



81	3922	3447	529.50818	61	2496	539.00000	529.50818	1.76%	15.9	96s
82	3923	3447	529.94308	53	2265	539.00000	529.94308	1.68%	15.9	101s
83	3927	3450	530.90088	118	2189	539.00000	530.90088	1.50%	15.9	108s
84	3929	3451	531.20844	233	2269	539.00000	531.20844	1.45%	15.9	110s
85	3930	3452	532.00000	388	2142	539.00000	532.00000	1.30%	15.9	117s
86	3934	3455	532.00000	876	2106	539.00000	532.00000	1.30%	15.9	125s
87	3938	3457	533.00000	148	1908	539.00000	533.00000	1.11%	15.9	131s
88	3941	3459	534.00000	148	2224	539.00000	534.00000	0.93%	15.8	136s
89	3943	3461	534.00000	15	2216	539.00000	534.00000	0.93%	15.8	152s
90	3948	3467	534.00000	15	1535	539.00000	534.00000	0.93%	25.3	156s
91	4012	3514	534.00000	23	1507	539.00000	534.00000	0.93%	30.2	160s
92	4237	3669	534.00000	48	1375	539.00000	534.00000	0.93%	41.4	165s
93	4510	3872	534.00000	78	1505	539.00000	534.00000	0.93%	51.4	170s
94	4795	4072	534.00000	111	1415	539.00000	534.00000	0.93%	59.5	175s
95	5067	4262	534.00000	140	1395	539.00000	534.00000	0.93%	68.8	180s
96	5382	4454	534.00000	172	1049	539.00000	534.00000	0.93%	76.0	185s
97	5659	4643	534.00000	205	1158	539.00000	534.00000	0.93%	83.0	190s
98	5958	4829	534.00000	236	1147	539.00000	534.00000	0.93%	89.9	196s
99	6212	5012	534.00000	262	1139	539.00000	534.00000	0.93%	96.3	201s
100	6434	5145	534.00000	290	1097	539.00000	534.00000	0.93%	101	205s
101	6781	5388	534.00000	340	1063	539.00000	534.00000	0.93%	107	211s
102	7042	5536	534.00000	376	1043	539.00000	534.00000	0.93%	112	216s
103	7309	5597	534.00000	414	1020	539.00000	534.00000	0.93%	115	222s
104	7416	5650	534.00000	432	1010	539.00000	534.00000	0.93%	117	227s
105	7619	5745	534.00000	458	934	539.00000	534.00000	0.93%	118	230s
106	7974	5865	534.00000	513	923	539.00000	534.00000	0.93%	124	236s
107	8156	6087	534.00000	532	834	539.00000	534.00000	0.93%	127	242s
108	8378	6190	534.00000	563	879	539.00000	534.00000	0.93%	128	245s
109	8690	6322	534.00000	593	806	539.00000	534.00000	0.93%	133	252s
110	8843	6363	534.00000	609	789	539.00000	534.00000	0.93%	137	256s
111	8958	6430	534.00000	618	694	539.00000	534.00000	0.93%	139	260s
112	9158	6431	infeasible	649		539.00000	534.00000	0.93%	142	265s
113	9522	6523	534.00000	687	673	539.00000	534.00000	0.93%	145	273s
114	9707	6590	cutoff	705		539.00000	534.00000	0.93%	146	277s
115	10105	6658	534.00000	742	693	539.00000	534.00000	0.93%	146	282s
116	10550	6627	534.00000	784	673	539.00000	534.00000	0.93%	146	286s
117	10732	6621	534.00000	796	662	539.00000	534.00000	0.93%	148	291s
118	10904	6645	infeasible	810		539.00000	534.00000	0.93%	151	296s
119	11280	6562	534.00000	860	594	539.00000	534.00000	0.93%	152	301s
120	11613	6732	534.00000	911	562	539.00000	534.00000	0.93%	151	309s
121	12230	6968	534.00000	85	916	539.00000	534.00000	0.93%	149	315s
122	12703	7181	534.00000	142	889	539.00000	534.00000	0.93%	152	324s
123	13083	7211	534.00000	209	839	539.00000	534.00000	0.93%	153	332s
124	13254	7661	534.00000	245	844	539.00000	534.00000	0.93%	154	339s
125	13763	7952	534.00000	302	793	539.00000	534.00000	0.93%	159	347s
126	14247	8508	534.00000	335	738	539.00000	534.00000	0.93%	161	354s
127	14922	8876	534.00000	396	656	539.00000	534.00000	0.93%	162	360s
128	15331	9359	534.00000	431	612	539.00000	534.00000	0.93%	161	365s
129	15929	9782	534.00000	495	582	539.00000	534.00000	0.93%	160	370s
130	16528	10119	534.00000	555	537	539.00000	534.00000	0.93%	158	421s
131	16971	10320	534.00000	598	522	539.00000	534.00000	0.93%	156	428s
132	17223	10694	534.00000	635	523	539.00000	534.00000	0.93%	156	433s
133	17805	11169	534.00000	714	458	539.00000	534.00000	0.93%	155	439s
134	18557	11601	534.00000	806	306	539.00000	534.00000	0.93%	152	445s
135	19063	12096	534.00000	844	389	539.00000	534.00000	0.93%	150	452s
136	19705	12492	534.00000	888	302	539.00000	534.00000	0.93%	147	459s
137	20236	12963	534.00000	927	280	539.00000	534.00000	0.93%	145	467s
138	20865	13587	534.00000	108	1135	539.00000	534.00000	0.93%	142	473s
139	21601	14164	534.00000	322	902	539.00000	534.00000	0.93%	139	478s
140	22234	14986	534.00000	525	762	539.00000	534.00000	0.93%	136	484s
141	23094	15826	534.00000	740	718	539.00000	534.00000	0.93%	131	490s
142	24296	16589	534.00000	1020	592	539.00000	534.00000	0.93%	126	495s
143	25085	17428	534.00000	1263	463	539.00000	534.00000	0.93%	123	500s
144	25765	17976	534.00000	1428	335	539.00000	534.00000	0.93%	120	505s
145	26639	18663	534.00000	286	542	539.00000	534.00000	0.93%	117	510s
146	27218	19368	534.00000	493	245	539.00000	534.00000	0.93%	114	516s
147	27644	19729	534.00000	571	215	539.00000	534.00000	0.93%	113	520s
148	28558	20665	534.00000	242	766	539.00000	534.00000	0.93%	110	526s
149	29287	21282	534.00000	417	603	539.00000	534.00000	0.93%	108	532s
150	29681	21704	534.00000	534	541	539.00000	534.00000	0.93%	107	535s
151	30308	22338	534.00000	647	506	539.00000	534.00000	0.93%	105	541s
152	31201	23014	534.00000	923	405	539.00000	534.00000	0.93%	103	546s
153	31523	23550	534.00000	973	339	539.00000	534.00000	0.93%	102	550s
154	32560	24215	534.00000	242	851	539.00000	534.00000	0.93%	99.4	555s
155										
156	Cutting planes:									
157	Learned: 788									
158	Gomory: 7									
159	Implied bound: 82									
160	Projected implied bound: 15									
161	MIR: 1754									
162	StrongCG: 205									
163	Flow cover: 5339									
164	Inf proof: 25									

```

165 Zero half: 339
166 RLT: 10
167 Relax-and-lift: 8573
168 BQP: 8
169
170 Explored 33439 nodes (3263882 simplex iterations) in 1201.11 seconds (975.11 work units)
171 Thread count was 8 (of 8 available processors)
172
173 Solution count 3: 539 539 539
174
175 Time limit reached
176 Best objective 5.390000000000e+02, best bound 5.340000000000e+02, gap 0.9276%
177
178 Output one feasible solution with limited computation time
179
180 Optimization was stopped with status 9
181
182 Number of solution stored: 3
183 539 539 539
184
185 Obj = 539.0
186
187 Solutions:
188 The total pi = 154.0
189 The total duration time in berth stage = 135.0
190 The total duration time in quay crane scheduling stage = 32.0
191 The total departure time in berth stage= 321.0
192 The total departure time in quay crane scheduling stage = 218.0
193 The total wasted crane work hour according QC0= 9.491742652971432
194 The last depature time in quay crane scheduling stage = 42.0
195
196 The specific solution are as follows:
197 Vessel i: 0: li: 7, pi: 11-18, ai-di: 30-53, taoi-deltai: 30-53, periodi: 23, taoPi_SP-
deltaPi_SP: 30-37, periodPi: 7, c_i: 5966545, dowork: 6063812, fa_i: 2
198 Vessel i: 1: li: 5, pi: 6-11, ai-di: 32-66, taoi-deltai: 32-36, periodi: 4, taoPi_SP-deltaPi_SP:
32-33, periodPi: 1, c_i: 1000124, dowork: 1054576, fa_i: 4
199 Vessel i: 2: li: 5, pi: 28-33, ai-di: 41-75, taoi-deltai: 41-46, periodi: 5, taoPi_SP-deltaPi_SP
: 41-42, periodPi: 1, c_i: 1063680, dowork: 1318220, fa_i: 4
200 Vessel i: 3: li: 5, pi: 13-18, ai-di: 11-44, taoi-deltai: 11-25, periodi: 14, taoPi_SP-
deltaPi_SP: 11-14, periodPi: 3, c_i: 3494800, dowork: 3691016, fa_i: 4
201 Vessel i: 4: li: 5, pi: 23-28, ai-di: 22-59, taoi-deltai: 22-39, periodi: 17, taoPi_SP-
deltaPi_SP: 22-25, periodPi: 3, c_i: 4279927, dowork: 4350126, fa_i: 4
202 Vessel i: 5: li: 6, pi: 28-34, ai-di: 8-44, taoi-deltai: 8-23, periodi: 15, taoPi_SP-deltaPi_SP
: 8-11, periodPi: 3, c_i: 3934082, dowork: 3954660, fa_i: 4
203 Vessel i: 6: li: 5, pi: 18-23, ai-di: 13-62, taoi-deltai: 13-38, periodi: 25, taoPi_SP-
deltaPi_SP: 13-18, periodPi: 5, c_i: 6531560, dowork: 6722922, fa_i: 4
204 Vessel i: 7: li: 6, pi: 0-6, ai-di: 15-56, taoi-deltai: 15-33, periodi: 18, taoPi_SP-deltaPi_SP
: 15-20, periodPi: 5, c_i: 4668515, dowork: 5009236, fa_i: 4
205 Vessel i: 8: li: 5, pi: 19-24, ai-di: 6-32, taoi-deltai: 6-11, periodi: 5, taoPi_SP-deltaPi_SP: 6
-7, periodPi: 1, c_i: 1186011, dowork: 1581864, fa_i: 4
206 Vessel i: 9: li: 5, pi: 8-13, ai-di: 8-29, taoi-deltai: 8-17, periodi: 9, taoPi_SP-deltaPi_SP: 8-
11, periodPi: 3, c_i: 2282475, dowork: 3163728, fa_i: 4
207 TimeSolveModel: 1212.000000
208
209 TimeAll: 1216.000000
210
211

```