```
this paper\Scripts\python.exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=
   client --port=8546
 3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   sys.path.extend(|'E:\\1 000\\3 0000\\1 00000\\1 000000\\1 00000\\1 LW 0000\\4 0000\\3 python code\\9 Code for this
   6
   PyDev console: starting.
   Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 8
   >>> runfile('E:/1 000/3 0000/1 00000/1 000000/1 000000/1 000000/1 LW 000/3 python_code/9 Code for this paper/main_RO_TWS.py', wdir='E:/1 0000/3 0000/1 000000/1 000000/1 000000/1 000000/1 LW 000/3 python_code/9 Code for
   this paper')
   Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 5s.....
   Set parameter MIPGap to value 1e-10
12
   Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
13
15
   CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
   Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
16
17
   Optimize a model with 532644 rows, 52642 columns and 1496394 nonzeros
19
   Model fingerprint: 0xc3512c76
   Variable types: 1 continuous, 52641 integer (52605 binary)
20
21
   Coefficient statistics:
    Matrix range [1e+00, 1e+10]
    Objective range [1e+00, 2e+01]
23
24
    Bounds range [1e+00, 1e+00]
                 [1e+00, 2e+10]
    RHS range
26
   Warning: Model contains large matrix coefficients
27
   Warning: Model contains large rhs
28
        Consider reformulating model or setting NumericFocus parameter
29
        to avoid numerical issues.
30
   Presolve removed 302841 rows and 23943 columns (presolve time = 5s) ...
31
   Presolve removed 460984 rows and 34620 columns
   Presolve time: 8.27s
   Presolved: 71660 rows, 18022 columns, 271487 nonzeros
34
   Variable types: 0 continuous, 18022 integer (17995 binary)
35
   Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
   Showing first log only...
38
39
   Root relaxation presolved: 18022 rows, 89682 columns, 289509 nonzeros
40
41
42
   Root simplex log...
43
44
   Iteration Objective
                        Primal Inf. Dual Inf.
       0 8.9300000e+02 0.000000e+00 1.119000e+03
45
46
   Concurrent spin time: 0.00s
48
   Solved with dual simplex (primal model)
49
50
   Root relaxation: objective 8.930000e+02, 2440 iterations, 0.38 seconds (0.33 work units)
51
52
     Nodes | Current Node | Objective Bounds
                                                     Work
53
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
54
55
         0 893.00000 0 12
                                 - 893.00000
   H \quad 0 \quad 0
                      5293.0000000 893.00000 83.1% - 10s
56
57
   Н
      0
                      4973.0000000 893.00000 82.0%
                                                     - 10s
58
   Η
                      3853.0000000 893.00000 76.8%
59
     0 0 893.00000 0 168 3853.00000 893.00000 76.8% - 11s
60 H 0 0
                      2133.0000000 893.00000 58.1% - 11s
                      2013.0000000 893.00000 55.6%
61
   Η
      0
62
         0 893.00000 0 167 2013.00000 893.00000 55.6% - 11s
63
         0 893.00000 0 54 2013.00000 893.00000 55.6% - 13s
64
         0 893.00000 0 64 2013.00000 893.00000 55.6% - 14s
   H \quad 0 \quad 0
                       893.0000000 893.00000 0.00%
                                                    - 15s
65
         0 893.00000 0 12 893.00000 893.00000 0.00% - 15s
      0
66
67
68
   Cutting planes:
69
    Cover: 37
    Implied bound: 875
70
    Clique: 8
    MIR: 51
73
    StrongCG: 47
74
    GUB cover: 4
75
    RLT: 7
76
    Relax-and-lift: 472
   Explored 1 nodes (17191 simplex iterations) in 15.52 seconds (22.99 work units)
   Thread count was 8 (of 8 available processors)
```

```
unknown
 81
     Solution count 6: 893 2013 2133 ... 5293
 82
 83 Optimal solution found (tolerance 1.00e-10)
    Best objective 8.930000000000e+02, best bound 8.93000000000e+02, gap 0.0000%
     Set parameter MIPGap to value 1e-08
 86 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 88 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 89 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 90
 91 Optimize a model with 536188 rows, 14427 columns and 1098491 nonzeros
  92 Model fingerprint: 0x68a1a62e
 93 Variable types: 36 continuous, 14391 integer (8316 binary)
 94 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
 96
      Objective range [6e-05, 5e+01]
      Bounds range [1e+00, 1e+00]
 97
 98
      RHS range
                     [8e-01, 1e+10]
     Warning: Model contains large matrix coefficients
 100 Warning: Model contains large rhs
101
           Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues.
102
103 Presolve removed 532514 rows and 13105 columns
104 Presolve time: 0.39s
105 Presolved: 3674 rows, 1322 columns, 9781 nonzeros
106 Variable types: 8 continuous, 1314 integer (781 binary)
107 Found heuristic solution: objective 3324.0500186
108 Found heuristic solution: objective 3815.6702574
109
110 Root relaxation: objective 5.238130e+03, 1189 iterations, 0.02 seconds (0.02 work units)
111
112
       Nodes | Current Node | Objective Bounds
                                                        | Work
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
113
114
        0 \quad \  \  0.5238.13028 \quad 0 \quad 31.3815.67026.5238.13028.37.3\%
115
116 H 0 0
                         5207.3302838 5238.13028 0.59% - 0s
        0 0 5237.20528 0 9 5207.33028 5237.20528 0.57% -
117
        0 0 5237.20528 0 9 5207.33028 5237.20528 0.57% -
118
                                                                   0s
119 H 0 0
                         5235.3302838 5237.20528 0.04% - 0s
120 H 0 0
                          5235.4966462 5237.20528 0.03%
121
        0 0
                      0 5236,7009882 5236,70099 0.00%
122
123 Cutting planes:
124
     Learned: 2
125
      Cover: 11
      Implied bound: 17
126
127
      Clique: 1
128
      MIR: 1
129
      Flow cover: 2
130
      RLT: 2
131
      Relax-and-lift: 13
132
      PSD: 2
133
134 Explored 1 nodes (1770 simplex iterations) in 0.64 seconds (0.83 work units)
135 Thread count was 8 (of 8 available processors)
136
137 Solution count 6: 5236.7 5235.5 5235.33 ... 3324.05
138
139 Optimal solution found (tolerance 1.00e-08)
140 Best objective 5.236700988201e+03, best bound 5.236700988201e+03, gap 0.0000%
141 SP is solved
142 SP's optimal solution is' ☐ 5236
143
144 Itr = 0
145 Collect_LB = [893.0]
146 Collect_UB = [11366.401976402514]
147 Collect Hua = [0.0]
148 Collect SPObjVal = [5236.700988201257]
149 Collect_MPObjValNHua = [893.0]
150
151
152
     Set parameter MIPGap to value 1e-10
153 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
154
155 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
156 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
157
158 Optimize a model with 541393 rows, 283978 columns and 1505179 nonzeros
159 Model fingerprint: 0x56a2e927
 160 Variable types: 1 continuous, 283977 integer (283941 binary)
161 Coefficient statistics:
      Matrix range [1e+00, 1e+10]
162
      Objective range [1e+00, 2e+01]
163
```

```
Bounds range
164
                    [1e+00, 1e+00]
165
      RHS range
                    [1e+00, 2e+10]
     Warning: Model contains large matrix coefficients
166
167
     Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
168
169
          to avoid numerical issues.
170 Presolve removed 377860 rows and 265257 columns (presolve time = 5s) ...
171 Presolve removed 490282 rows and 275538 columns
172 Presolve time: 9.17s
173 Presolved: 51111 rows, 8440 columns, 131258 nonzeros
174 Variable types: 0 continuous, 8440 integer (8414 binary)
175 Root relaxation presolved: 8440 rows, 59551 columns, 139698 nonzeros
176
177
178 Root simplex log...
179
180 Iteration Objective
                           Primal Inf. Dual Inf.
181
            handle free variables
                                              10s
       4391 6.6769047e+03 1.836262e+04 0.000000e+00
182
183
             6.1297010e+03 0.000000e+00 0.000000e+00
                                                           11s
       8144 6.1297010e+03 0.000000e+00 0.000000e+00
184
                                                           11s
185
186 Root relaxation: objective 6.129701e+03, 8144 iterations, 1.66 seconds (2.48 work units)
187
188
       Nodes | Current Node | Objective Bounds

↓ Work

189
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
190
191
           0 6129.70099 0 13
                                    - 6129.70099
                                                       - 11s
                                     - 6129.70099
192
       0
           0.6129.70099 0.400
193
           0 6129.70099 0 345
                                     - 6129.70099
194
       0
           0 6129.70099 0 249
                                     - 6129.70099
                                                       - 14s
195
           0.6129.70099 0 35
                                    - 6129.70099
                                                       - 16s
       0
196
       0
           0.6129.70099 \quad 0.282
                                     - 6129.70099
                                                       - 17s
197
       0
           0 6129.70099 0 307
                                     - 6129.70099
198
       0
           0 6129.70099 0 214
                                     - 6129.70099
                                                       - 18s
                                     - 6129.70099
199
           0 6129.70099 0 111
                                                       - 20s
       0
                                                       - 20s
200
       0
           0 6129.70099 0 110
                                     - 6129.70099
           0 6129.70099 0 190
                                     - 6129.70099
201
           0 6129.70099 0 120
                                     - 6129.70099
                                                       - 21s
202
       0
                                                   - - 21s
203
       0
           0 6129.70099 0 118
                                     - 6129.70099
204
           0 6129.70099 0 25
                                    - 6129.70099
                                                   - - 22s
205
       0
          0 6129.70099 0 25
                                    - 6129.70099
                                                       - 22s
                       6129.7009882 6129.70099 0.00%
206 H 0 0
           0 6129.70099 0 25 6129.70099 6129.70099 0.00%
207
208
209 Cutting planes:
210 Learned: 1
211
      Gomory: 2
212
      Cover: 128
     Implied bound: 22
213
214
      Clique: 2538
215
     MIR: 120
      StrongCG: 80
216
      GUB cover: 3
217
218
      Zero half: 8
219
      RLT: 7
220
      Relax-and-lift: 17
221
      BQP: 2
222
223 Explored 1 nodes (40936 simplex iterations) in 23.83 seconds (30.07 work units)
224 Thread count was 8 (of 8 available processors)
225
226 Solution count 1: 6129.7
227
228 Optimal solution found (tolerance 1.00e-10)
229 Best objective 6.129700988201e+03, best bound 6.129700988201e+03, gap 0.0000%
230 Set parameter MIPGap to value 1e-08
231 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
232
233 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
234 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
235
236 Optimize a model with 536188 rows, 14427 columns and 1098491 nonzeros
237 Model fingerprint: 0x2aed0eed
238 Variable types: 36 continuous, 14391 integer (8316 binary)
239 Coefficient statistics:
240 Matrix range [1e-01, 1e+10]
241
      Objective range [6e-05, 5e+01]
      Bounds range [1e+00, 1e+00]
242
                    [8e-01, 1e+10]
243
     RHS range
     Warning: Model contains large matrix coefficients
244
245 Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
246
247
          to avoid numerical issues.
```

```
248 Presolve removed 530927 rows and 12661 columns
249 Presolve time: 0.39s
250 Presolved: 5261 rows, 1766 columns, 14065 nonzeros
251 Variable types: 8 continuous, 1758 integer (1028 binary)
252 Found heuristic solution: objective 4330.7009882
253
254 Root relaxation: objective 6.044701e+03, 1621 iterations, 0.02 seconds (0.02 work units)
255
256
       Nodes | Current Node | Objective Bounds
                                                     Work
257
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
258
259 H 0 0
                         6044.7009882 15606.7410 158% - 0s
260
                  - 0 6044.70099 6044.70099 0.00% - 0s
261
262 Explored 1 nodes (2194 simplex iterations) in 0.56 seconds (0.79 work units)
263 Thread count was 8 (of 8 available processors)
264
265 Solution count 2: 6044.7 4330.7
266
267 Optimal solution found (tolerance 1.00e-08)
268 Best objective 6.044700988201e+03, best bound 6.044700988201e+03, gap 0.0000%
269 SP is solved
270 SP's optimal solution is' □ 6044
271
272 Itr = 1
273 Collect_LB = [893.0, 6129.700988201257]
274 Collect UB = [11366.401976402514, 6937.700988201257]
275 Collect_Hua = [0.0, 5236.700988201257]
276 Collect_SPObjVal = [5236.700988201257, 6044.700988201257]
277 Collect_MPObjValNHua = [893.0, 893.0]
278
279
280 Set parameter MIPGap to value 1e-10
281 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
282
283 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
284 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
285
286 Optimize a model with 541393 rows, 283978 columns and 1505179 nonzeros
287 Model fingerprint: 0x1ab23a7e
288 Variable types: 1 continuous, 283977 integer (283941 binary)
289 Coefficient statistics:
290 Matrix range [1e+00, 1e+10]
291
     Objective range [1e+00, 2e+01]
292
     Bounds range [1e+00, 1e+00]
                   [1e+00, 2e+10]
293
     RHS range
294 Warning: Model contains large matrix coefficients
295 Warning: Model contains large rhs
296
          Consider reformulating model or setting NumericFocus parameter
297
          to avoid numerical issues.
298 Presolve removed 377860 rows and 265257 columns (presolve time = 5s) ...
299 Presolve removed 490282 rows and 275538 columns
300 Presolve time: 9.10s
301 Presolved: 51111 rows, 8440 columns, 131258 nonzeros
302 Variable types: 0 continuous, 8440 integer (8414 binary)
303 Root relaxation presolved: 8440 rows, 59551 columns, 139698 nonzeros
304
305
306 Root simplex log...
307
308 Iteration Objective
                          Primal Inf. Dual Inf.
309
            handle free variables
       4863 7.2885241e+03 1.070318e+04 0.000000e+00
310
311
       8144 6.9377010e+03 0.000000e+00 0.000000e+00
                                                           11s
       8144 6.9377010e+03 0.000000e+00 0.000000e+00
312
                                                           11s
313
314 Root relaxation: objective 6.937701e+03, 8144 iterations, 1.60 seconds (2.48 work units)
315
316
       Nodes | Current Node | Objective Bounds

↓ Work

317
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
318
319
           0 6937.70099 0 13
                                    - 6937,70099
                                                       - 11s
320
       0
           0 6937.70099 0 400
                                     - 6937.70099
321
           0 6937.70099 0 345
                                     - 6937.70099
                                                       - 14s
322
           0 6937.70099 0 249
                                    - 6937,70099
       0
                                                       - 14s
323
       0
           0 6937.70099 0 35
                                    - 6937,70099
                                                      - 16s
324
           0 6937.70099 0 282
                                    - 6937.70099
325
       0
           0 6937.70099 0 307
                                     - 6937.70099
                                                       - 17s
                                                       - 17s
326
           0 6937,70099 0 214
                                     - 6937,70099
       0
327
       0
           0 6937.70099 0 111
                                     - 6937.70099
                                                       - 19s
328
       0
           0 6937.70099
                         0 110
                                     - 6937.70099
                                                       - 19s
           0 6937.70099 0 190
                                     - 6937.70099
                                                   - - 20s
329
       0
           0 6937.70099 0 120
                                     - 6937.70099
330
       0
                                                   - - 20s
       0
           0.6937.70099 \quad 0.118
                                     - 6937.70099
                                                       - 20s
331
```

```
unknown
                                                           22s
332
            0 6937.70099 0 25
                                     - 6937.70099
333
        0 0 6937.70099 0 25
                                     - 6937.70099
                        6937.7009882 6937.70099 0.00% - 23s
334 H 0 0
335
        0 0 6937.70099 0 25 6937.70099 6937.70099 0.00%
336
337 Cutting planes:
338
     Learned: 1
339
      Gomory: 2
340
      Cover: 128
341
      Implied bound: 22
342
      Clique: 2538
343
      MIR: 120
344
      StrongCG: 80
345
      GUB cover: 3
346
      Zero half: 8
347
      RLT: 7
      Relax-and-lift: 17
348
349
      BOP: 2
350
351 Explored 1 nodes (40936 simplex iterations) in 23.54 seconds (30.07 work units)
352 Thread count was 8 (of 8 available processors)
353
354 Solution count 1: 6937.7
355
356 Optimal solution found (tolerance 1.00e-10)
357 Best objective 6.937700988201e+03, best bound 6.937700988201e+03, gap 0.0000%
358 Set parameter MIPGap to value 1e-08
359 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
360
361 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
362
     Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
363
364 Optimize a model with 536188 rows, 14427 columns and 1098491 nonzeros
365 Model fingerprint: 0x2aed0eed
366 Variable types: 36 continuous, 14391 integer (8316 binary)
367 Coefficient statistics:
368
      Matrix range [1e-01, 1e+10]
369
      Objective range [6e-05, 5e+01]
370
      Bounds range [1e+00, 1e+00]
371
      RHS range
                     [8e-01, 1e+10]
     Warning: Model contains large matrix coefficients
    Warning: Model contains large rhs
373
374
          Consider reformulating model or setting NumericFocus parameter
375
          to avoid numerical issues.
376 Presolve removed 530927 rows and 12661 columns
377 Presolve time: 0.39s
378 Presolved: 5261 rows, 1766 columns, 14065 nonzeros
     Variable types: 8 continuous, 1758 integer (1028 binary)
380 Found heuristic solution: objective 4330.7009882
381
382 Root relaxation: objective 6.044701e+03, 1621 iterations, 0.02 seconds (0.02 work units)
383
384
       Nodes | Current Node | Objective Bounds
                                                          Work
385
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
386
387 H 0 0
                          6044.7009882 15606.7410 158% - 0s
388
                   - 0
                         6044.70099 6044.70099 0.00% - 0s
389
390 Explored 1 nodes (2194 simplex iterations) in 0.58 seconds (0.79 work units)
391 Thread count was 8 (of 8 available processors)
392
393
     Solution count 2: 6044.7 4330.7
394
395 Optimal solution found (tolerance 1.00e-08)
396 Best objective 6.044700988201e+03, best bound 6.044700988201e+03, gap 0.0000%
397
398 SP's optimal solution is' □ 6044
399
400 \text{ Itr} = 2
     Collect_LB = [893.0, 6129.700988201257, 6937.700988201257]
402 Collect_UB = [11366.401976402514, 6937.700988201257, 6937.700988201257]
403 Collect_Hua = [0.0, 5236.700988201257, 6044.700988201257]
404 Collect_SPObjVal = [5236.700988201257, 6044.700988201257, 6044.700988201257]
405 Collect MPObjValNHua = [893.0, 893.0, 893.0]
406
407
408
      Reach the termination conditions, stop iteration
409
      Values adopted from the Itr' th iteration, and Itr = \{2\}, judgeCount = \{2\}
410
                 ~judge = 2, SPObj_SPF = 6044.700988201257
                  pi: 0-5, ai-di: 54-79, gi_SP-gpi_SP: 0.000000-0.000000,
412
     Vessel i: 0:
                                                                               ai SP-di: 54-79,
                                                                                                 taoi-deltai: 54-68,
                                                                                                                     taoPi SP-deltaPi SP: 54-68,
                                                                                                                                                   betaNi:
     14. bi: 14
                   pi: 0-6, ai-di: 11-34, gi_SP-gpi_SP: 0.0000000-0.000000,
     Vessel i: 1:
                                                                               ai_SP-di: 11-34,
                                                                                                 taoi-deltai: 11-31,
                                                                                                                     taoPi_SP-deltaPi_SP: 11-31,
                                                                                                                                                   betaNi:
           bi: 20
```

```
unknown
414 Vessel i: 2:
                    pi: 6-11,
                                ai-di: 13-21,
                                               gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                     ai_SP-di: 13-21,
                                                                                                        taoi-deltai: 13-19,
                                                                                                                             taoPi_SP-deltaPi_SP: 13-19,
                                                                                                                                                             betaNi
      : 6, bi: 6
415 Vessel i: 3:
                                                                                     ai_SP-di: 47-82,
                                                                                                        taoi-deltai: 47-71,
                    pi: 5-12,
                                ai-di: 47-82,
                                               gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                                                             taoPi_SP-deltaPi_SP: 47-71,
                                                                                                                                                             betaNi
      : 24,
            bi: 24
                    pi: 6-11,
      Vessel i: 4:
                                ai-di: 33-46,
                                               gi SP-gpi SP: 0.000000-0.000000,
                                                                                     ai SP-di: 33-46,
                                                                                                         taoi-deltai: 33-38,
                                                                                                                             taoPi SP-deltaPi SP: 33-38,
                                                                                                                                                             betaNi
      : 5, bi: 5
417
     Vessel i: 5:
                    pi: 3-8,
                              ai-di: 40-55,
                                              gi_SP-gpi_SP: 0.000000-1.000000,
                                                                                    ai_SP-di: 40-55,
                                                                                                        taoi-deltai: 40-45,
                                                                                                                            taoPi_SP-deltaPi_SP: 40-45,
                                                                                                                                                           betaNi:
      5, bi: 5
     Vessel i: 6:
                    pi: 14-20,
                                 ai-di: 9-31,
                                               gi_SP-gpi_SP: 0.500000-0.100000,
                                                                                     ai_SP-di: 13-31,
                                                                                                         taoi-deltai: 13-27,
                                                                                                                             taoPi_SP-deltaPi_SP: 13-27,
                                                                                                                                                             betaNi
      : 14, bi: 14
      Vessel i: 7:
                    pi: 27-34,
                                                 gi_SP-gpi_SP: 0.900000-0.700000,
                                                                                      ai_SP-di: 22-47,
                                                                                                         taoi-deltai: 22-47,
                                                                                                                              taoPi_SP-deltaPi_SP: 22-47,
                                 ai-di: 13-47,
      betaNi: 25,
                    bi: 25
                    pi: 15-22,
      Vessel i: 8:
                                 ai-di: 36-72,
                                                gi_SP-gpi_SP: 1.000000-0.600000,
                                                                                      ai SP-di: 43-72,
                                                                                                         taoi-deltai: 43-71,
                                                                                                                              taoPi SP-deltaPi SP: 43-71,
      betaNi: 28,
                    bi: 28
421
422 round LB = [893, 6130, 6938]
423 round UB = [11366, 6938, 6938]
424 round Hua = [0, 5237, 6045]
425 round SPObjVal = [5237, 6045, 6045]
426 round MPObjValNHua = [893, 893, 893]
427
428 OptimalObj = 6937.700988201257
429 Time: 133.000000
430
431
432
433
```