

Appendix D: Running optimisation using CMOST AI module in CMG.

- Run the .dat file specified in Appendix D for each case using Builder module.
- Create a new study in CMOST AI module.
- Create variable parameters using cEdit
- Define Objective function
- Design des experiments

```

INUNIT SI
WSRF WELL 1
WSRF GRID TIME
OUTSRF GRID PRES SG SO SW
OUTSRF RES NONE
OUTSRF WELL LAYER ALL DOWNHOLE
OUTSRF WELL PSPLIT
OUTSRF WELL GHGTHY
XWEL 'CO2' 'Producer'
ZWEL 'CO2' 'Producer'
WPRN GRID 0
OUTPRN GRID NONE
OUTPRN RES NONE
**
*****
** Definition of fundamental cartesian grid
**
*****
GRID VARI 55 20 5
KDIR DOWN
DI IVAR
55*11
DJ JVAR
20*10
DK ALL
1100*5 1100*6 1100*7 1100*4 1100*5
DTOP
1100*400
XOFFSET      0.0000
YOFFSET      0.0000
ROTATION      0.0000
AXES-DIRECTIONS 1.0 -1.0 1.0
** 0 = null block, 1 = active block
NULL CON      1
PERMI KVAR
<CMOST>this[100]=layer1</CMOST> <CMOST>this[200]=layer2</CMOST>
<CMOST>this[250]=layer3</CMOST> <CMOST>this[300]=layer4</CMOST>
<CMOST>this[300]=layer5</CMOST>

```

POR KVAR

0.15 0.18 0.17 0.2 0.1

PERMJ KVAR

<CMOST>this[100]=layer1</CMOST> <CMOST>this[200]=layer2</CMOST>

<CMOST>this[250]=layer3</CMOST> <CMOST>this[300]=layer4</CMOST>

<CMOST>this[300]=layer5</CMOST>

PERMK EQUALSI * 0.1

** 0 = pinched block, 1 = active block

PINCHOUTARRAY CON 1

CPOR 1e-6

**The following is the fluid component

**property data in GEM format.

**The unit system and fluid compositions should

**be specified in the I/O control section.

**The units and compositions specified in WinProp

**are included here as comments for informational purposes.

** PVT UNITS CONSISTENT WITH *INUNIT *SI

**COMPOSITION *PRIMARY

** 1.4000000E-03 9.8000000E-03 5.7420000E-01 1.3400000E-01

** 7.4353881E-02 1.7382418E-01 3.2421938E-02

**COMPOSITION *SECOND

** 0.0000000E+00 1.0000000E+00 0.0000000E+00 0.0000000E+00

** 0.0000000E+00 0.0000000E+00 0.0000000E+00

** Model and number of components

MODEL SRK

NC 7 7

COMPNAME 'N2' 'CO2' 'CH4' 'C2HtoNC4' 'IC5toC06' 'C10toC21' 'C26+'

TRES <CMOST>this[102]=temperature</CMOST>

VISCOR MODPEDERSEN

MW

2.8013000E+01 4.4010000E+01 1.6043000E+01 4.1092710E+01 9.5004877E+01

2.2139553E+02 4.6602207E+02

AC

0.04 0.225 0.008 0.136576 0.274212 0.59027 1.06349

PCRIT

3.3500000E+01 7.2800000E+01 4.5400000E+01 4.3450226E+01 3.1115187E+01

1.8232484E+01 1.0836202E+01

VCRIT

8.9500000E-02 9.4000000E-02 9.9000000E-02 1.8945622E-01 3.7540045E-01 7.9130636E-

01 1.4181450E+00

TCRIT

1.2620000E+02 3.0420000E+02 1.9060000E+02 3.5660996E+02 5.3739677E+02

7.4083684E+02 9.4079417E+02

PCHOR

41 78 77 140.159 280.49 589.01 1016.06

SG

0.809 0.818 0.3 0.462352 0.718507 0.851279 0.948926

TB

-195.75 -78.45 -161.45 -25.0282 95.3781 286.578 502.129

HCFLAG

0 0 0 0 0 0

OMEGA

0.42748 0.42748 0.42748 0.42748 0.42748 0.42748 0.42748

OMEGB

0.0866404 0.0866404 0.0866404 0.0866404 0.0866404 0.0866404 0.0866404

VSHIFT

0 0 0 0 0.0882057 0.195725 0.241098

HEATING_VALUES

0 0 844.29 1966.43 960.716 0 0

BIN

0.0000000E+00

2.0000000E-02 1.2000000E-01

7.1283582E-02 1.5000000E-01 6.9826985E-03

1.0854128E-01 1.5000000E-01 2.8941751E-02 7.7468685E-03

1.2000000E-01 1.5000000E-01 6.8176090E-02 3.3178799E-02 9.2012531E-03

1.2000000E-01 1.5000000E-01 1.0811687E-01 6.4152287E-02 2.8782276E-02 5.6480492E-03

VISW <CMOST>this[0.45]=viscosity</CMOST>

ROCKFLUID

RPT 1

** Sw k_{rw} k_{row}

SWT

0.03 0 1

0.081875 0.000538873 0.838459

0.13375 0.00319988 0.694516

0.185625 0.00907169 0.567307

0.2375 0.0190012 0.45595

0.289375 0.0337163 0.359546

0.34125 0.0538685 0.277174

0.393125 0.080055 0.20789

0.445 0.112831 0.150726

0.496875 0.152718 0.104682

0.54875 0.20021 0.0687235

0.600625 0.255779 0.0417773

0.6525 0.319876 0.0227183

0.704375 0.392935 0.0103584

0.75625 0.475374 0.00342424

0.808125 0.567598 0.000516122

0.86 0.67 0

** Sl k_{rg} k_{rog}

SLT

0.13 0.72 0

0.1825 0.578889 2.65671e-005

0.235	0.458479	0.000370048
0.2875	0.356891	0.00172745
0.34	0.272295	0.00515433
0.3925	0.202915	0.0120346
0.445	0.14703	0.0240613
0.4975	0.102979	0.0432232
0.55	0.0691594	0.0717936
0.6025	0.0440391	0.112322
0.655	0.0261552	0.167627
0.7075	0.014123	0.240789
0.76	0.00664308	0.335145
0.8125	0.00251233	0.454285
0.865	0.000638099	0.602047
0.9175	6.12924e-005	0.782512
0.97	0	1

INITIAL

VERTICAL DEPTH_AVE WATER_OIL EQUIL

ZOIL

1.4000000E-03 9.8000000E-03 5.7420000E-01 1.3400000E-01 7.4353881E-02 1.7382418E-01 3.2421938E-02

REFPRES

<CMOST>this[42600]=pressure</CMOST>

REFDEPTH

427

DWOC

428

SWOC

0.99

GASZONE NOOIL

NUMERICAL

DTMIN 1e-005

CONVERGE MAXRES LOOSE

RUN

DATE 2021 1 1

DTWELL 0.01

**

WELL 'Producer'

PRODUCER 'Producer'

OPERATE MIN BHP 13789.514 CONT

** rad geofac wfrac skin

GEOMETRY K 0.0762 0.37 1.0 0.0

PERF GEOA 'Producer'

** UBA ff Status Connection
 54 10 1 1.0 OPEN FLOW-TO 'SURFACE' REFLAYER
 54 10 2 1.0 OPEN FLOW-TO 1
 54 10 3 1.0 OPEN FLOW-TO 2
 54 10 4 1.0 OPEN FLOW-TO 3
 54 10 5 1.0 OPEN FLOW-TO 4
 **

WELL 'Injector'

** rad geofac wfrac skin
 GEOMETRY K 0.0762 0.37 1.0 0.0

PERF GEOA 'Injector'

** UBA ff Status Connection
 2 10 1 1.0 OPEN FLOW-TO 'SURFACE' REFLAYER
 2 10 2 1.0 OPEN FLOW-TO 1
 2 10 3 1.0 OPEN FLOW-TO 2
 2 10 4 1.0 OPEN FLOW-TO 3
 2 10 5 1.0 OPEN FLOW-TO 4

LAYERXYZ 'Injector'

** perf geometric data: UBA, block entry(x,y,z) block exit(x,y,z), length
 2 10 1 16.500000 95.000000 400.000000 16.500000 95.000000 405.000000 5.000000
 2 10 2 16.500000 95.000000 405.000000 16.500000 95.000000 411.000000 6.000000
 2 10 3 16.500000 95.000000 411.000000 16.500000 95.000000 418.000000 7.000000
 2 10 4 16.500000 95.000000 418.000000 16.500000 95.000000 422.000000 4.000000
 2 10 5 16.500000 95.000000 422.000000 16.500000 95.000000 427.000000 5.000000
 DATE 2021 2 1.00000
 DATE 2021 3 1.00000
 DATE 2021 4 1.00000
 DATE 2021 5 1.00000
 DATE 2021 6 1.00000
 DATE 2021 7 1.00000
 DATE 2021 8 1.00000
 DATE 2021 9 1.00000
 DATE 2021 10 1.00000
 DATE 2021 11 1.00000
 DATE 2021 12 1.00000
 DATE 2022 1 1.00000
 **

WELL 'Injector'

INJECTOR 'Injector'

INCOMP WATER

OPERATE MAX STW <CMOST>this[3200.0]=Water_Rate</CMOST> CONT

OPERATE MAX BHP 50000.0 CONT

DATE 2022 2 1.00000
 DATE 2022 3 1.00000
 DATE 2022 4 1.00000

DATE 2022 5 1.00000
 DATE 2022 6 1.00000
 DATE 2022 7 1.00000
 DATE 2022 8 1.00000
 DATE 2022 9 1.00000
 DATE 2022 10 1.00000
 DATE 2022 11 1.00000
 DATE 2022 12 1.00000
 DATE 2023 1 1.00000

**

WELL 'Injector'

INJECTOR 'Injector'

INCOMP SOLVENT 0.0 1.0 0.0 0.0 0.0 0.0 0.0

OPERATE MAX BHG <CMOST>this[1000.0]=Gas_Rate</CMOST> CONT

OPERATE MAX BHP 50000.0 CONT

DATE 2023 2 1.00000
 DATE 2023 3 1.00000
 DATE 2023 4 1.00000
 DATE 2023 5 1.00000
 DATE 2023 6 1.00000
 DATE 2023 7 1.00000
 DATE 2023 8 1.00000
 DATE 2023 9 1.00000
 DATE 2023 10 1.00000
 DATE 2023 11 1.00000
 DATE 2023 12 1.00000
 DATE 2024 1 1.00000

**

WELL 'Injector'

INJECTOR 'Injector'

INCOMP WATER

OPERATE MAX STW <CMOST>this[3200.0]=Water_Rate</CMOST> CONT

OPERATE MAX BHP 50000.0 CONT

DATE 2024 2 1.00000
 DATE 2024 3 1.00000
 DATE 2024 4 1.00000
 DATE 2024 5 1.00000
 DATE 2024 6 1.00000
 DATE 2024 7 1.00000
 DATE 2024 8 1.00000
 DATE 2024 9 1.00000
 DATE 2024 10 1.00000
 DATE 2024 11 1.00000
 DATE 2024 12 1.00000
 DATE 2024 12 31.00000
 DATE 2025 1 1.00000

**

WELL 'Injector'
INJECTOR 'Injector'
INCOMP SOLVENT 0.0 1.0 0.0 0.0 0.0 0.0 0.0
OPERATE MAX BHG <CMOST>this[1000.0]=Gas_Rate</CMOST> CONT
OPERATE MAX BHP 50000.0 CONT
DATE 2025 2 1.00000
DATE 2025 3 1.00000
DATE 2025 4 1.00000
DATE 2025 5 1.00000
DATE 2025 6 1.00000
DATE 2025 6 19.00000
DATE 2025 7 1.00000
DATE 2025 8 1.00000
DATE 2025 9 1.00000
DATE 2025 10 1.00000
DATE 2025 11 1.00000
DATE 2025 11 16.00000
STOP
DATE 2025 12 1.00000
DATE 2025 12 31.00000
DATE 2026 1 1.00000
DATE 2026 2 1.00000
DATE 2026 3 1.00000
DATE 2026 4 1.00000
DATE 2026 5 1.00000
DATE 2026 6 1.00000
DATE 2026 7 1.00000
DATE 2026 8 1.00000
DATE 2026 9 1.00000
DATE 2026 10 1.00000
DATE 2026 11 1.00000
DATE 2026 12 1.00000
DATE 2027 1 1.00000
DATE 2027 2 1.00000
DATE 2027 3 1.00000
DATE 2027 4 1.00000
DATE 2027 5 1.00000
DATE 2027 6 1.00000
DATE 2027 7 1.00000
DATE 2027 8 1.00000
DATE 2027 9 1.00000
DATE 2027 10 1.00000
DATE 2027 11 1.00000
DATE 2027 12 1.00000
DATE 2028 1 1.00000
DATE 2028 2 1.00000
DATE 2028 2 14.00000

DATE 2028 3 1.00000
DATE 2028 4 1.00000
DATE 2028 5 1.00000
DATE 2028 6 1.00000
DATE 2028 7 1.00000
DATE 2028 8 1.00000
DATE 2028 9 1.00000
DATE 2028 10 1.00000
DATE 2028 11 1.00000
DATE 2028 12 1.00000
DATE 2029 1 1.00000
DATE 2029 2 1.00000
DATE 2029 3 1.00000
DATE 2029 4 1.00000
DATE 2029 5 1.00000
DATE 2029 6 1.00000
DATE 2029 7 1.00000
DATE 2029 8 1.00000
DATE 2029 9 1.00000
DATE 2029 10 1.00000
DATE 2029 11 1.00000
DATE 2029 12 1.00000
DATE 2030 1 1.00000
DATE 2030 2 1.00000
DATE 2030 3 1.00000
DATE 2030 4 1.00000
DATE 2030 5 1.00000
DATE 2030 6 1.00000
DATE 2030 7 1.00000
DATE 2030 8 1.00000
DATE 2031 1 1.00000
DATE 2040 1 1.00000
RESULTS RELPERMCORR NUMROCKTYPE 1 'CMGTEMP_000.inc'