Chapter IX

Conclusion

The developed software for Computer-Aided Heat Exchanger Network Design is coded in Quick Basic for implementation on a personal computer. It has the following features:

1. Evaluate energy targets and locate pinch point.
2. Design heat exchange network for both restricted and unrestricted matching conditions.
3. Search for and break down primary loop.
4. Carry out quick but approximate economic analysis, and calculate annualized costs for new network design or payback period for existing network modification.

The above software is applicable under the following assumptions:

1. Operating conditions of the process are fixed.
2. No phase change occurs in any working fluid stream.
3. Heat loss to the environment is negligible.

The required typical user input data for network design are inlet/outlet temperatures and heat capacity-flow rates of each stream. The output results are composed of

- Problem table.
- Minimum utility requirements and location cf pinch point.
- Composite curves.

Table 9-1 Summary of the designed results

No.	No. of streams hot	cold	QHmin	QCmin	No. of unit Minimum	New design	Existing
D1.1	2	2	1602.1	0.0	4	4	4
D1.2	2	2	0.0	134.0	4	4	5
D1.3	2	2	60.0	160.0	5	3	5
D1.4	2	2	107.5	40.0	5	7	6
D1.5	2	2	40.0	38.0	5	7	-
D1.6	2	2	60.0	225.0	5	5	6
D1.7	2	2	50.0	60.0	5	7	7
D1.8	3	1	336.8	0.0	4	4	4
D1.9	2	3	883.0	0.0	5	5	5
D1.10	2	4	40.0	136.0	7	7	7
D1.11	3	3	0.0	1552.0	6	6	6
D1.12	3	3	1100.0	40.0	7	7	-
D1.13	3	4	0.0	1179.9	7	7	7
D1.14	3	4	936.8	0.0	7	7	7
D1.15	3	4	236.6	0.0	7	7	7
D1.16	3	4	217.6	0.0	7	7	7
D1.17	4	3	0.0	2925.8	7	8	14
D1.18	6	1	8.58E7	6.47E7	8	11	16
D1.19	6	1	2992.0	5016.0	8	9	9
D1.20	6	1	3795.0	2882.0	8	9	9
D1.21	4	4	2.227E6	3.97E5	9	11	13
D1.22	5	5	0.0	1879.0	10	10	10
D1.23	7	3	88.8	124.5	11	18	15
D1.24	9	3	1.055E8	0.0	12	14	18
D1.25	7	7	0.0	4.26E5	14	21	18
D1.26	10	10	0.0	3.36E6	20	20	19

- Grand composite curve.
- Matching of streams
- Grid representation of network.

The above software has been tested in the design of 26 networks under the unrestricted matching conditions (see Appendix D), the results of which are summarized in Table 9-1. It may be observed that each network design exhibits the maximum energy recovery feature, and in most cases a minimum or near minimum number of exchanger units has been obtained. It has also been shown that the software is applicable to threshold type problems.

On the other hand, in the case of restricted matching conditions, there is no guarantee that MER networks are always obtained for all types of problems. Appendix D describes four successful applications. In any case, the user can rest assured that all extra-utility requirements are accurately predicted for all problems studied here.