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## Appendices

### Initial deck file for a single layer homogenous reservoir

```

*C
*C
*C *****
*C *           W O R K B E N C H           *
*C * WorkBench Release 1.8.2 Bump 250.1 on 99/09/10 *
*C *     INITIALIZATION DECK FOR SIMBEST II     *
*C *                                           *
*C *****
*C
*C
*C TITLE t15
*C
*C
*C
*C PROJECT t15
*C CASE
*C
*C
*C CONTEXT t15
*C
*C
*C ----- START OF BASIC DATA
*C
*C LIST
*C
*C SATCORM
*C
*C BLK
*C
*C GRID *RTZ 20 20 31
*C RZERO .250
*C
*C DWSTD CW BWINIT VISW TRRES
*C MISC .99955 3.00000E-06 1.0010 1.0000 160.00
*C
*C STDCON 14.650 60.000
*C
*C IDATE 05 02 04
*C
*C
*C OUTPUT
*C
*C
*C WINIT *SKIP
*C
*C CRVAR *MATRIX *CONSTANT 6.00000E-06
*C
*C
*C ----- END OF BASIC DATA
*C
*C

```

```

*C
*C ----- START OF TABULAR DATA
*C
*C
*C
*C
*C
*C
*SATWO *MATRIX 1
*C
*C      SW      KRW      KROW      PCOWD      PCOWI
*C      -----
.1000 .0000 .9000 7.572
.1395 3.7005E-06 .8062 4.775
.1789 5.9208E-05 .7150 3.376
.2184 2.9974E-04 .6272 2.757
.2579 9.4773E-04 .5437 2.387
.2974 2.3128E-03 .4651 2.135
.3368 4.7958E-03 .3922 1.949
.3763 8.8849E-03 .3252 1.805
.4158 1.5157E-02 .2645 1.688
.4553 2.4279E-02 .2105 1.592
.4947 3.7005E-02 .1631 1.510
.5342 5.4179E-02 .1224 1.440
.5737 7.6734E-02 8.8321E-02 1.378
.6132 .1057 6.0573E-02 1.324
.6526 .1422 3.8827E-02 1.276
.6921 .1873 2.2624E-02 1.233
.7316 .2425 1.1388E-02 1.194
.7711 .3091 4.4283E-03 1.158
.8105 .3885 9.3923E-04 1.125
.8500 .4823 .0000 1.095
1.000 1.000 .0000 1.000

```

```

*C
*SATGO *MATRIX 1
*C
*C      SL      KROG      KRG      PCGOD      PCGOI
*C      -----
.1000 .0000 .9000 12.94
.2000 .0000 .7029 6.903
.2422 6.9831E-06 .6252 4.353
.2844 1.1173E-04 .5492 3.078
.3267 5.6563E-04 .4759 2.513
.3689 1.7877E-03 .4062 2.176
.4111 4.3644E-03 .3411 1.947
.4533 9.0501E-03 .2811 1.777
.4956 1.6766E-02 .2267 1.645
.5378 2.8603E-02 .1783 1.539
.5800 4.5816E-02 .1361 1.451
.6222 6.9831E-02 .1002 1.376
.6644 .1022 7.0471E-02 1.312
.7067 .1448 4.6771E-02 1.257
.7489 .1994 2.8703E-02 1.207
.7911 .2683 1.5760E-02 1.163
.8333 .3535 7.2876E-03 1.124
.8756 .4576 2.4897E-03 1.088
.9178 .5832 4.2301E-04 1.056
.9600 .7331 .0000 1.026
1.000 .9000 .0000 1.000

```

```

*C
*C
*C
*PVTO      1 1671.0
*API      32.800 *CO 1.00000E-06 *VCO 6.39000E-05
*C
*C      PRES      RSO      VO      BO
*C      -----
14.7      1.57      1.6400      1.0500
251.3     48.03     1.3000     1.0700
487.9     106.76     1.0500     1.1000
724.5     171.85     .8800     1.1400
961.1     241.50     .7700     1.1800
1197.7    314.77     .6800     1.2200
1434.3    391.08     .6100     1.2600
1671.0    470.00     .5600     1.3000
2447.3    0.0 0.0 1.4700
3223.6    0.0 0.0 1.6600
4000.0    0.0 0.0 1.8600
*C
*C
*C
*PVTG *BG  1 .99000
*C
*C      PRES      BG      VISG
*C      -----
14.7      211.58590 .01104
400.0     6.99531 .01165
800.0     3.08803 .01253
1200.0    1.81235 .01545
1600.0    1.23645 .01938
1671.0    1.17193 .02021
*C
*C
*C
*----- END OF TABULAR DATA
*C
*C
*C
*----- START OF GRID DATA
*C
*C
*C
*DR *RVAR
0.0369 0.0550 0.0821 0.1225 0.1828 0.2727 0.4068
0.6068 0.9053 1.3505
2.0147 3.0055 4.4837 6.6889 9.9787 14.8865 22.2081
33.1306 49.4250 73.7334
*C
*C
*C
*DTHET *THVAR
8.4600 9.8100 11.3753 13.1905 15.2953 17.7360 20.5661
23.8478 27.6532 32.0658
32.0658 27.6532 23.8478 20.5661 17.7360 15.2953 13.1905
11.3753 9.8100 8.4600
*C
*C
*C
*TH *ZVAR
1.9793 1.6024 1.2974 1.0504 0.8504 0.6885 0.5574
0.4513 0.3654 0.2958
0.2395 0.1939 0.1570 0.1271 0.1029 0.0833 0.1029
0.1271 0.1570 0.1939

```



```

0.2395 0.2958 0.3654 0.4513 0.5574 0.6885 0.8504
1.0504 1.2974 1.6024 1.9793
*C
*C
*HTOP *LAYER
400*8100
*C
*C
*PHI *CON
0.1800
*C
*KR *CON
10.00
*C
*KTHET *CON
10.00
*C
*KZ *CON
1.00
*C
*IPVT *CON
1.0000
*C
*C
*IREGEQ *CON
1.0000
*C
*C
*IREG *CON
1.0000
*C
*C
*C ----- END OF GRID DATA
*C
*C
*C ----- NO AQUIFER DATA
*C
*C
*C
*C ----- START OF EQUIL DATA
*C
*C
*EQUIL
*C
*C          INITIAL
*C REGION DATUM PRESSURE WOC PCWOC GOC PCGOC BPINI
*C
1 7348.00 3216.00 8000.00 1.00 .00 .00 1671.00
*C
*C ----- END OF EQUIL DATA
*C
*ENDJOB

```

## Simulation deck file for a single layer homogenous reservoir

```

*C
*RESTART 0 15 16
*C
*C
*C *****
*C *          W O R K B E N C H          *
*C * WorkBench Release 1.8.2 Bump 250.1 on 99/09/10 *
*C *          R U N D E C K F O R S I M B E S T I I          *
*C *          *          *
*C *****
*C
*RTITLE t15
*C
*C
*C
*C PROJECT t15
*C CASE
*C
*C
*C CONTEXT t15
*C
*C
*C W P L O T 1
*C
*C W M A P * T I M E
*C
*C ----- START OF WELLBORE HYDRAULICS DATA
*C
*C ----- END OF WELLBORE HYDRAULICS DATA
*C
*LIST
*C
*C ----- NO GATHERING CENTRES DEFINED
*OUTPUT *SO *P
*PRINT *WELL *TIME
*PRINT *ARRAYS *TIME
*C *****
*C Define probe as a multi-perf well
*C *****
*WELL 1 *PROBE 1 1
*PERF *S 1 *IJK 1 1 1 16 -1
*PROD *W 1
*C R F L O W 1 0.250 0.2687 0
*C *****
*C Set the solver parameters
*C *****
*C Meth Max_lin Diag. Tolp Tols Jdif NWatt NumOrth NormResid
*ESPIDO 50 0 0.000001 0.000001 6 0 12 3
*C
*C Non-linear iteration control
*C MinOut MaxOut MaxSat MaxPress MaxRs TolSat TolPress TolRs TolResid
*ITER 1 15 0.05 40 0.15 0.01 0.05 0.02 0.001
*C
*C *****
*C Conduct pre-test drawdown of 1 min
*C *****

```

```
*C BACK *ON 1
*C
*Q 1 2.54
*BHP 1 500
*C
*C
*C DT DTMIN DTMAX TARGDS CUTDS TARGDP TARGDRS MAXCUT
*TSTEP -2E-6 2E-6 1E-4 0.2 -1 1.0 -1 -1
*C
*TIME 2.083E-2
*C
*C
*C *****
*C Stop probe flow for post test buildup
*C *****
*C
*Q 1 0.0
*C
*C DT DTMIN DTMAX TARGDS CUTDS TARGDP TARGDRS MAXCUT
*TSTEP -2.0E-6 2E-6 1E-4 0.2 -1 1.0 -1 -1
*C
*TIME 8.333E-2
*C
*C
*STOP
*C END OF DATA INPUT
*ENDJOB
```

## Initial deck file for two layers reservoir

```

*C
*C
*C *****
*C *          W O R K B E N C H          *
*C * WorkBench Release 1.8.2 Bump 250.1 on 99/09/10 *
*C *   INITIALIZATION DECK FOR SIMBEST II   *
*C *                                     *
*C *****
*C
*C
*C
*C
*C PROJECT    m01p05
*C CASE
*C
*C
*C CONTEXT    m01p05
*C
*C
*C ----- START OF BASIC DATA
*C
*C LIST
*C
*C SATCORM
*C
*C BLK
*C
*C GRID *RTZ   20  20  31
*C RZERO      .250
*C
*C      DWSTD      CW   BWINIT      VISW      TRRES
*C MISC      .99955  3.00000E-06  1.0010    1.0000    160.00
*C
*C STDCON      14.650   60.000
*C
*C IDATE      05 02 04
*C
*C
*C
*C OUTPUT
*C
*C
*C WINIT *SKIP
*C
*C CRVAR *MATRIX *CONSTANT 6.00000E-06
*C
*C
*C ----- END OF BASIC DATA
*C
*C
*C
*C ----- START OF TABULAR DATA
*C
*C
*C
*C

```

```

*C
*C
*SATWO *MATRIX 1
*C
*C      SW      KRW      KROW      PCOWD      PCOWI
*C      -----
.1000   .0000   .9000   7.572
.1395  3.7005E-06 .8062   4.775
.1789  5.9208E-05 .7150   3.376
.2184  2.9974E-04 .6272   2.757
.2579  9.4773E-04 .5437   2.387
.2974  2.3128E-03 .4651   2.135
.3368  4.7958E-03 .3922   1.949
.3763  8.8849E-03 .3252   1.805
.4158  1.5157E-02 .2645   1.688
.4553  2.4279E-02 .2105   1.592
.4947  3.7005E-02 .1631   1.510
.5342  5.4179E-02 .1224   1.440
.5737  7.6734E-02 8.8321E-02 1.378
.6132  .1057  6.0573E-02 1.324
.6526  .1422  3.8827E-02 1.276
.6921  .1873  2.2624E-02 1.233
.7316  .2425  1.1388E-02 1.194
.7711  .3091  4.4283E-03 1.158
.8105  .3885  9.3923E-04 1.125
.8500  .4823  .0000  1.095
1.000  1.000  .0000  1.000

```

```

*C
*SATGO *MATRIX 1
*C
*C      SL      KROG      KRG      PCGOD      PCGOI
*C      -----
.1000   .0000   .9000   12.94
.2000   .0000   .7029   6.903
.2422  6.9831E-06 .6252   4.353
.2844  1.1173E-04 .5492   3.078
.3267  5.6563E-04 .4759   2.513
.3689  1.7877E-03 .4062   2.176
.4111  4.3644E-03 .3411   1.947
.4533  9.0501E-03 .2811   1.777
.4956  1.6766E-02 .2267   1.645
.5378  2.8603E-02 .1783   1.539
.5800  4.5816E-02 .1361   1.451
.6222  6.9831E-02 .1002   1.376
.6644  .1022  7.0471E-02 1.312
.7067  .1448  4.6771E-02 1.257
.7489  .1994  2.8703E-02 1.207
.7911  .2683  1.5760E-02 1.163
.8333  .3535  7.2876E-03 1.124
.8756  .4576  2.4897E-03 1.088
.9178  .5832  4.2301E-04 1.056
.9600  .7331  .0000  1.026
1.000  .9000  .0000  1.000

```

```

*C
*C
*C
*PVTO 1 1671.0
*API 32.800 *CO 1.00000E-06 *VCO 6.39000E-05
*C

```

```

*C      PRES      RSO      VO      BO
*C      -----
      14.7      1.57      1.6400      1.0500
      251.3      48.03      1.3000      1.0700
      487.9      106.76      1.0500      1.1000
      724.5      171.85      .8800      1.1400
      961.1      241.50      .7700      1.1800
      1197.7      314.77      .6800      1.2200
      1434.3      391.08      .6100      1.2600
      1671.0      470.00      .5600      1.3000
      2447.3      0.0      0.0      1.4700
      3223.6      0.0      0.0      1.6600
      4000.0      0.0      0.0      1.8600

*C
*C
*C PVTG *BG 1 .99000
*C
*C      PRES      BG      VISG
*C      -----
      14.7      211.58590      .01104
      400.0      6.99531      .01165
      800.0      3.08803      .01253
      1200.0      1.81235      .01545
      1600.0      1.23645      .01938
      1671.0      1.17193      .02021

*C
*C
*C ----- END OF TABULAR DATA
*C
*C
*C ----- START OF GRID DATA
*C
*C
*C
*C *DR *RVAR
      0.0369      0.0550      0.0821      0.1225      0.1828      0.2727      0.4068
      0.6068      0.9053      1.3505
      2.0147      3.0055      4.4837      6.6889      9.9787      14.8865      22.2081
      33.1306      49.4250      73.7334

*C
*C
*C *DTHET *THVAR
      8.4600      9.8100      11.3753      13.1905      15.2953      17.7360      20.5661
      23.8478      27.6532      32.0658
      32.0658      27.6532      23.8478      20.5661      17.7360      15.2953      13.1905
      11.3753      9.8100      8.4600

*C
*C
*C *TH *ZVAR
      1.0162      0.8250      0.6697      0.5437      0.4414      0.3584      0.2909
      0.2362      0.1918      0.1557
      0.1264      0.1026      0.0833      0.1026      0.1264      0.1557      0.1918
      0.2362      0.2909      0.3584
      0.4414      0.5437      0.6697      0.8250      1.0162      1.1618      1.3284
      1.5188      1.7365      1.9854      2.2700

*C
*C
*C *HTOP *LAYER
      400*8100

```

```
*C
*C
*PHI *CON
  0.1800
*C
*KR *ZVAR
  25*10.00 6*100.00
*C
*KTHET *ZVAR
  25*10.00 6*100.00
*C
*KZ *ZVAR
  25*1.00 6*10.00
*C
*IPVT *CON
  1.0000
*C
*C
*IREGEQ *CON
  1.0000
*C
*C
*IREG *CON
  1.0000
*C
*C
*----- END OF GRID DATA
*C
*C
*----- NO AQUIFER DATA
*C
*C
*C
*C
*----- START OF EQUIL DATA
*C
*C
*EQUIL
*C
*          INITIAL
*C REGION DATUM PRESSURE WOC PCWOC GOC PCGOC BPINI
*C
  1 7348.00 3216.00 8000.00 1.00 .00 .00 1671.00
*C
*----- END OF EQUIL DATA
*C
*ENDJOB
```

## Simulation deck file for two layers reservoir

```

*C
*RESTART 0 15 16
*C
*C
*C *****
*C *          W O R K B E N C H          *
*C * WorkBench Release 1.8.2 Bump 250.1 on 99/09/10 *
*C *          R U N D E C K F O R S I M B E S T I I          *
*C *          *
*C *****
*C
*RTITLE m01p05
*C
*C
*C
*C PROJECT m01p05
*C CASE
*C
*C
*C CONTEXT m01p05
*C
*C
*C W P L O T 1
*C
*C W M A P * T I M E
*C
*C ----- START OF WELLBORE HYDRAULICS DATA
*C
*C ----- END OF WELLBORE HYDRAULICS DATA
*C
*LIST
*C
*C ----- NO GATHERING CENTRES DEFINED
*OUTPUT *SO *P
*PRINT *WELL *TIME
*PRINT *ARRAYS *TIME
*C *****
*C Define probe as a multi-perf well
*C *****
*WELL 1 *PROBE 1 1
*PERF *S 1 *IJK 1 1 1 13 -1
*PROD *W 1
*C R F L O W 1 0.250 0.2687 0
*C *****
*C Set the solver parameters
*C *****
*C Meth Max_lin Diag. Tolp Tols Jdif NWatt NumOrth NormResid
*ESPIDO 50 0 0.000001 0.000001 6 0 12 3
*C
*C Non-linear iteration control
*C MinOut MaxOut MaxSat MaxPress MaxRs TolSat TolPress TolRs TolResid
*ITER 1 15 0.05 40 0.15 0.01 0.05 0.02 0.001
*C
*C *****
*C Conduct pre-test drawdown of 1 min
*C *****

```



```
*C BACK *ON 1
*C
*Q 1 2.54
*BHP 1 500
*C
*C
*C DT DTMIN DTMAX TARGDS CUTDS TARGDP TARGDRS MAXCUT
*TSTEP -2E-6 2E-6 1E-4 0.2 -1 1.0 -1 -1
*C
*TIME 2.083E-2
*C
*C
*C *****
*C Stop probe flow for post test buildup
*C *****
*C
*Q 1 0.0
*C
*C DT DTMIN DTMAX TARGDS CUTDS TARGDP TARGDRS MAXCUT
*TSTEP -2.0E-6 2E-6 1E-4 0.2 -1 1.0 -1 -1
*C
*TIME 8.333E-2
*C
*C
*STOP
*C END OF DATA INPUT
*ENDJOB
```

## **Vitae**

Duenpen Palasarn was born on 12<sup>th</sup> August 1976 in Surin, Thailand. She received her Bachelor of Engineering in Survey Engineering from the Faculty of Engineering, Chulalongkorn University in 1999. She has been a graduate student in the Master's Degree Program in Petroleum Engineering of the Department of Mining and Petroleum Engineering, Chulalongkorn University since 2003.

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