PHP PROGRAM ON SHELL-AND-TUBE HEAT EXCHANGER DESIGN

趙逸庭、謝其源

E-mail: 9126604@mail.dyu.edu.tw

ABSTRACT

THE PURPOSE OF THIS PAPER IS TO WRITE A COMPUTER ASSISTED WEBPAGE DATABASE DESIGN SOFTWA -RE OVER SHELL TUBE HEAT EXCHANGERS SUITABLE FOR USE ON PERSONAL COMPUTERS, WHICH AT THE S -AME TIME, PROVIDES A HUMANIZE DIALOGUE-BASED OPERATING INTERFACE. THE OBJECTIVE IS ACHIEVED BY UTILIZING A FREE SHAREWARE NAMED PHP LANGUAGE WHICH IS EXECUTABLE ON UNIX, LINUX AND WI -NDOWS PLATFORMS; COMBINED WITH MYSQL DATABASE CAPABLE OF PROCESSING EXTENSIVE DATABASES.F -URTHERMORE, TAKING ADVANTAGES OF THE EXTENSIVE STORAGE CAPACITY, PRECISE AND FAST COMPUTI -NG ABILITY OF THE COMPUTER, IT IS POSSIBLE TO SIMPLIFY SOME GENERALLY TRIVIAL, TIME-CONSU -MING ACTIVITIES SUCH AS GRAPHIC CHART CONSULTATION AND COMPLEX CALCULATIONS ENCOUNTERED I -N THE PROCESS OF DESIGNING SHELL TUBE HEAT EXCHANGER. THE ABOVE MENTIONED WILL PERMIT THE USER TO EASILY AND QUICKLY OBTAIN RELIABLE RESULTS FOR FURTHER REFERENCE AND UTILIZATION.M -EANWHILE, IT DOESN'T ONLY MEET WITH THE GEOMETRIC AND PERFORMANCE REQUIREMENTS WHEN DESIG -NING SHELL TUBE HEAT EXCHANGER, BUT ALSO WITH THE REQUIREMENTS OF THE REGULATIONS. THE ME -THODOLOGY EMPLOYED IN THIS PAPER IS AS FOLLOWS: TO CALCULATE WORKING FLUID OF SHELL SIDE AND TUBE SIDE, HEAT TRANSFER COEFFICIENT, HEAT TRANSMISSION AREA, SHELL BORE BY APPLYING T -HEORIES, DATA, AND EMPIRICAL FORMULATION REQUIRED FOR THE DESIGNING OF SHELL TUBE HEAT EX -CHANGER STORED IN THE COMPUTER. THIS WILL ALLOW MORE SELECTIVITY TO THE DESIGNER ENGAGED IN THE DESIGNING PROCESS. FURTHERMORE, IT IS POSSIBLE TO CHANGE INPUT PARAMETERS CONVENIEN -TLY AND QUICKLY IN A VERY SHORT PERIOD OF TIME AND THUS,OBTAIN VARIOUS DIMENSIONS OF HEAT EXCHANGERS SUITED FOR RESPECTIVE PERFORMANCES. OWING TO ITS COMPARABILITY AND SELECTIVITY , ITS VALUE ON ENGINEERING APPLICABILITY INCREASES. THIS COMPUTER ASSISTED WEBPAGE DATABAS -E DESIGN PROGRAM FEATURES THE FOLLOWING FUNCTIONS: (A) PERFORMANCE ASSESSMENT OF A SHELL- AND-TUBE HEAT EXCHANGER. (B) PERFORM DIMENSIONAL DESIGN AFTER I/O TEMPERATURE OF THE WORKI -NG FLUID OF SHELL SIDE AND TUBE SIDE, SHELL SIDE MASS FLOW RATE AND THE NUMBER OF TUBES A -RE PROVIDED. THE ACTIVITY OF STRUCTURAL DESIGNS SHALL FOLLOW THE REGULATIONS ESTABLISHED BY THE "HEAT EXCHANGER DESIGN HANDBOOK", BY T. KUPPAN[1] AND THE TEMA[2][3] (TUBULAR EXCHA -NGER MANUFACTURES ASSOCIATION). INFORMATION ON WIDELY USED MATERIALS AND THEIR CHARACTERI -STICS ARE TO BE EMBEDDED INTO THE PROGRAM IN ORDER TO AVOID EXCESSIVE AND COMPLEX PROCEDU -RES ENCOUNTERED ON THE DESIGNING PROCESS; HENCEFORTH, ACHIEVING OPTIMUM OPERATION OR DESI -GN AS WELL AS THE ECONOMIZATION OF TIME AND FUND REQUIRED FOR LAB EXPERIMENTS.

Keywords : PHP WEB PROGRAMS, TURBULENT FLOW HEAT EXCHANGE, SHELL-AND-TUBE HEAT EXCHANGER, TEMA, OPTIMAL DESIGN.

Table of Contents

REFERENCES

〔1〕 T. KUPPAN.,"HEAT EXCHANGER DESIGN HANDBOOK", MARCEL DEKKER,INC.,NEW YORK. BASEL, 2000. 〔2〕 "STANDARD OF TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION.", TEMA, 6TH ED, NEW YORK , 1978. 〔3〕 STANDARDS OF THE TUBULAR EXCHANGER MANUFACTURES ASSOCIATION,7TH, TEMA INC, 1988. 〔4〕 COLBURN, A. P.,"A METHOD OF CORRELATION FORCED CONVECTION HEAT TRANSFER DATA AND COM -PARISON WITH FLUID FRICTION", TRANS. AICHE, VOL. 29, PP.174-210, 1933. 〔5〕 GRIMISON, E.D., "CORRELATION AND UTIZATION OF NEW DATA OF FLOW RESISTANCE AND HEAT TRANSFER FOR CROSS-FLOW OF GASES OVER TUBE BANKS ", J., HEAT TRANSFER, VOL. 59, NO. 7, PP. 589-594, 1937. 〔6〕 DONOHUE, D. A., PET. REFINER, PART 1, AUGUST 1955; PART 2, OCTOBER 1955; PART 3, NO VEMBER 1955; PART 4, JANUARY 1956. 〔7〕 KERN, D.Q., "PROCESS HEAT TRANSFER", MCGRAW-HILL, NEW YORK, 1950. 〔8〕 TINKER, T., J., " HEAT TRANSFER", VOL. 80,PP.36-52, 1958. 〔9〕 TINKER,T.,"SHELL SIDE CHARACTERISTICS OF SHELL AND TUBE HEAT EXCHANGERS", PARTS 1, 2, AND 3, GENERAL DISCUSSION OF HAET TRANSFER PROC. INSTITUTION OF MECHANICAL ENGIN -NEERS , LONDON 1951. 〔10〕 PALEN, J. W., TABOREK, J.,"SOLUTION OF SHELL SIDE FLOW PRESSURE DROP AND HAET TRANS -FER BY STREAM ANALYSIS METHOD", CHEM ENG. PROG. SYMP. SER, VOL 65, NO.92, 1969. 〔11〕 BELL , K. J. "FINAL REPORT OF THE COOPERATIVE RESEARCH PROGRAM ON SHELL-AND-TUBE HE -AT EXCHANGERS", UNIVERSITY OF DELAWARE ENG. EXP. SAT. SULL. 5, 1963. 〔12〕 BELL, K.J., EXCHANGER DESIGN BASED ON THE DELAWARE RESEARCH PROGRAM, PETROLEUM CHEMI -CAL ENGINEER, PP.26-36, 1960. 〔13〕 FRAAS, A.P. AND OZISIK, M.N., HEAT EXCHANGER DESIGN, JOHN WILEY & SONS, NEW YORK,19 -65. 〔14〕 PALEN, J.W., HEAT EXCHANGER SOURCE BOOK, HEMISPHERE PUBLISHING CO, 1986. 〔15〕 TABOREK, J., INPUT DATA AND RECOMMENDED PRACTICES, HEAT EXCHANGER DESIGN HANDBOOK, HEDH, VOL. 3. SEC.3.3 1983. 〔16〕 HEAT EXCHANGER DESIGN HANDBOOK, HEMISPHERE PUBLISHING CO., NEW YORK, 1996. 〔17〕 BELL, K.J., PRELIMINARY DESIGN OF SHELL-AND-TUBE HEAT EXCHANGERS, HEAT EXCHANGER SOU -RCE BOOK, EDITED BY PALEN, J.W., PP.107-128, 1986. 〔18〕 張育瑞, "殼管式熱交換器之電腦輔助設計", 成功大學機械工程學研究所碩士論文, 1990. 〔19〕 林家興,"殼管式熱交換器電腦輔助機械強度設計" , 成功大學機械工程學研究所碩士論文, 1991 〔20〕 KAYS, W.M. AND LONDON, A.L., COMPACT HEAT EXCHANGER, MCGRAW-HILL, 1993. 〔21〕 周明宏, "殼管式熱交換器設計探討", 台灣海洋大學機械與輪機工程學研究所碩士論文, 1997. 〔22〕 呂宏哲, "冷凝物件導向設計程式", 台灣海洋大學機械與輪機工程學研究所碩士論文, 1998. 〔23〕 王冠得, "殼管式熱交換器VB程式設計", 台灣海洋大學機械與輪機工程學研究所碩士論文,1999. 〔24〕 戴啟楷, "冷凍空調用熱交換器之性能測試及電腦輔助設計軟體開發" , 成功大學機械工程學研 究所碩士論文, 2000. 〔25〕 許大勇, "鰭管式及殼管式熱交換器之性能測試和即時監控系統之建立" , 成功大學機械工程學 研究所碩士論文, 2001. 〔26〕 林廣台、李世榮, "熱傳遞", 高立圖書有限公司, 2版, 1993. 〔27〕 徐永錢、張簡國平、黃金龍, "裝置設計及實習", 高立圖書有限公司, 2版, 1989. 〔28〕 李昭仁等,"熱交換器",第四版, 高立圖書有限公司, 4版, 1990. 〔29〕 FRANK P. INCROPERA AND DAVID P. DEWITT., "FUNDAMENTALS OF HEAT AND MASS TRANSFER", FOURTH EDITION, JOHN WILEI & SONS , NEW YORK.,1996. 〔30〕 SIEDER, E.N., AND G.E. TATE, IND. ENG. CHEM., 28, 1429, 1936. 〔31〕 WHITAKER, S., AICHE J., 18, 361, 1972. 〔32〕 ZHUKAUSKAS, A.,"HEAT TRANSFER FROM TUBES IN CROSS FLOW," IN J. P. HARTNETT AND T.F. IRVINE, JR., EDS., ADVANCES IN HEAT TRANSFER,VOL. 8, ACADEMIC PRESS, NEW YORK, 1972.