

elements than the order of T . Thus, a , δ have degenerate normal distributions.

LITERATURE CITED

- Beckman, J. R., "Data Adjustment for Nonreactive Batch or Steady State Processes," *Chem. Eng. Commun.*, **15**, 357 (1982).
- Britt, H. I., and R. H. Luecke, "The Estimation of Parameters in Nonlinear Implicit Models," *Technometrics*, **15**, 233 (1973).
- Crowe, C. M., Y. A. Garcia Campos, and A. Hrymak, "Reconciliation of Process Flow Rates by Matrix Projection. I: The Linear Case," *AIChE J.*, **29**, 881 (1983).
- Cutting, G. W., "Estimation of Interlocking Mass Balances on Complex Mineral Beneficiation Plants," *Int. J. Mineral Proc.*, **3**, 207 (1976).
- Ham, P. G., G. W. Cleaves, and J. K. Lawlor, "Operation Data Reconciliation: An Aid to Improved Plant Performance," *Proc. 10th World Petroleum Congr.*, Bucharest, **4**, 281 (1979).
- Hlavacek, V., "Analysis of a Complex Plant—Steady State and Transient Behavior," *Comput. Chem. Eng.*, **1**, 75 (1977).
- Hodouin, D., and M. D. Everell, "A Hierarchical Procedure for Adjustment and Material Balancing of Mineral Process Data," *Int. J. Mineral Proc.*, **7**, 91 (1980).
- Hodouin, D., T. Gelpe, and M. D. Everell, "Sensitivity Analysis of Material Balance Calculations—An Application to a Cement Clinker Grinding Process," *Powder Technol.*, **32**, 139 (1982).
- Iordache, C., R. S. H. Mah, and A. C. Tamhane, "Detection of Gross Errors in Process Data Using Measurement Test," *Paper 43c*, AIChE Spring Meet. Anaheim, CA (1984).
- Knepper, J. C., and J. W. Gorman, "Statistical Analysis of Constrained Data Sets," *AIChE J.*, **26**, 260 (1980).
- Laguitton, D., "Material Balance of Mineral Processing Flowsheets. FORTRAN Program MATBAL2 Users' Manual," Division Report MRP/MSL 80-33 (IR), CANMET, Ottawa (1980).
- Mah, R. S. H., "Design and Analysis of Process Performance Monitoring Systems," *Chem. Proc. Control 2*, Proc. Eng. Found. Conf., Sea Island, GA, *AIChE*, 525 (1981).
- Mah, R. S. H., G. M. Stanley, and D. M. Downing, "Reconciliation and Rectification of Process Flow and Inventory Data," *Ind. Eng. Chem. Proc. Des. Dev.*, **15**, 175 (1976).
- Mah, R. S. H., and A. C. Tamhane, "Detection of Gross Errors in Process Data," *AIChE J.*, **28**, 828 (1982).
- Mular, A. L., et al., "Mass Balance of a Grinding Circuit," *CIM Bull.*, **69**, 124 (Dec., 1976).
- Ragot, J., and M. Aubrun, "A Useful Technique for Metallurgical Mass Balances—Applications in Flotation," *Proc. 3rd IFAC Symp. Automation in Mining, Mineral and Metal Processing*, Montreal, 229 (1980).
- Romagnoli, J. A., "On Data Reconciliation: Constraints Processing and Treatment of Bias," *Chem. Eng. Sci.*, **38**, 1,107 (1983).
- Romagnoli, J. A., and G. Stephanopoulos, "On the Rectification of Measurement Errors for Complex Chemical Plants," *Chem. Eng. Sci.*, **35**, 1,067 (1981).
- Smith, H. W., and N. Ichiyen, "Computer Adjustment of Metallurgical Balances," *Can. Inst. Mining Metall. (C.I.M.) Bull.*, **66**, 97 (Sept., 1973).
- Smith, H. W., and C. L. Lewis, "Computer Control Experiments at Lake Dufault," *Can. Inst. Mining Metall. (C.I.M.) Bull.*, **62**, 109 (Feb., 1969).
- Stanley, G. M., and R. S. H. Mah, "Observability and Redundancy in Process Data Estimation," *Chem. Eng. Sci.*, **36**, 259 (1981a).
- , "Observability and Redundancy Classification in Process Networks. Theorems and Algorithms," *Chem. Eng. Sci.*, **36**, 1,941 (1981b).
- Vaclavek, V., "Studies on System Engineering III. Optimal Choice of the Balance Measurements in Complicated Chemical Engineering Systems," *Chem. Eng. Sci.*, **24**, 947 (1969).
- Vaclavek, V., M. Kubicek, and M. Louchka, "Calculation of Material Balances for Chemical Engineering Systems with Due Allowance for Measurement Errors," *Theor. Found. Chem. Eng.*, **9**, 242 (1976a). (Translation of *Teor. Osnovy Khim. Tekhnol.* **9**, 270 [1975].)
- , "Calculation of Material Balances for Chemical Engineering Systems with Due Allowance for Errors in Measurement Classification of Stream Parameters," *Theor. Found. Chem. Eng.*, **10**, 256 (1976b). (Translation of *Teor. Osnovy Khim. Tekhnol.* **10**, 281 [1976].)
- White, J. W., R. L. Winslow, and G. J. Rossiter, "A Useful Technique for Metallurgical Mass Balances—Applications in Grinding," *Int. J. Mineral Proc.*, **4**, 39 (1977).
- Wiegel, R. L., "Advances in Mineral Processing Material Balances," *Can. Metall. Quart.*, **1**, 413 (1972).

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ERRATA

- In the paper titled "Reconciliation of Process Flow Rates by Matrix Projection" by C. M. Crowe, Y. A. Garcia Campos, and A. Hrymak (29, p. 881, December, 1983), the following corrections are made:
- p. 881, right column, line 10 in Scope: "malfunction of miscalibration" should read "malfunction or miscalibration"
 - p. 882, right column, line 6 above Eq. 1, Eq. 2, and lines 1, 2 following Eq. 2 as well as Eq. 8 on p. 883: "ε" should read "ζ"
 - p. 884, left column, line 3 under "Detection of Errors": "unknown variance" should read "known variance"
 - p. 885, add at end of Eq. 35: $= a_j$
 - p. 887, Table 3, rightmost column heading: "X" should read "χ" twice; and Table 3, line 5, leftmost column: "Straints" should read "Constraints"
 - p. 888, reference to Kuehn and Davidson: "1967" should read "1961"; and reference to Swenker: "Messergenbnissen" should read "Messergenbnissen"