9, 1981, pp. 156-161
Program Sizes Flange-top Orifice Plate	John E. Hogsett	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Mar. 23, 1981, pp. 132-136
Program Computes Orifice-meter Flow Rate	Jed R. Martin	TI-58/59	<i>Oil Gas J.</i> , Vol. 79, Oct. 12, 1981, pp. 130-131
Automatic Stability Calculations for Feedback Control Systems	Mehmet T. Gökbudak	HP-41C	<i>Control Eng.</i> , Vol. 29, June, 1982, pp. 80-82

## Equipment engineering

Calculator Program Solves Cyclone Efficiency Equations	Yatendra M. Shah and Richard T. Price	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 85, Aug. 28, 1978, pp. 99-102
Overall Efficiency of a Combustion Boiler	S. Jagannath	TI-58/59	<i>Tappi</i> , Vol. 62, Jan. 1979, pp. 87-88

## Equipment engineering (continued)

Title	Author	Calculator	Reference
Calculator Program for Sour-water Stripper Design	Norman H. Wild	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Feb. 12, 1979, pp. 103-113
Calculator Program Aids Quench-tower Design	William H. Mink	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Dec. 3, 1979, pp. 95-98
Program Predicts Radiant Heat Flux in Direct Fired Heaters	Tayseer A. Abdel-Halim	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 86, Dec. 17, 1979, pp. 87-91
Quick Calculation of Heat Exchanger Weight	Mike Taylor	HP-67/97	<i>Process Eng.</i> , Vol. 61, Jan. 1980, pp. 56-59
Calculator Analyzes Compressor Performance	Jim Urlick and Fred Odom	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Jan. 14, 1980, pp. 60-65
Calculator Gives Compression Ratio for Compressors	Chandra P. Verma	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Feb. 25, 1980, pp. 128-130 (see next item)
Calculator Gives . . . Compressors—A Correction	Chandra P. Verma	TI-58/59	<i>Oil Gas J.</i> , Vol. 78, Mar. 31, 1980, p. 129
Kinetics of Fixed-bed Sorption Processes	Henry K. S. Tan	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Mar. 24, 1980, pp. 117-119
Calculator Program for Designing Packed Towers	Vaclav I. Pancuska	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, May 5, 1980, pp. 113-114
Calculator Program Aids Design of Spouted Beds	Domingo Mele and Julian Martínez	HP-67/97 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Oct. 20, 1980, pp. 137-139
Calculating Hole-area Distribution for Liquid Spargers	William H. Mink	TI-58/59 <sup>a</sup>	<i>Chem. Eng.</i> , Vol. 87, Nov. 17, 1980, pp. 277-281 (see next item)
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