A Matheuristic for Solving Inventory Sharing Problems : A corrigendum to experimental results

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Abstract

This document provides a correction of some of values reported in the appendix of our article entitled "A Matheuristic for Solving Inventory Sharing Problems" (Computers & Operations Research, Volume 138, 2022, 105605, ISSN 0305-0548, https://doi.org/10.1016/j.cor.2021.105605). The correction only concerns the results of the experiments performed on the benchmark of large instances generated for the single and multi-vehicle inventory routing problem. All tables are presented along with the corrected values.

Keywords: Shared Inventory, Transshipment, Inventory Routing Problem, Matheuristic

1. On the main contributions of the paper (Achamrah et al., 2022)

In Achamrah et al. (2022), we presented a new mathematical model for a multi-product multi-vehicle inventory routing problem with transshipment in which transshipment-related decisions, unlike other research, are integrated into the design of routes. Each vehicle is allowed to deliver regular demand of each product: from a Central Warehouse to customers, and also to deliver transshipped products from a pickup node to a delivery node. Moreover, we proposed an original matheuristic to handle the combinatorial complexity of the problem which integrates mathematical modelling strengthened with relevant derived valid inequalities and hybridisation of two sophisticated metaheuristics, namely Genetic Algorithm and Simulated Annealing. Furthermore, we conducted experiments to highlight the inventory sharing benefits and draw managerial insights.

In tandem, we conducted broad experiments to assess the performance of the suggested matheuristic on another classical problem. We used 660 benchmark sets of the literature designed for the classical single and multi-vehicle IRP without transshipment. The benchmark consists of 160 small instances proposed by Archetti et al. (2007), 60 large ones proposed by Archetti et al. (2012) for a single-vehicle IRP, and 320 small instances and 120 large ones adapted for multi-vehicle case ($k = \{2, 3\}$) by Coelho and Laporte (2013). Our results are compared to those obtained using the best known exact algorithm branch-and-cut (B-C) of

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Coelho and Laporte (2013, 2014) with a time limit up to 86400 s and to the recent improved branch-and-cut (I-B-C) developed by Guimarães et al. (2020).

Experimental results show that the proposed matheuristic can find optimal solutions for all 160 small-scale instances for single-vehicle IRP and within a minimal amount of time compared to B-C and I-B-C. Moreover, for the multi-vehicle cases under consideration, on average, both I-B-C and matheuristic outperform B-C in terms of the number of optimal solutions found and run time. Finally, for the 320 instances, the matheuristic outperforms I-B-C, the current best resolution approach regarding computational times, which highlights its performance and efficiency.

As for 180 large-scale instances generated for single-vehicle and multi-vehicle IRP, we claimed that, with respect to the gap computed using lower bound of B-C and I-B-C, our matheursitic can find solutions with lower average gap: 8.06% against 9.29% for I-B-C and 28.07% for B-C. However, some of the reported results are incorrect, they are found to be lower than the best lower bounds reported by Guimarães et al. (2020) and Coelho and Laporte (2013, 2014). Accordingly, we re-run tests to correct these values. In the following section, we present the update of tables presented in the appendix.

2. Correction of tables presented in Subsection 5.3.1

Table 1 summarises the comparison of the results regarding the average $\overline{UB}$, $\overline{GLB}$ and $\overline{CPU}$. Tables 2, 3, 4, 5, 6 and 7 provide detailed results for IRP on large instances. For each exact algorithm B-C and I-B-C, the tables report the best solutions found so far (noted $Z1$ and $Z2$ respectively), and the corresponding CPU in second. For the matheuristic, tables provide the worst solution (WS), the best solution (BS), the average of the best solutions found ($\overline{BFS}$), and the average of the scaled CPU ($\overline{S\_CPU}$) with regards to hardware performances. Tables also provide the contribution of the constructive phase (CPC in %) in improving the quality of the final solution. Finally, for each $\overline{S\_CPU}$, tables report the computational time needed in the constructive phase (CP) and improvement phase (IP).

From Table 1, we can see that the proposed matheuristic can always find solutions within a least amount of computational time compared to B-C and I-B-C due to its exploration capability regarding the searching procedures. Indeed, the matheursitic can find solutions with an average $\overline{CPU}$ of 3045 s against 6654 s for I-B-C and 79103 s for B-C. As for solution quality, we can see that both I-B-C and the matheuristic outperform B-C and that I-B-C has yet the lowest $\overline{UB}$ compared to our matheuristic. Moreover, both approaches can find good exclusive solutions. On the other hand, we can observe that, unlike small instances, the matheuristic does not scale quite well with large instances. In this case, there is an exponential increase in search space size, which requires an increase of the GA' population size to further explore the space.

Table 1: Summary of comparison of results for large benchmark instances obtained using B-C, I-B-C and the matheuristic

Instances				B-C		I-B-C		Matheuristic	
K	T	IC	NI	$\overline{UB}$	$\overline{CPU}$(s)	$\overline{UB}$	$\overline{CPU}$(s)	$\overline{UB}$	$\overline{CPU}$(s)
1	6	Low	30	19911	69058	16535	5798	16879	2315
	6	High	30	72078	59960	64431	5326	65681	2692
2	6	Low	30	31061	86400	18804	7200	19689	2732
	6	High	30	60487	86400	66886	7200	69679	3148
3	6	Low	30	42348	86400	22235	7200	23062	3401
	6	High	30	84955	86400	70505	7200	73382	3981

Table 2: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=1, high cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N1K6T	30,189	3,056	30,189	744	30,552	30,190	30,392	48	1314	1458	2772
1P50N1K6T	29,790	3,334	29,790	730	30,088	29,790	29,900	44	1221	1206	2427
1P50N1K6T	29,791	4,020	29,791	1,399	30,089	29,791	29,801	45	1902	2191	4093
1P50N1K6T	31,518	5,737	31,518	1,910	31,897	31,519	31,819	50	1894	2330	4224
1P50N1K6T	29,240	684	29,240	3,586	29,563	29,241	29,269	36	1110	1281	2391
1P50N1K6T	31,903	28,320	31,903	3,477	32,223	31,904	31,934	30	1048	1082	2130
1P50N1K6T	29,735	13,561	29,734	1,412	30,062	29,735	29,892	44	1990	1945	3935
1P50N1K6T	25,954	21,552	25,954	1,312	26,241	25,955	26,228	43	779	1020	1799
1P50N1K6T	30,193	20,581	30,193	1,401	30,495	30,193	30,494	44	1051	1368	2419
1P50N1K6T	31,338	1,879	31,338	2,295	31,652	31,339	31,456	41	599	652	1250
1P100N1K6T	57,459	86,400	57,334	7,200	58,359	57,716	57,970	31	1641	2145	3786
1P100N1K6T	53,510	86,400	53,311	7,200	53,969	53,329	53,703	36	1030	1194	2224
1P100N1K6T	58,505	86,400	58,421	7,200	59,195	58,493	59,109	44	2028	2138	4166
1P100N1K6T	51,554	86,400	51,552	7,200	52,121	51,554	51,755	34	651	749	1400
1P100N1K6T	57,977	86,400	57,943	4,705	58,537	57,957	58,156	32	610	681	1291
1P100N1K6T	55,088	86,400	55,091	7,200	55,695	55,089	55,473	50	1630	1662	3292
1P100N1K6T	56,077	86,400	56,054	7,200	56,620	56,059	56,422	35	863	842	1705
1P100N1K6T	56,057	86,400	55,052	7,200	56,193	55,637	55,722	50	1016	1085	2101
1P100N1K6T	59,426	86,400	58,483	7,200	60,074	59,362	59,694	47	1695	1800	3495
1P100N1K6T	56,588	86,400	56,354	7,200	57,053	56,488	56,489	48	1788	2087	3875
1P200N1K6T	136,337	86,400	111,200	7,200	117,571	116,177	117,063	42	974	1267	2241
1P200N1K6T	141,543	86,400	112,350	7,200	118,102	116,817	117,974	50	1875	2260	4135
1P200N1K6T	123,147	86,400	108,335	7,200	113,693	112,456	112,785	35	1758	2322	4080
1P200N1K6T	129,615	86,400	109,413	7,200	117,458	116,295	117,426	32	1003	1127	2130
1P200N1K6T	126,552	86,400	109,376	7,200	113,762	109,106	113,328	39	1371	1752	3123
1P200N1K6T	136,513	86,400	109,403	7,200	111,321	110,219	110,843	52	1923	1860	3783
1P200N1K6T	111,186	86,400	97,939	7,200	105,586	104,334	105,574	33	841	1065	1906
1P200N1K6T	115,946	86,400	101,754	7,200	106,017	104,967	105,701	35	634	700	1334
1P200N1K6T	136,819	54,474	104,847	7,200	106,143	104,988	105,623	42	857	923	1780
1P200N1K6T	142,796	86,400	109,056	7,200	114,987	113,736	114,858	40	727	740	1467
Average	72078.2	59959.9	64430.7	5325.7	66510.6	65795.4	66228.4	41.1	1260.8	1431.0	2691.8

* All values are rounded up for the sake of a better presentation

Table 3: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=1, low cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N1K6T	9,976	86,400	9,966	1,485	10,085	9,975	9,987	50	986	974	1960
1P50N1K6T	10,632	2,536	10,632	758	10,749	10,632	10,678	51	631	827	1458
1P50N1K6T	10,511	1,355	10,511	4,575	10,627	10,511	10,569	40	656	659	1315
1P50N1K6T	10,513	60,289	10,513	2,181	10,630	10,514	10,520	31	1101	1449	2550
1P50N1K6T	10,113	2,416	10,113	5,349	10,214	10,113	10,171	46	1150	1450	2600
1P50N1K6T	10,148	86,400	10,148	3,831	10,757	10,629	10,690	45	1294	1404	2698
1P50N1K6T	9,982	14,698	9,982	1,331	10,103	9,983	10,009	36	1385	1620	3005
1P50N1K6T	10,299	86,400	10,299	4,795	10,413	10,300	10,327	43	1023	1341	2364
1P50N1K6T	10,010	6,326	10,010	1,731	10,130	10,010	10,086	51	973	1279	2252
1P50N1K6T	9,659	3,523	9,659	3,912	9,766	9,660	9,731	38	1194	1239	2433
1P100N1K6T	15,649	86,400	15,639	7,200	15,828	15,640	15,745	31	1092	1279	2371
1P100N1K6T	14,697	86,400	14,551	7,200	14,756	14,581	14,678	52	1066	1406	2472
1P100N1K6T	16,155	86,400	15,539	7,200	16,089	15,898	16,021	40	1076	1273	2349
1P100N1K6T	14,644	86,400	14,643	7,200	14,804	14,643	14,669	48	1232	1252	2484
1P100N1K6T	15,235	86,400	15,222	7,200	15,410	15,227	15,325	50	1511	1669	3180
1P100N1K6T	15,769	86,400	15,226	7,200	15,427	15,259	15,344	51	1193	1218	2411
1P100N1K6T	15,538	86,400	15,321	7,200	15,665	15,495	15,620	48	815	1022	1837
1P100N1K6T	15,279	86,400	15,041	7,200	15,383	15,201	15,207	35	1422	1607	3029
1P100N1K6T	17,190	86,400	15,563	7,200	15,999	15,825	15,832	46	1536	1598	3134
1P100N1K6T	16,145	86,400	15,464	7,200	16,233	16,056	16,223	39	1494	1485	2979
1P200N1K6T	32,683	86,400	24,373	7,200	27,225	26,955	27,168	42	1241	1407	2648
1P200N1K6T	34,033	86,400	24,708	7,200	25,503	25,226	25,427	51	1292	1538	2830
1P200N1K6T	33,317	86,400	23,914	7,200	24,888	24,593	24,593	43	1143	1343	2486
1P200N1K6T	34,004	86,400	24,396	7,200	25,025	24,777	24,826	38	965	1118	2083
1P200N1K6T	35,487	86,400	25,216	7,200	26,250	25,990	26,024	36	841	952	1793
1P200N1K6T	33,360	86,400	23,917	7,200	24,991	24,695	24,751	52	820	836	1656
1P200N1K6T	32,774	86,400	23,977	7,200	24,281	24,017	24,035	48	586	714	1300
1P200N1K6T	33,489	79,789	23,165	7,200	24,685	24,392	24,615	37	1179	1227	2406
1P200N1K6T	35,173	86,400	24,729	7,200	25,034	24,737	24,924	50	806	812	1618
1P200N1K6T	34,872	86,400	23,597	7,200	25,088	24,840	24,897	34	871	871	1742
Average	19,911.2	69057.7	16,534.5	5798.3	17,067.9	16,879.1	16,956.4	43.3	1085.8	1229.0	2314.8

* All values are rounded up for the sake of a better presentation

Table 4: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=2, high cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N2K6T	31,783	86,400	31,557	7200	31,979	31,600	31,819	36	1715	1755	3470
1P50N2K6T	31,121	86,400	30,957	7200	31,429	31,118	31,359	41	1435	1459	2894
1P50N2K6T	30,439	86,400	30,377	7200	30,755	30,420	30,513	40	1008	1225	2233
1P50N2K6T	32,722	86,400	32,288	7200	32,977	32,586	32,627	48	1957	2341	4298
1P50N2K6T	30,115	86,400	30,100	7200	30,441	30,110	30,278	37	1523	1932	3455
1P50N2K6T	33,495	86,400	33,182	7200	33,602	33,269	33,485	38	1219	1544	2763
1P50N2K6T	31,840	86,400	31,315	7200	31,888	31,541	31,773	33	1701	1723	3424
1P50N2K6T	28,552	86,400	27,709	7200	28,381	28,072	28,252	41	1106	1305	2411
1P50NK6T	31,415	86,400	31,287	7200	31,723	31,409	31,605	51	1159	1407	2566
1P50N2K6T	32,788	86,400	32,691	7200	33,027	32,700	33,000	49	1575	1680	3255
1P100N2K6T	91,823	86,400	58,447	7200	61,879	61,266	61,934	41	1972	2245	4217
1P100N2K6T	59,861	86,400	54,791	7200	56,658	56,097	56,181	43	1597	1741	3338
1P100N2K6T	114,040	86,400	59,528	7200	62,469	61,789	62,456	46	1117	1179	2296
1P100N2K6T	55,344	86,400	52,743	7200	54,607	54,066	54,407	37	1601	1628	3229
1P100N2K6T	67,259	86,400	60,179	7200	65,081	64,437	64,833	45	1185	1154	2339
1P100N2K6T	93,171	86,400	57,456	7200	61,983	61,369	61,490	36	2071	2002	4073
1P100N2K6T	111,776	86,400	57,124	7200	62,944	62,198	62,590	52	1850	2415	4265
1P100N2K6T	142,585	86,400	57,247	7200	61,402	60,734	61,274	30	1309	1731	3040
1P100N2K6T	70,293	86,400	60,189	7200	65,692	65,042	65,214	37	1038	1337	2375
1P100N2K6T	89,315	86,400	58,088	7200	63,037	62,290	62,368	52	1979	2277	4256
1P200N2K6T	-	-	114,641	7200	116,401	115,021	115,109	40	1074	1206	2280
1P200N2K6T	-	-	116,632	7200	119,203	118,023	118,736	52	1276	1593	2869
1P200N2K6T	-	-	112,425	7200	114,703	113,567	114,139	30	1480	1770	3250
1P200N2K6T	-	-	112,426	7200	127,441	125,930	127,035	37	1251	1427	2678
1P200N2K6T	-	-	113,247	7200	118,170	116,768	116,875	36	1555	1678	3233
1P200N2K6T	-	-	113,719	7200	123,944	122,717	123,466	31	1444	1588	3032
1P200N2K6T	-	-	103,707	7200	112,197	111,086	111,532	40	1468	1560	3028
1P200N2K6T	-	-	108,320	7200	111,158	110,057	110,266	42	1925	1974	3899
1P200N2K6T	-	-	109,730	7200	118,334	117,162	118,250	35	1247	1505	2752
1P200N2K6T	-	-	114,489	7200	119,217	117,920	118,889	39	1585	1633	3218
Average	60,486.7	86400.0	66,886.3	7200.0	70,424.0	69,678.8	70,058.5	40.4	1481	1667	3148

* All values are rounded up for the sake of a better presentation

Table 5: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=2, low cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N2K6T	12209	86400	11317	7200	11,615	11,500	11,542	42	1114	1246	2360
1P50N2K6T	11820	86400	11705	7200	11,850	11,709	11,844	45	1467	1683	3150
1P50N2K6T	11238	86400	11041	7200	11,301	11,189	11,221	37	1064	1209	2273
1P50N2K6T	11740	86400	11152	7200	11,286	11,174	11,217	37	1264	1310	2574
1P50N2K6T	10856	86400	10873	7200	10,986	10,866	10,868	40	1167	1199	2366
1P50N2K6T	11662	86400	11381	7200	11,620	11,494	11,500	45	957	1248	2205
1P50N2K6T	12012	86400	11530	7200	11,765	11,637	11,731	42	1195	1319	2514
1P50N2K6T	13379	86400	12130	7200	13,362	13,217	13,353	45	1498	1728	3226
1P50NK6T	11302	86400	11079	7200	11,294	11,171	11,231	45	1145	1416	2561
1P50N2K6T	11475	86400	10891	7200	11,482	11,368	11,381	41	1263	1379	2642
1P100N2K6T	50284	86400	17082	7200	18,481	18,280	18,434	46	1671	1624	3295
1P100N2K6T	72767	86400	16000	7200	17,370	17,164	17,220	37	1078	1185	2263
1P100N2K6T	20837	86400	17145	7200	17,494	17,287	17,409	50	1235	1347	2582
1P100N2K6T	42634	86400	15423	7200	16,406	16,244	16,298	46	1368	1460	2828
1P100N2K6T	72016	86400	16449	7200	17,677	17,502	17,506	48	1097	1316	2413
1P100N2K6T	52945	86400	17220	7200	18,727	18,505	18,520	43	1637	1604	3241
1P100N2K6T	47628	86400	16780	7200	17,121	16,935	16,942	32	1222	1480	2702
1P100N2K6T	47360	86400	17773	7200	18,991	18,784	18,939	46	1323	1340	2663
1P100N2K6T	48667	86400	16979	7200	17,519	17,346	17,406	35	1610	1617	3227
1P100N2K6T	48398	86400	16259	7200	17,576	17,385	17,547	50	1427	1755	3182
1P200N2K6T	-	-	28662	7200	30,794	30,459	30,786	34	1012	1323	2335
1P200N2K6T	-	-	27535	7200	29,984	29,658	29,914	48	1400	1382	2782
1P200N2K6T	-	-	27828	7200	29,402	29,082	29,150	43	1394	1603	2997
1P200N2K6T	-	-	28333	7200	30,628	30,295	30,527	46	1652	1608	3260
1P200N2K6T	-	-	29083	7200	30,530	30,168	30,195	37	1154	1207	2361
1P200N2K6T	-	-	28551	7200	31,345	30,973	31,006	34	1275	1408	2683
1P200N2K6T	-	-	28293	7200	29,652	29,301	29,361	46	1118	1221	2339
1P200N2K6T	-	-	29290	7200	31,366	30,994	31,248	33	1289	1609	2898
1P200N2K6T	-	-	29077	7200	30,668	30,364	30,446	32	1337	1495	2832
1P200N2K6T	-	-	27265	7200	28,913	28,626	28,807	48	1460	1731	3191
Average	31,061.3	86400.0	18,804.2	7200.0	19,906.8	19,689.2	19,785.0	41.8	1296.4	1435.1	2731.5

* All values are rounded up for the sake of a better presentation

Table 6: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=3, high cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N3K6T	36,497	86,400	33,449	7200	34,225	33,819	34,189	49	1926	1917	3843
1P50N3K6T	37,328	86,400	33,594	7200	34,477	34,068	34,091	31	2048	2250	4298
1P50N3K6T	33,124	86,400	32,148	7200	32,748	32,424	32,480	49	1978	2581	4559
1P50N3K6T	41,325	86,400	34,533	7200	35,751	35,397	35,568	40	2168	2579	4747
1P50N3K6T	34,070	86,400	32,067	7200	32,737	32,381	32,454	30	2183	2107	4290
1P50N3K6T	38,640	86,400	35,892	7200	36,491	36,058	36,175	34	1839	1857	3696
1P50N3K6T	35,795	86,400	33,496	7200	34,768	34,356	34,594	39	1663	1895	3558
1P50N3K6T	33,535	86,400	30,535	7200	32,161	31,843	32,110	46	2064	2273	4337
1P50N3K6T	36,437	86,400	33,529	7200	33,919	33,583	33,849	33	1849	2306	4155
1P50N3K6T	36,330	86,400	35,027	7200	35,550	35,163	35,491	41	1487	1904	3391
1P100N3K6T	110,146	86,400	62,597	7200	66,021	65,367	65,441	42	1561	1963	3524
1P100N3K6T	107,683	86,400	60,160	7200	65,560	64,847	65,221	42	1666	1682	3348
1P100N3K6T	165,084	86,400	64,933	7200	68,012	67,272	67,837	50	1705	2220	3925
1P100N3K6T	168,527	86,400	54,369	7200	58,847	58,207	58,833	39	1852	2321	4173
1P100N3K6T	167,986	86,400	63,306	7200	70,618	69,919	70,139	46	2239	2316	4555
1P100N3K6T	109,981	86,400	60,243	7200	63,547	62,793	62,978	38	1818	2348	4166
1P100N3K6T	107,437	86,400	61,319	7200	66,154	65,499	65,583	45	2300	2253	4553
1P100N3K6T	106,218	86,400	61,236	7200	66,736	65,945	66,294	44	1858	2153	4011
1P100N3K6T	184,721	86,400	64,627	7200	68,230	67,421	67,926	44	1820	1825	3645
1P100N3K6T	108,231	86,400	60,377	7200	63,560	62,931	63,070	48	1745	1710	3455
1P200N3K6T	-	-	120,512	7200	124,770	123,412	123,770	42	2027	1991	4018
1P200N3K6T	-	-	122,979	7200	129,930	128,644	129,030	51	1647	1978	3625
1P200N3K6T	-	-	118,259	7200	125,101	123,618	124,148	46	2157	2371	4528
1P200N3K6T	-	-	117,705	7200	120,322	119,131	119,897	50	1728	1800	3528
1P200N3K6T	-	-	118,737	7200	123,205	121,864	121,916	41	1738	1882	3620
1P200N3K6T	-	-	118,640	7200	123,679	122,333	123,539	43	1858	2240	4098
1P200N3K6T	-	-	107,266	7200	115,668	114,297	115,369	44	1593	2106	3699
1P200N3K6T	-	-	112,216	7200	116,104	114,840	116,026	31	1654	2166	3820
1P200N3K6T	-	-	113,994	7200	118,338	117,167	117,777	44	1963	2377	4340
1P200N3K6T	-	-	117,407	7200	128,272	126,876	127,240	32	1849	2081	3930
Average	84,954.7	86400.0	70,505.0	7200.0	74,183.4	73,382.5	73,767.8	41.8	1866.2	2115.0	3981.2

* All values are rounded up for the sake of a better presentation

Table 7: Computational results for large scale benchmark instances using B-C, I-B-C and matheuristic (k=3, low cost)

Instances	B-C		I-B-C		Matheursitic						
					WS	BS	BSF	CPC (%)	S_CPU		
	Z1	CPU	Z2	CPU					CP	IP	Total
1P50N3K6T	15,533	86,400	13,337	7200	14,396	14,225	14,254	49	1509	1643	3152
1P50N3K6T	17,992	86,400	14,112	7200	14,758	14,597	14,599	43	1681	2050	3731
1P50N3K6T	15,425	86,400	12,400	7200	13,411	13,278	13,311	40	1500	1939	3439
1P50N3K6T	17,315	86,400	13,606	7200	14,186	14,032	14,170	46	1618	1869	3487
1P50N3K6T	15,651	86,400	12,938	7200	14,084	13,917	13,947	47	1622	1865	3487
1P50N3K6T	16,468	86,400	13,720	7200	13,971	13,833	13,898	51	1827	1760	3587
1P50N3K6T	17,899	86,400	13,940	7200	14,633	14,459	14,506	51	1541	1500	3041
1P50N3K6T	19,411	86,400	14,866	7200	15,273	15,107	15,116	46	1579	1551	3130
1P50N3K6T	17,759	86,400	13,467	7200	14,717	14,571	14,680	50	1525	1832	3357
1P50N3K6T	16,003	86,400	12,664	7200	12,985	12,844	12,971	43	1387	1757	3144
1P100N3K6T	70,571	86,400	20,381	7200	22,418	22,152	22,367	30	1610	1745	3355
1P100N3K6T	68,421	86,400	17,711	7200	19,807	19,572	19,663	39	1622	2119	3741
1P100N3K6T	64,860	86,400	20,559	7200	21,487	21,253	21,393	47	1607	1704	3311
1P100N3K6T	66,067	86,400	18,005	7200	19,850	19,653	19,739	41	1797	1768	3565
1P100N3K6T	66,508	86,400	20,571	7200	22,825	22,599	22,690	40	1635	2028	3663
1P100N3K6T	69,777	86,400	21,411	7200	22,258	22,038	22,097	42	1433	1894	3327
1P100N3K6T	66,054	86,400	20,269	7200	22,282	22,040	22,127	37	1780	1855	3635
1P100N3K6T	66,338	86,400	21,003	7200	23,030	22,757	22,824	45	1494	1731	3225
1P100N3K6T	71,530	86,400	21,434	7200	22,417	22,195	22,383	46	1447	1676	3123
1P100N3K6T	67,377	86,400	20,169	7200	22,222	22,002	22,170	35	1561	1784	3345
1P200N3K6T	-	-	32,591	7200	33,472	33,140	33,230	37	1456	1813	3269
1P200N3K6T	-	-	33,811	7200	34,792	34,414	34,658	46	1526	1600	3126
1P200N3K6T	-	-	32,713	7200	32,421	32,037	32,242	47	1855	1920	3775
1P200N3K6T	-	-	32,429	7200	34,271	33,898	34,009	33	1563	2002	3565
1P200N3K6T	-	-	33,703	7200	33,766	33,432	33,719	50	1616	1821	3437
1P200N3K6T	-	-	32,847	7200	34,020	33,683	33,794	48	1531	1707	3238
1P200N3K6T	-	-	33,191	7200	34,356	33,983	34,211	39	1590	1578	3168
1P200N3K6T	-	-	32,764	7200	33,549	33,184	33,489	36	1755	1705	3460
1P200N3K6T	-	-	33,670	7200	33,825	33,424	33,600	34	1500	1873	3373
1P200N3K6T	-	-	32,769	7200	33,937	33,534	33,662	35	1637	2133	3770
Average	42,347.9	86400.0	22,235.0	7200.0	23,314.0	23,061.8	23,184.0	42.5	1593.5	1807.4	3400.9

* All values are rounded up for the sake of a better presentation

3. Conclusion

In this document, we have updated some of values reported in the appendix of our published paper. We were able to show that these new values for the classical IRP are still computationally competitive in terms of solutions quality and run time. The results also highlight the limitation of the genetic algorithm regarding scalability, which may leave room for improvement of the matheuristic's performance for a more thorough global and local search.

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