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Coal Analysis Program v1.0

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5 PRINT "                COAL EVALUATION PROGRAM"
6 PRINT
8 PRINT "NOTE: PROGRAM USES NOVEMBER 1986 STANDARDS FOR BY-PRODUCT VALUES, FIXED
AND VARIABLE CONVERSION COSTS AND BULK DENSITY OIL USAGE.  UPDATING REQUIRES CH
ANGES IN LINES 1410,1420,1430,1440,4150,4160,4170,4410,4690 AND 4720."
9 PRINT
10 DIM A(40,40),E(20,50),B(20,50),Z(20,20),C(20,20),A$(50),B$(50)
15 PRINT "THIS PROGRAM IS DESIGNED FOR A BLEND CONTAINING UP TO SEVEN COALS PLUS
PETCOKE.  ENTER THE NUMBER OF COALS IN THE BLEND."
17 INPUT C
20 FOR N=1 TO C
25 PRINT
30 PRINT "ENTER NAME OF COAL"
35 INPUT A$(N)
40 PRINT
45 PRINT "ENTER DATA IN THIS ORDER: COST/TON, %WET COAL IN BLEND, %COAL H2O, AND
(DRY BASIS) %FIXED CARBON, %ASH, %VOLATILE MATTER, %SULFUR, %OXYGEN, BTU/LB"
50 INPUT C(N,1),A(N,1),B(N,5),B(N,1),B(N,2),B(N,3),B(N,4),B(N,21),B(N,22)
55 NEXT N
60 PRINT
65 N=C
70 PRINT "DOES THE BLEND CONTAIN PETCOKE? ENTER 'YES' OR 'NO' "
75 INPUT D$
77 A$(8)="PETCOKE"
80 IF D$="NO" THEN 100
85 PRINT
90 PRINT "ENTER DATA IN THIS ORDER: COST/TON, %WET PETCOKE IN BLEND, %PETCOKE H2
O, AND (DRY BASIS) %FIXED CARBON, %ASH, %VOLATILE MATTER, %SULFUR, %OXYGEN, BTU/
LB"
95 INPUT C(8,1),A(8,1),B(8,5),B(8,1),B(8,2),B(8,3),B(8,4),B(8,21),B(8,22)
100 A$(9)="COAL PORTION"
104 A$(10)="BLEND"
106 A$(12)="FCE COKE"
107 A$(I)=A$(N)
108 PRINT
109 PRINT "ENTER THE PREDICTED COKE STABILITY"
110 INPUT S
118 LPRINT "                COAL YIELD EVALUATION "
119 LPRINT
123 LPRINT
124 LPRINT "                COAL ANALYSIS "
127 LPRINT
129 LPRINT "                *****DRY BASIS*****"
130 LPRINT "COAL NAME    WET COAL    H2O    F.C.    ASH    VOL. MAT.    S    O2"
140 LPRINT "IN BLEND    IN MIX,%    %    %    %    %    %    %"
190 FOR N=1 TO 8
200 A(10,1)=A(10,1)+A(N,1)
210 E(1,5)=E(1,5)+A(N,1)*B(N,5)/100
220 E(1,1)=E(1,1)+A(N,1)*((100-B(N,5))/100)*B(N,1)/100

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230 E(1,2)=E(1,2)+A(N,1)*((100-B(N,5))/100)*B(N,2)/100
240 E(1,3)=E(1,3)+A(N,1)*((100-B(N,5))/100)*B(N,3)/100
250 E(1,4)=E(1,4)+A(N,1)*((100-B(N,5))/100)*B(N,4)/100
260 E(1,21)=E(1,21)+A(N,1)*((100-B(N,5))/100)*B(N,21)/100
270 E(1,22)=E(1,22)+A(N,1)*((100-B(N,5))/100)*B(N,22)/100
275 NEXT N
280 FOR N=1 TO C
285 P$="\ \###.## \###.### \###.### \###.### \###.### \###.### \###.###"
287 LPRINT USING P$ ;A$(N),A(N,1),B(N,5),B(N,1),B(N,2),B(N,3),B(N,4),B(N,21)
290 NEXT N
295 IF D$="NO" THEN 303
300 LPRINT USING P$ ;A$(8),A(8,1),B(8,5),B(8,1),B(8,2),B(8,3),B(8,4),B(8,21)
303 N=C
305 LPRINT
310 LPRINT
315 LPRINT " BLENDED ANALYSIS "
320 LPRINT
390 REM COAL BLENDED LESS PETCOKE ANALYSIS
400 A(9,1)=A(10,1)-A(8,1)
410 E(11,5)=(E(1,5)-A(8,1)*B(8,5)/100)*100/A(9,1)
420 E(11,1)=(E(1,1)-(A(8,1)*B(8,1)/100)*(100-B(8,5))/100)*100/A(9,1)
430 E(11,2)=(E(1,2)-(A(8,1)*B(8,2)/100)*(100-B(8,5))/100)*100/A(9,1)
435 E(11,3)=(E(1,3)-(A(8,1)*B(8,3)/100)*(100-B(8,5))/100)*100/A(9,1)
440 E(11,4)=(E(1,4)-(A(8,1)*B(8,4)/100)*(100-B(8,5))/100)*100/A(9,1)
445 E(11,21)=(E(1,21)-(A(8,1)*B(8,21)/100)*(100-B(8,5))/100)*100/A(9,1)
450 E(11,22)=(E(1,22)-(A(8,1)*B(8,22)/100)*(100-B(8,5))/100)*100/A(9,1)
452 E(8,1)=B(8,1)*(100-B(8,5))/100
454 E(8,2)=B(8,2)*(100-B(8,5))/100
456 E(8,3)=B(8,3)*(100-B(8,5))/100
458 E(8,4)=B(8,4)*(100-B(8,5))/100
460 E(8,21)=B(8,21)*(100-B(8,5))/100
462 LPRINT " *****WET BASIS*****"
464 LPRINT " WET COAL H2O F.C. ASH VOL. MAT. S O2"
466 LPRINT " IN MIX,% % % % % % %"
471 Y=E(11,4)
472 X=E(11,21)
473 LPRINT USING P$; A$(9),A(9,1),E(11,5),E(11,1),E(11,2),E(11,3),Y,X
474 Y=E(8,4)
475 X=E(8,21)
477 LPRINT USING P$; A$(8),A(8,1),B(8,5),E(8,1),E(8,2),E(8,3),Y,X
479 Y=E(1,4)
480 X=E(1,21)
481 LPRINT USING P$; A$(10),A(10,1),E(1,5),E(1,1),E(1,2),E(1,3),Y,X
482 LPRINT
500 REM PRODUCED COKE (COKE PUSHED FROM THE OVENS)=COAL +PETCOKE
510 Z(4,1)=E(11,1)+E(11,2)+9.000001E-02*E(11,3)+1.18*(100-E(11,5))/100
515 Z(4,1)=(Z(4,1)/100)*2000*(A(9,1)/100)
520 Z(4,2)=(B(8,1)+B(8,2))*((100-B(8,5))/100)
525 Z(4,2)=(Z(4,2)/100)*2000*(A(8,1)/100)
530 Z(4,3)=Z(4,1)+Z(4,2)
540 Z(5,1)=E(11,1)+E(11,2)
550 Z(6,1)=E(11,3)-E(11,21)
560 REM T IS THE COKING TEMPERATURE IN KELVIN
565 T=1323
570 Z(6,1)=(Z(6,1)^(1.26 *(T/1000)^1.4))/(9.5*(T/1000)^7.3)
580 Z(5,1)=Z(5,1)+Z(6,1)
584 Z(5,1)=(Z(5,1)/100)*2000*(A(9,1)/100)
590 Z(5,2)=(B(8,1)+B(8,2))*((100-B(8,5))/100)
595 Z(5,2)=(Z(5,2)/100)*2000*(A(8,1)/100)
600 Z(5,3)=Z(5,1)+Z(5,2)
610 Z(6,1)=(1/2)*(Z(4,1)+Z(5,1))
620 Z(6,2)=(1/2)*(Z(4,2)+Z(5,2))
630 Z(6,3)=(1/2)*(Z(4,3)+Z(5,3))
705 REM TAR YIELD
710 Z(1,1)=8.399999*(E(11,3)-E(11,21))^2/T
714 Z(1,1)=(Z(1,1)/100)*(A(9,1)/100)*2000

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720 Z(1,2)=.75*B(8,3)*((100-B(8,5))/100)
724 Z(1,2)=(Z(1,2)/100)*(A(8,1)/100)*2000
730 Z(1,3)=Z(1,1)+Z(1,2)
800 REM LIGHT OIL YIELD
810 Z(2,1)=-.284+.0384*E(11,3)
812 Z(2,1)=(Z(2,1)/100)*(A(9,1)/100)*2000
820 Z(2,2)=0
830 Z(2,3)=Z(2,1)+Z(2,2)
900 REM COKE OVEN GAS YIELD
910 Z(3,1)=14500*E(11,1)/100
920 Z(3,1)=.105*(E(11,22)-Z(3,1))
930 Z(3,1)=Z(3,1)*(T/E(11,3))^(1/2)
934 Z(3,1)=Z(3,1)*2000/(500*35.6)
938 Z(3,1)=Z(3,1)*(A(9,1)/100)
940 Z(3,2)=.05*B(8,3)*((100-B(8,5))/100)
944 Z(3,2)=(Z(3,2)/100)*2000
946 Z(3,2)=Z(3,2)*(A(8,1)/100)
950 Z(3,3)=Z(3,1)+Z(3,2)
960 REM DETERMINE COKE FC, ASH, VM AND S ANALYSIS ON A DRY WT BASIS
972 A(12,1)=(Z(6,3)/2000)*100
974 E(12,2)=(E(1,2)/A(12,1))*100
976 E(12,3)=.9
978 E(12,4)=.6*(A(9,1)/100)*E(11,4)
980 E(12,4)=E(12,4)+.8*(A(8,1)/100)*E(8,4)
981 E(12,4)=(E(12,4)/A(12,1))*100
984 E(12,1)=100-E(12,2)-E(12,3)
987 X=E(12,4)
990 Q$="THE OXYGEN CONTENT OF THE WET COAL PORTION OF THE BLEND IS BY WT ##.###
%"
992 LPRINT USING Q$; E(11,21)
994 R$="THE HEATING VALUE OF THE WET COAL PORTION OF THE BLEND IN BTU/LB IS ####
#"
996 LPRINT USING R$;E(11,22)
1000 REM COKE OVEN GAS FOR UNDERFIRING REQUIREMENT
1010 REM 1,022 BTU/LB OF DRY COAL; 1,710 BTU/LB OF WATER
1020 REM C.O.G. IS AT 35.6 CU FT/LB AND 500 BTU/CU FT
1030 Z(3,4)=1022*2000*((100-E(1,5))/100)
1040 Z(3,4)=Z(3,4)+1710*2000*(E(1,5)/100)
1050 Z(3,4)=Z(3,4)/(500*35.6)
1100 REM PRODUCED COKE TO FURNACE COKE, BREEZE AND BUCKWHEAT
1110 REM L=L(2,1); M=E(2,2); S=E(1,17); N=L(1,1)
1120 REM BREEZE; PRODUCED COKE ASH; STABILITY; FURNACE COKE
1122 M=E(12,2)
1130 L=.79+(1.824*M-.152*S)
1150 Z(7,3)=Z(6,3)*(L/100)
1160 Z(7,5)=Z(7,3)
1170 Z(8,3)=Z(6,3)-Z(7,3)
1200 FOR I=1 TO 8
1210 Z(I,5)=Z(I,3)-Z(I,4)
1220 NEXT I
1300 REM PRODUCTS PER NT OF DRY FURNACE COKE
1310 FOR I=1 TO 8
1320 Z(I,6)=Z(I,5)*(2000/Z(8,5))
1330 NEXT I
1400 REM UNIT VALUES
1410 Z(1,7)=.38/9.68
1420 Z(2,7)=.5/7.41
1430 Z(3,7)=(2.94/1000000!)*500*35.6
1440 Z(7,7)=39.7/(2000*(100-12)/100)
1500 REM DETERMINE VALUE PER NT OF FURNACE COKE
1510 FOR I=1 TO 8
1520 Z(I,8)=Z(I,6)*Z(I,7)
1530 NEXT I
2000 LPRINT
2005 LPRINT
2010 LPRINT

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2020 LPRINT
2030 LPRINT
2032 B$(1)="COAL"
2034 B$(2)="PETCOKE"
2036 B$(3)="BLEND"
2038 B$(4)="USED"
2040 B$(5)="PRODUCT"
2042 B$(6)="/NT COKE"
2044 B$(7)="$ /LB"
2046 B$(8)="$ /NT COKE"
2058 LPRINT "ITEM          TAR          L.OIL      COKE OVEN      COKE      COKE      FURNAC
E"
2060 LPRINT "LB/NT          GAS          TOTAL      BREEZE      COKE"
2066 FOR I=1 TO 6
2070 S$="\          \ ###.###  ###.###  ###.###  ####.##  ####.##  ####.##"
2080 LPRINT USING S$;B$(I),Z(1,I),Z(2,I),Z(3,I),Z(6,I),Z(7,I),Z(8,I)
2090 NEXT I
2107 LPRINT
2108 LPRINT
2110 LPRINT "   COKE PRODUCED FROM COAL ONLY  TOTAL COKE      BREEZE &      FURNACE
2120 LPRINT "   FORMULA 1 FORMULA 2 AVERAGE  PRODUCED      BUCKWHEAT      COKE"
2170 T$="   ####.##  ####.##  ####.##  ####.##  ####.##  ####.##"
2180 LPRINT USING T$; Z(4,1),Z(5,1),Z(6,1),Z(6,3),Z(7,3),Z(8,3)
2210 REM COAL COST
2320 C(9,2)=2000/Z(8,5)
2400 FOR I=1 TO 8
2410 C(I,2)=C(9,2)*A(I,1)/100
2420 C(I,3)=C(I,2)*(100-B(I,5))/100
2430 C(I,4)=C(I,1)*C(I,2)
2450 C(9,3)=C(9,3)+C(I,3)
2460 C(9,4)=C(9,4)+C(I,4)
2470 NEXT I
2474 C(9,1)=C(9,4)/C(9,2)
2480 LPRINT
2482 LPRINT
2484 LPRINT
2494 LPRINT "   COAL NAME          UNIT WET      WET COAL NT/      DRY COAL NT/      COAL CO
ST "
2496 LPRINT "   IN BLEND          COAL COST      NT DRY          NT DRY          $/NT OF
DRY "
2497 LPRINT "          $/NT      FURNACE COKE      FURNACE COKE      FURNACE
COKE "
2500 FOR I=1 TO N
2510 U$="\          \ ##.##          #.###          #.###          ###.###"
2520 LPRINT USING U$; A$(I),C(I,1),C(I,2),C(I,3),C(I,4)
2525 NEXT I
2530 IF D$="NO" THEN 2540
2535 LPRINT USING U$; A$(8),C(8,1),C(8,2),C(8,3),C(8,4)
2540 LPRINT
2544 LPRINT USING U$; A$(10),C(9,1),C(9,2),C(9,3),C(9,4)
2560 LPRINT
2570 LPRINT
2900 REM WET COAL BLEND, DRY COAL BLEND AND COKE ANALYSIS
2910 REM WET COAL BLEND ANALYSIS
2920 A=A(10,1)
2930 B=E(1,5)
2940 C=E(1,1)
2950 D=E(1,2)
2960 E=E(1,3)
2970 F=E(1,4)
2975 A$="WET BLEND"
2980 LPRINT USING P$ ;A$,A,B,C,D,E,F,E(1,21)
3010 REM DRY COAL BLEND ANALYSIS
3020 A=A(10,1)-E(1,5)
3040 C=E(1,1)*100/A
3050 D=E(1,2)*100/A

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3060 E=E(1,3)*100/A
3070 F=E(1,4)*100/A
3080 G=E(1,21)*100/A
3090 H=E(1,22)*100/A
3095 A#="DRY BLEND"
3103 E(1,5)=0!
3105 LPRINT USING P#;A#,A(10,1),E(1,5),C,D,E,F,G
3106 LPRINT
3108 LPRINT
3110 V#="THE HEATING VALUE OF THE WET BLEND IN BTU/LB IS #####"
3112 LPRINT USING V#; E(1,22)
3120 W#="THE HEATING VALUE OF THE DRY BLEND IN BTU/LB IS #####"
3122 LPRINT USING W#; H
3310 LPRINT
3320 LPRINT
3353 A$(12)="FURNACE COKE "
3355 A$(13)="TOTAL COKE"
3357 LPRINT "          DRY COKE   H2O     F.C.    ASH     VOL. MAT.   S  "
3359 LPRINT "          YIELD,%    %      %      %      %         %   "
3361 LPRINT USING P#; A$(13),A(12,1),E(12,5),E(12,1),E(12,2),E(12,3),X
3363 Y=(Z(8,3)/2000)*100
3364 LPRINT USING P#; A$(12),Y,E(12,5),E(12,1),E(12,2),E(12,3),X
3372 LPRINT
3380 LPRINT
4000 LPRINT " DESCRIPTION                                $/NT DRY      $/NT DRY "
4010 LPRINT "                                FURNACE COKE FURNACE COKE "
4020 LPRINT " RAW MATERIAL COST"
4030 LPRINT "      COAL"
4040 X#="                                ###.###"
4050 LPRINT USING X#; C(9,4)
4140 LPRINT "      BULK DENSITY OIL"
4150 LPRINT "      1.53 GAL/NT FCE COKE"
4160 LPRINT "      AT $0.50/GALLON      "
4170 LPRINT "                                0.770 "
4200 LPRINT "      INVENTORY COST AT 1% "
4210 C(10,4)=(1/100)*C(9,4)
4220 LPRINT USING X#; C(10,4)
4300 LPRINT "      COG FOR UNDERFIRING"
4310 C(11,4)=Z(3,8)*Z(3,4)/Z(3,5)
4320 LPRINT USING X#; C(11,4)
4400 LPRINT "      SUBTOTAL RAW MATERIALS"
4410 C(12,4)=C(9,4)+.77+C(10,4)+C(11,4)
4420 Y#="                                ###.###      ###.###"
4430 LPRINT USING Y#; C(12,4),C(12,4)
4450 LPRINT
4460 LPRINT " BY-PRODUCT CREDITS"
4470 PRINT
4480 LPRINT "      EXCESS COKE OVEN GAS"
4490 LPRINT USING X#; Z(3,8)*(-1)
4500 LPRINT "      COG FOR UNDERFIRING"
4510 A=Z(3,8)*Z(3,4)/Z(3,5)*(-1)
4520 LPRINT USING X#;A
4530 LPRINT "      TOTAL COKE OVEN GAS"
4540 T=Z(3,8)*Z(3,3)/Z(3,5)*(-1)
4545 LPRINT USING X#; T
4547 LPRINT
4550 LPRINT "      TAR"
4560 LPRINT USING X#; Z(1,8)*(-1)
4570 LPRINT "      LIGHT OIL"
4580 LPRINT USING X#; Z(2,8)*(-1)
4590 LPRINT "      COKE BREEZE AND BUCKWHEAT"
4600 LPRINT USING X#; Z(7,8)*(-1)
4610 B=T-Z(1,8)-Z(2,8)-Z(7,8)
4620 LPRINT "      TOTAL BY-PRODUCTS CREDITS"
4630 LPRINT USING Y#; B,B
4650 LPRINT

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4660 LPRINT "CONVERSION COST"
4670 LPRINT
4680 LPRINT "      CONVERSION - VARIABLE"
4690 C=16.23
4700 LPRINT USING X#; C
4710 LPRINT "      CONVERSION - FIXED"
4720 D=193073!/(7*100*18*(Z(8,5)/2000))
4730 LPRINT USING X#; D
4740 LPRINT "      TOTAL CONVERSION COST"
4750 E=C+D
4760 LPRINT USING Y#; E,E
4780 LPRINT
4790 LPRINT " TOTAL PRODUCTION COST"
4800 LPRINT " $/NT DRY FURNACE COKE"
4810 G=C(12,4)+B+E
4820 LPRINT USING Y#; G,G
4830 LPRINT
5130 LPRINT
5140 LPRINT
5230 LPRINT
5240 LPRINT
6110 LPRINT "END OF RUN"
7000 END
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