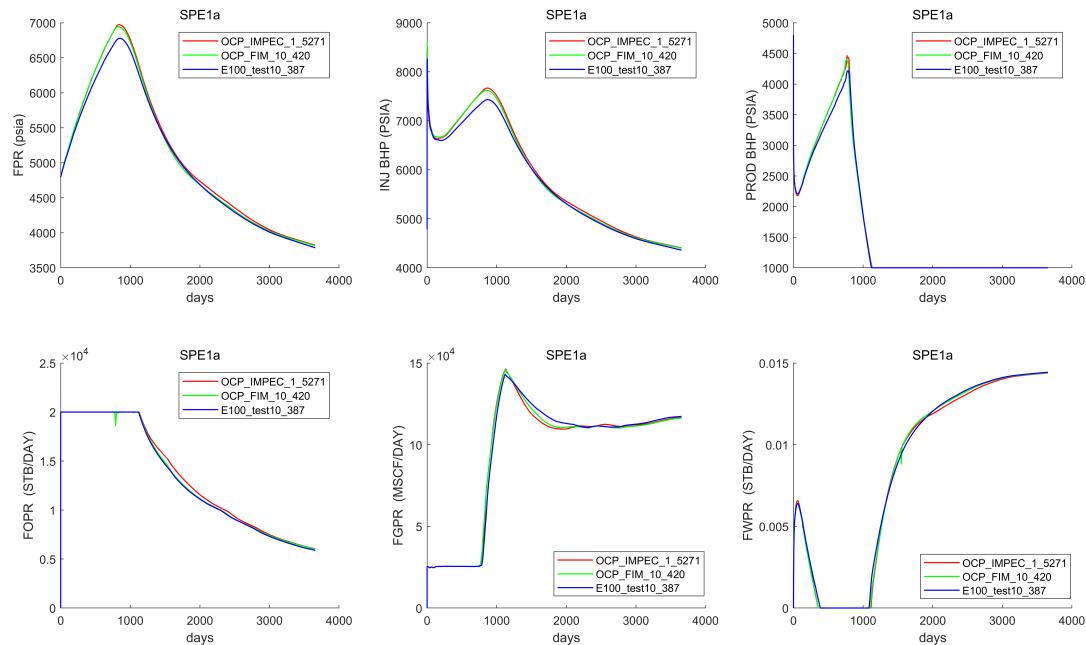


# Numerical Results for Comparison

## SPE1A



### OCP\_IMPEC\_1

```
.\OpenCAEPoro.exe ..\..\examples\spe1a\spe1a.data method=IMPEC
dtInit=0.1 dtMax=1 dtMin=0.1
```

Final time: 3655.500 Days  
 Total time steps: 4633  
 Total Newton steps: 4633 (+47 wasted steps)  
 Total linear steps: 7748 (+91 wasted steps)  
 Linear solve time: 0.772s (56.857%)  
 Simulation time: 1.357s

### OCP\_FIM\_10

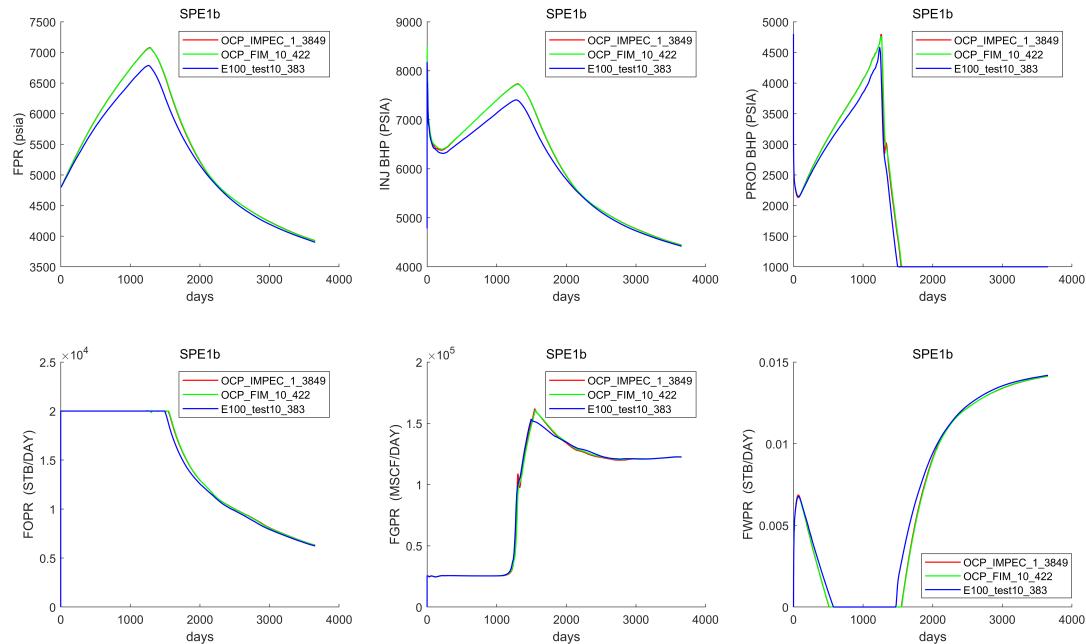
```
.\OpenCAEPoro.exe ..\..\examples\spe1a\spe1a.data method=FIM dtInit=1
dtMax=100 dtMin=0.1
```

precond\_type = 69

Final time: 3655.500 Days

```
Total time steps: 64
Total Newton steps: 147 (+2 wasted steps)
Total linear steps: 2274 (+34 wasted steps)
Linear solve time: 0.162s (52.650%)
Simulation time: 0.308s
```

## SPE1B




---

### OCP\_IMPEC\_1

```
.\OpenCAEPoro.exe ..\..\examples\spe1b\spe1b.data method=IMPEC
dtInit=0.1 dtMax=1 dtMin=0.1
```

```
Final time: 3655.500 Days
Total time steps: 3852
Total Newton steps: 3852 (+8 wasted steps)
Total linear steps: 7209 (+14 wasted steps)
Linear solve time: 0.659s (58.432%)
Simulation time: 1.127s
```

---

### OCP\_FIM\_10

```
.\OpenCAEPoro.exe ..\..\examples\spe1b\spe1b.data method=FIM dtInit=1
dtMax=100 dtMin=0.1
```

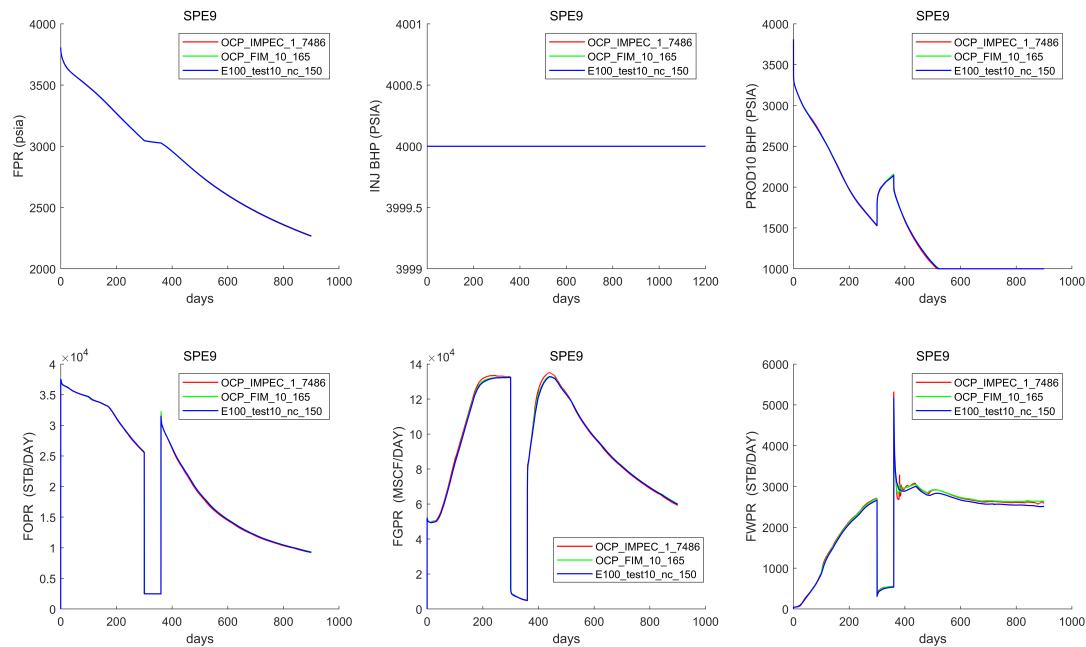
```

precond_type          = 69

Final time:           3655.500 Days
Total time steps:     75
Total Newton steps:   175 (+2 wasted steps)
Total linear steps:   2599 (+37 wasted steps)
Linear solve time:    0.189s (53.695%)
Simulation time:      0.352s

```

## SPE9




---

### OCP\_IMPEC\_1

```
.\OpenCAEPoro.exe ...\\examples\spe9\spe9_IMPEC.data
```

```

Final time:           900.000 Days
Total time steps:     7486
Total Newton steps:   7486 (+42 wasted steps)
Total linear steps:   9900 (+96 wasted steps)
Linear solve time:    55.246s (62.154%)
Simulation time:      88.885s

```

---

### OCP\_FIM\_10

```
.\OpenCAEPoro.exe ...\\examples\spe9\spe9_FIM.data
```

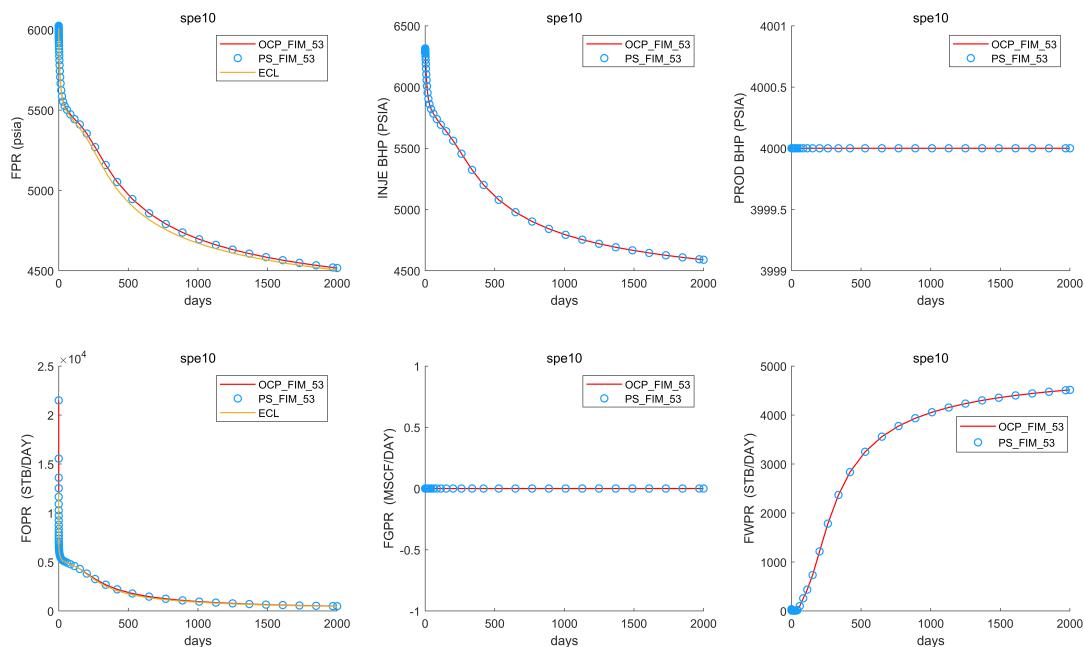
```

precond_type          = 69

Final time:           900.000 Days
Total time steps:     140
Total Newton steps:   185 (+67 wasted steps)
Total linear steps:   2751 (+852 wasted steps)
Linear solve time:    7.817s (52.918%)
Simulation time:      14.771s

```

## SPE10




---

## PS\_FIM

```

Final time:           2000 Days
Total time steps:     53
Total Newton steps:   215
Wasted Newton steps:  5
Total linear steps:   1305
Linear solver time:   1413.86s
Simulation time:      2905.24s

```

---

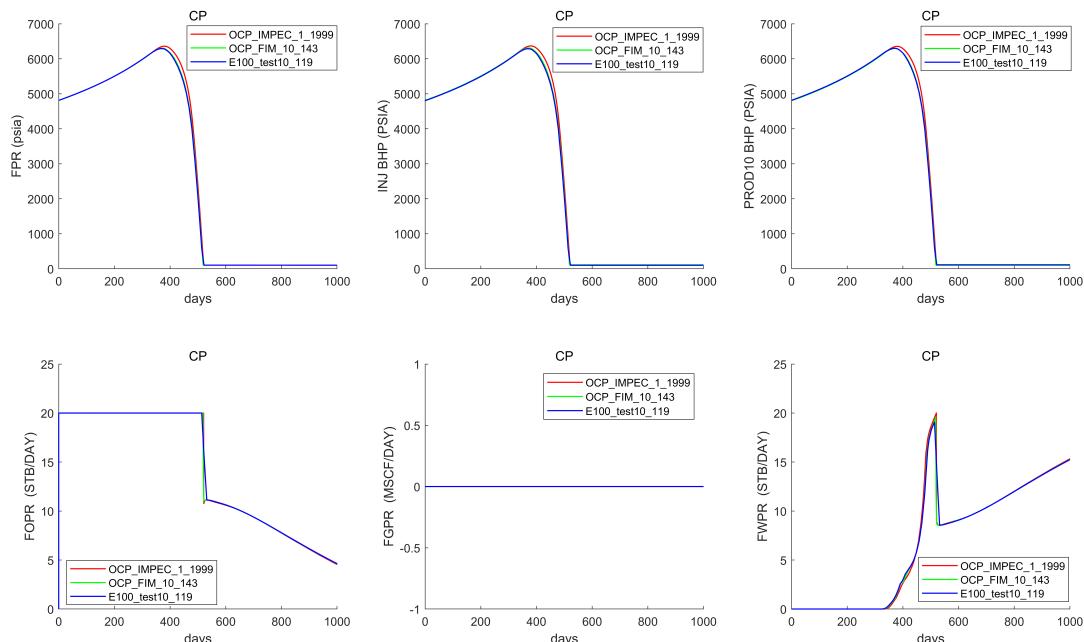
## OCP\_FIM

```
.\OpenCAEPoro.exe ...\\examples\\spe10\\spe10.data
```

```

Final time:      2000.000 Days
Total time steps: 53
Total Newton steps: 215 (+5 wasted steps)
Total linear steps: 1278 (+40 wasted steps)
Linear solve time: 1343.855s (73.547%)
Simulation time: 1827.200s

```

**CP****OCP\_IMPEC\_1**

```

.\OpenCAEPoro.exe ...\\examples\\cornerpoint\\CP.data   method=IMPEC
dtInit=0.1 dtMax=1 dtMin=0.1

```

```

Final time:      1000.000 Days
Total time steps: 1999
Total Newton steps: 1999 (+3 wasted steps)
Total linear steps: 13542 (+35 wasted steps)
Linear solve time: 0.044s (29.720%)
Simulation time: 0.148s

```

**OCP\_FIM\_10**

```

.\OpenCAEPoro.exe ...\\examples\\cornerpoint\\CP.data   method=FIM
dtInit=1 dtMax=100 dtMin=0.1

```

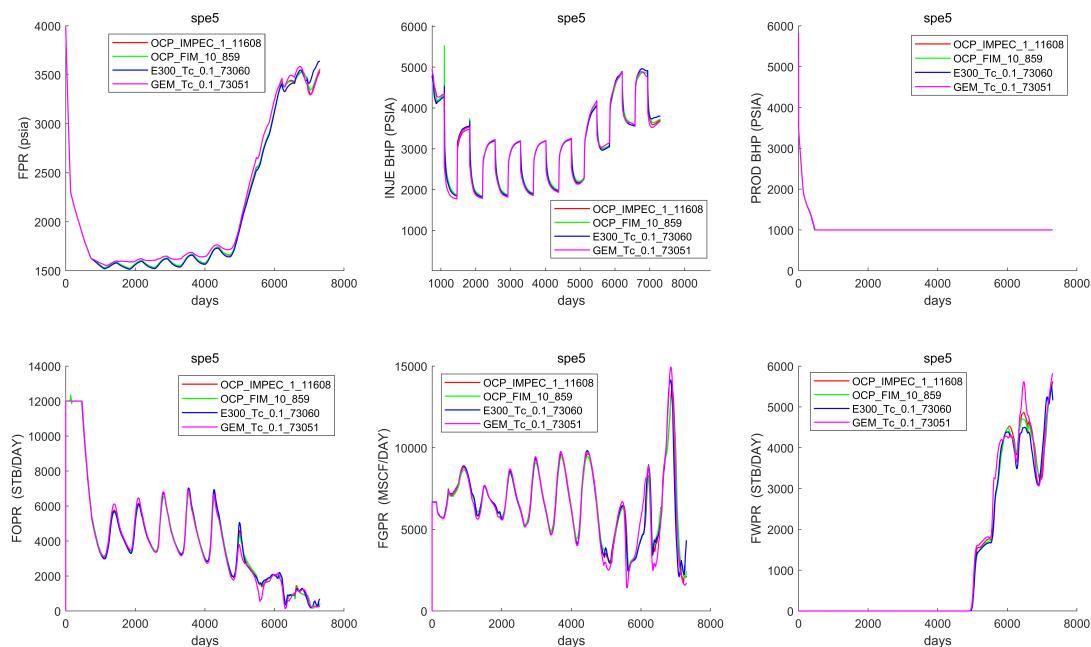
```

precond_type          = 69

Final time:      1000.000 Days
Total time steps: 66
Total Newton steps: 154 (+3 wasted steps)
Total linear steps: 1582 (+24 wasted steps)
Linear solve time: 0.024s (25.256%)
Simulation time: 0.096s

```

## SPE5



## OCP\_IMPEC

```

.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data method=IMPEC
dtInit=0.1 dtMax=1 dtMin=0.1

```

SSMSTA: 6347464  
 NRSTA: 20264  
 SSMSM: 9455434  
 NRSP: 1665916

---

```

Final time:      7305.000 Days
Total time steps: 10791
Total Newton steps: 10791 (+25 wasted steps)
Total linear steps: 17352 (+49 wasted steps)

```

```
Linear solve time: 1.140s (8.054%)
Simulation time: 14.159s
```

---

#### OCP\_FIM

```
.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data method=FIM dtInit=1
dtMax=50 dtMin=0.1
```

```
precond_type = 64
```

```
SSMSTA: 186830
NRSTA: 124
SSMSP: 471467
NRSP: 95568
```

---

```
Final time: 7305.000 Days
Total time steps: 312
Total Newton steps: 853 (+46 wasted steps)
Total linear steps: 2726 (+178 wasted steps)
Linear solve time: 6.927s (81.680%)
Simulation time: 8.481s
```

---

#### OCP\_FIMn

```
.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data method=FIMn dtInit=1
dtMax=50 dtMin=0.1
```

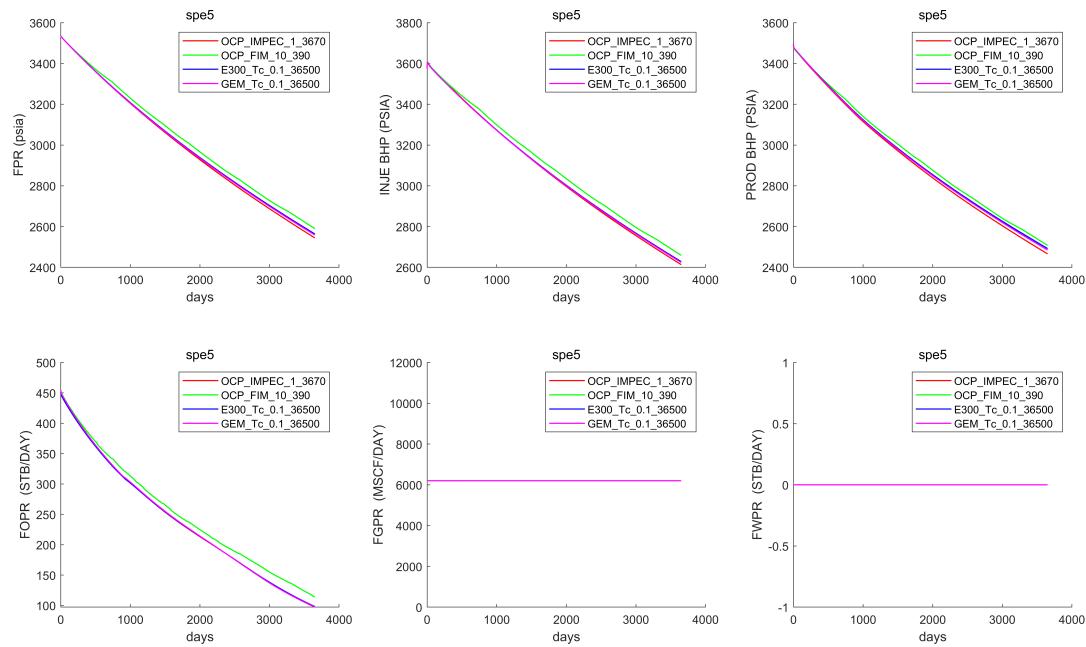
```
precond_type = 64
```

```
SSMSTA: 638384
NRSTA: 4939
SSMSP: 910204
NRSP: 128626
```

---

```
Final time: 7305.000 Days
Total time steps: 304
Total Newton steps: 807 (+36 wasted steps)
Total linear steps: 2573 (+177 wasted steps)
Linear solve time: 6.819s (76.855%)
Simulation time: 8.873s
```

## SPE3



### OCP\_IMPEC

```
.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data  method=IMPEC
dtInit=0.1 dtMax=1 dtMin=0.1
```

SSMSTA: 23725633  
NRSTA: 19451  
SSMSP: 23979137  
NRSP: 1462997

---

Final time: 3650.000 Days  
Total time steps: 3652  
Total Newton steps: 3652 (+0 wasted steps)  
Total linear steps: 7307 (+0 wasted steps)  
Linear solve time: 1.042s (2.698%)  
Simulation time: 38.641s

---

### OCP\_FIM

```
.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data  method=FIM  dtInit=1
dtMax=100 dtMin=0.1
```

precond\_type = 64

SSMSTA: 249769  
NRSTA: 4769  
SSMSP: 429433

```
NRSP:      33115
=====
Final time:      3650.000 Days
Total time steps: 46
Total Newton steps: 85 (+0 wasted steps)
Total linear steps: 129 (+0 wasted steps)
Linear solve time: 0.689s (39.492%)
Simulation time: 1.745s
```

---

### OCP\_FIMn

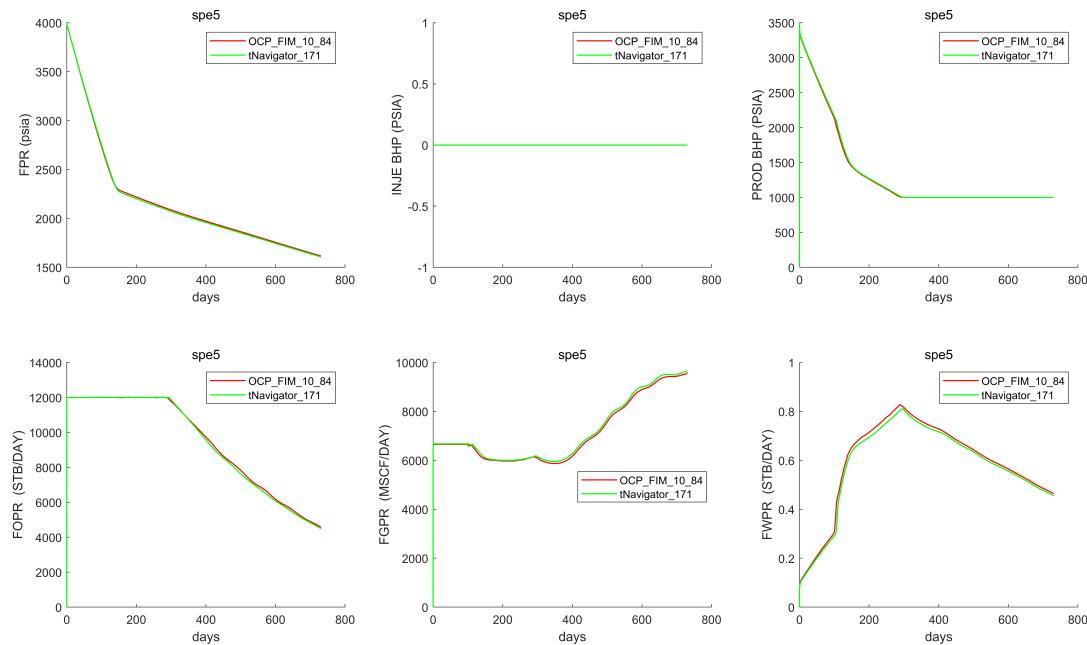
```
.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data method=FIMn dtInit=1
dtMax=100 dtMin=0.1
```

```
precond_type          = 64
```

```
SSMSTA:      777437
NRSTA:       4900
SSMSP:       874045
NRSP:        40469
=====
```

```
Final time:      3650.000 Days
Total time steps: 46
Total Newton steps: 86 (+0 wasted steps)
Total linear steps: 132 (+0 wasted steps)
Linear solve time: 0.773s (30.430%)
Simulation time: 2.540s
```

## SPE5r



### OCP\_FIM

```
.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data
method=FIM dtInit=1 dtMax=10 dtMin=0.1 pl=1
```

```
precond_type = 64
```

```
SSMSTA: 185640490
NRSTA: 76
SSMSP: 140723299
NRSP: 50135363
```

```
=====
Final time: 730.000 Days
Total time steps: 82
Total Newton steps: 260 (+27 wasted steps)
Total linear steps: 896 (+87 wasted steps)
Linear solve time: 542.995s (47.367%)
Simulation time: 1146.347s
```

```
.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data
method=FIM dtInit=1 dtMax=20 dtMin=0.1 pl=1
```

```
precond_type = 64
```

```
SSMSTA: 96792555
NRSTA: 74
SSMSP: 52566167
NRSP: 26468101
```

```
=====
Final time:      730.000 Days
Total time steps: 49
Total Newton steps: 222 (+30 wasted steps)
Total linear steps: 833 (+85 wasted steps)
Linear solve time: 474.654s (51.896%)
Simulation time: 914.624s
```

```
.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data FIM
1 50 0.1
```

```
precond_type = 64
```

```
SSMSTA: 190604401
NRSTA: 117
SSMSP: 149990315
NRSP: 56039151
```

```
=====
Final time:      730.000 Days
Total time steps: 47
Total Newton steps: 213 (+85 wasted steps)
Total linear steps: 781 (+442 wasted steps)
Linear solve time: 687.898s (48.709%)
Simulation time: 1412.269s
```

---

#### OCP\_NEW\_FIM

```
.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data FIMn
1 10 0.1
```

```
precond_type = 64
```

```
SSMSTA: 180930118
NRSTA: 80
SSMSP: 140805797
NRSP: 50478353
```

```
=====
Final time:      730.000 Days
Total time steps: 80
Total Newton steps: 252 (+14 wasted steps)
Total linear steps: 864 (+24 wasted steps)
Linear solve time: 552.229s (42.005%)
Simulation time: 1314.664s
```

```
.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data FIMn
1 20 0.1
```

```
precond_type = 64
```

```
SSMSTA:      178769093
NRSTA:       72
SSMSP:       124291924
NRSP:        45607746
=====
Final time:    730.000 Days
Total time steps: 50
Total Newton steps: 218 (+34 wasted steps)
Total linear steps: 807 (+112 wasted steps)
Linear solve time: 545.601s (43.609%)
Simulation time: 1251.113s

.\OpenCAEPoro.exe ...\\examples\\spe5refine\\spe5-70x70x30-2y.data  FIMn
1 50  0.1

precond_type = 64

SSMSTA:      193803346
NRSTA:       86
SSMSP:       160981671
NRSP:        60714439
=====
Final time:    730.000 Days
Total time steps: 50
Total Newton steps: 210 (+93 wasted steps)
Total linear steps: 757 (+397 wasted steps)
Linear solve time: 665.262s (43.112%)
Simulation time: 1543.095s
```