such that the opening for EOR is below 0.2.

f) Trial-and-error calculations soon show that it is impossible to find a C_v for a linear valve that spans the BOR-EOR flow range, giving both openings between 0.2 and 0.8.

Equal percentage characteristics enable a wider range of by-pass flowrates to be accommodated; *i.e.,* calculation soon demonstrates that a C_v of 5.32 gives an opening of 0.8 for EOR and 0.404 for BOR.

APPENDIX

Strictly, the assumption of constant UA is inaccurate because opening the by-pass reduces flow through the heat exchanger, which affects the film coefficient and hence the overall coefficient. The lower real UA means slightly less would have to be by-passed, hence the by-pass flow calculated on the assumption of constant UA is an upper bound. For the problem presented, you would expect the by-pass to change from 14.15% to around 13% if account is taken for the reduced U. Thus for design, provided that the most severe case and associated flows have been identified, the small "errors" for the alternative modes are easily accommodated by the control loop.

ACKNOWLEDGMENTS

Thanks to Carl Pulford for drawing the figures and John Dos Santos for helpful discussions on heat recovery.

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ChE letter to the editor

Dear Editor

The universities with the eight top-ranked doctoral programs in chemical engineering in 1982, as rated by the National Academy of Sciences, were listed in *Changing Times.* In a 1991 letter to the editor of this journal (Vol. 25, page 181), I pointed out that an analysis of this ranking revealed that 63.4% of the faculty members in these eight "elite" programs had obtained their doctoral degrees from one of the same eight top-ranked schools. I suggested that these programs had maintained and enhanced their reputations by hiring their own and one another's graduates.

Doctoral programs in chemical engineering were ranked more than one decade later by the National Research Council (*Chronicle of Higher Education,* **42**(4), 1995). I studied this report to find 1) the extent to which the eight chemical engineering programs that ranked highest in 1982 retained their high rankings in 1995, and 2) the extent to which these programs persisted in hiring their own and one another's graduates.

The eight universities and their respective ranking in 1982 and 1995 are: Minnesota, 1, 1; Wisconsin, 2, 4; California, Berkeley, 3, 3; California Institute of Technology 3, 6; Stanford, 4, 7; Delaware, 5, 8; Massachusetts Institute of Technology, 6, 2; Illinois, 7, 5. Each of the eight programs that ranked highest in 1982 was again ranked among the top eight programs in 1995.

The names and alma maters of the full-time faculty members in these eight programs in 1982 and 1995 were obtained from the Internet. The median percentage of faculty members who had obtained their doctoral degrees from their own school or from one of the other seven top-ranked schools in 1995 was 70.8% (range, 50.0% to 91.7%). This is very similar to the 67.4% (range, 50.0% to 75.0%) figure in 1982.

Sincerely,

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