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ORIGINAL RESEARCH

N-list-enhanced heuristic for distributed three-stage assembly permutation flow shop scheduling

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Abstract
System-wide optimization of distributed manufacturing operations enables process improvement beyond the standalone and individual optimality norms. This study addresses the production planning of a distributed manufacturing system consisting of three stages: production of parts (subcomponents), assembly of components in Original Equipment Manufacturer (OEM) factories, and final assembly of products at the product manufacturer's factory. Distributed Three Stage Assembly Permutation Flowshop Scheduling Problems (DTrSAPFSP) models this operational situation; it is the most recent development in the literature of distributed scheduling problems, which has seen very limited development for possible industrial applications. This research introduces a highly efficient constructive heuristic to contribute to the literature on DTrSAPFSP. Numerical experiments considering a comprehensive set of operational parameters are undertaken to evaluate the performance of the benchmark algorithms. It is shown that the N-list-enhanced Constructive Heuristic algorithm performs significantly better than the current best-performing algorithm and three new metaheuristics in terms of both solution quality and computational time. It can, therefore, be considered a competitive benchmark for future studies on distributed production scheduling and computing.

Keywords Distributed manufacturing · Multi-stage production · Constructive heuristic · Optimization

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1 Introduction

Process integration is a prerequisite for successful supply chain digitalization (Pourhejazy, 2022). System-wide optimization tools should be employed for the planning and control of decentralized production activities. Distributed scheduling problems are developed to address this practical need where production operations across different supply chain facilities are planned simultaneously. The integrated optimization view towards production planning underlines coordination between different units to meet global demands while ensuring optimal overall performance.

The Distributed Two-Stage Assembly Flowshop Scheduling Problem (DTSAFSP; (Xiong & Xing, 2014)) and the Distributed Assembly Permutation Flowshop Scheduling Problem (DAPFSP; (Hatami et al., 2013)) are the mainstream variants of distributed production scheduling under flowshop setting, i.e. when all jobs follow the same processing route and the shop floors are designed considering the flow of jobs. The former variant, DTSAFSP, models a distributed manufacturing system with production and assembly operations at every plant. The latter, DAPFSP, represents a more practical, supply chain-like setting in which an assembly plant is dedicated to the assembly of components arriving from different manufacturing facilities. Given the widespread use of DAPFSP in modern manufacturing, new extensions, and solution algorithms are developed to accommodate this practical scheduling extension and extend its industrial reach.

Among the existing studies, (Hatami et al., 2013) developed three heuristics for solving DAPFSPs, of which the variable neighborhood descent method yielded better outcomes. (Lin & Zhang, 2016) introduced the hybrid biogeography-based optimization algorithm; (S.-Y. Wang & Wang, 2016) developed the estimation of the distribution algorithm-based memetic algorithm; the backtracking search hyper-heuristic was developed by (Lin et al., 2017), and (Sang et al., 2019) put forward the invasive weed optimization algorithm. More recently, (Ferone et al., 2020) solved the DAPFSP using a biased-randomized iterated local search. Solution algorithms based on NEH (Nawaz, Enscore, and Ham; (Nawaz et al., 1983)) with new coding structures and job sorting rules have also been developed for solving DAPFSP variants (Ying et al., 2020). For a detailed and exhaustive review of the published works, we refer interested readers to the literature review in a recent study by (Pourhejazy et al., 2022).

The literature on DAPFSP assumes that the components used in the assembly of the final product have no subcomponents. In practice, however, the components are often complex and require processing. Taking automotive and heavy equipment as an example, main components, such as the engine, are made of many subcomponents that are manufactured and assembled by the component suppliers, the Original Equipment Manufacturers (OEMs). After procurement, the main components should be assembled into the final product at the product manufacturer's plants. This practical supply chain situation can be modeled by the Distributed Three Stage Assembly Permutation Flowshop Scheduling Problem (DTrSAPFSP), which is a combination of DTSAFSP and DAPFSP.

As a new variant of distributed scheduling problems, DTrSAPFSP can be used for the integrated scheduling of the production of sub-components, the assembly of the sub-components to complete the main parts/components, and the assembly of the components that form the final product; this integration makes the scheduling model highly intractable and calls for tailored solution methods to contribute to the advances in distributed manufacturing and supply chain digitalization. There are very limited published and pre-published papers related to DTrSAPFSP. (J. Wang, Lei, and Cai 2022; J. Wang, Lei, & Li, 2022a, 2022b) extended the

distributed three-stage assembly scheduling, which is the most relevant variant to the DTrSAPFSP, which considers the constraints of maintenance and setup time. In a preprint, (Hao et al., 2022) developed three Social Spider Optimization (SSO) metaheuristics for solving the DTrSAPFSP. They showed that their solution methods outperform the earlier algorithms developed for solving DAPFSPs; this is the only study on solving the DTrSAPFSP. To address this gap, the present research paper extends to develop a novel constructive heuristic algorithm, hereafter called the N-list-enhanced Constructive Heuristic (NCH). The NCH method is compared with state-of-the-art algorithms to evaluate its strength. The statistical test follows to confirm the superiority of NCH over the existing methods. The developed algorithm is scalable for parallel computing and is expected to be considered a strong benchmark in the field.

The rest of this paper begins with a review of the relevant literature in Sect. 2. A detailed explanation of the computational elements of the developed solution method follows in Sect. 3. Numerical experiments and statistical analysis of the results are then presented in Sect. 4 to report the performance of the new algorithm. Section 5 concludes this research by summarizing the major findings and providing insights for further developments in the topic of three-stage production scheduling.

2 Relevant literature

Multistage production processes have been extensively studied in the forms of flexible flowshop (Luo et al., 2019) and two-stage assembly flowshop (Lee et al., 1993). Distributed flowshop scheduling has seen considerable development in recent years considering both modeling and solution algorithms.

2.1 Distributed assembly permutation flowshop and distributed two-stage assembly scheduling problems

(Hatami et al., 2013) introduced the Distributed Assembly Permutation Flowshop Scheduling Problem (DAPFSP). This work inspired other scheduling extensions; in one of the seminal works, (Yang & Xu, 2020) suggested that more than one machine should be considered in the assembly stage (i.e., flexible assembly). The DAPFSP with flexible assembly assumes that the assembly stage is executed in a different plant and that no subassemblies are required for producing the components. (Xiong & Xing, 2014) put forward the Distributed Two-Stage Assembly Scheduling Problem (DTSASP), in which the production and assembly operations of a product are performed in the same factory. DTSASP schedules production operations at OEMs, based on which, separate scheduling must be done for the final product manufacturing. To model an integrated production plan, DTSASP should be merged with flexible assembly in a separate factory to enable an integrated production plan of parts and components at OEMs and final products at the mother company. For this reason, (Hao et al., 2022) proposed the DTrSAPFSP and presented three SSO-based metaheuristics to solve it.

2.2 Distributed three-stage assembly permutation flowshop scheduling problems

DTrSAPFSP assumes that there are several OEMs, each of which is responsible for producing parts and assembling them into a certain component. The components from the OEMs

then arrive at the main company's plant, where they are assembled and processed into final products.

The solution algorithms developed for solving DTSAFSPs, as the most relevant variant of DTrSAPFSP, are relatively limited. From the seminal works, (Xiong et al., 2014) developed a Variable Neighborhood Search-based approach for minimizing the total completion time in DTSAFSP with setup times. (Zhang & Xing, 2018) developed the SSO optimization for minimizing the total completion time in DTSAFSP. (Deng et al., 2016) introduced the Competitive Memetic Algorithm (CMA) for minimizing the makespan in DTSAFSPs, which outperformed the earlier algorithms. Most recently, (Pourhejazy et al., 2022) developed the Meta-Lamarckian-based Iterated Greedy algorithm for optimizing DTSAFSP with mixed setups, which outperformed the earlier best-performing algorithms in minimizing the makespan.

From the published studies, (Zheng & Wang, 2021) developed a new variant of the Bat Optimization Algorithm for Solving the Three-Stage Distributed Assembly Permutation Flowshop Scheduling Problem. (J. Wang, Lei, & Li, 2022a, 2022b) developed a Q-Learning-Based Artificial Bee Colony (ABC) algorithm for solving the Distributed Three-Stage Assembly Scheduling Problem with Factory Eligibility and Setup Times. (J. Wang, Lei, and Cai 2022) developed the adaptive ABC for solving the distributed three-stage assembly scheduling problem with maintenance. These metaheuristics used basic constructive algorithms, such as NEH (Nawaz et al., 1983), in the initialization stage of the algorithm. Despite its merits, NEH cannot obtain good initial solutions for complex problems and needs to be adjusted for different scheduling problems. Given the stochastic nature of the above metaheuristics, the quality of the final solution depends heavily on that of the initial solution, especially when dealing with highly intractable problems. In the next section, a new constructive heuristic is developed to contribute to the advances in distributed and multi-stage scheduling.

3 Optimization method

3.1 Problem definition

We investigate a distributed manufacturing system where geographically dispersed factories produce the parts/sub-components (Stage I), assemble the component (Stage II), and send the components to a main factory for the assembly of the final product (Stage III); this process is illustrated in Fig. 1. The problem assumes that all jobs follow the same routine and that each job can only be processed on one machine/assembly stage at a time. The processing times are deterministic and independent of the jobs/products sequence. Once a production/assembly job is assigned to a factory, it cannot be re-assigned. The model is symbolized by $(DF_m \rightarrow 1) \rightarrow 1||C_{max}$ with the first part indicating that the distributed system has m parallel machines in the production stage of every factory; one assembly machine completes the sub-component, and one assembly stage forms the final product. The objective is to find the production schedule with (near-) minimum maximum completion time (makespan; C_{max}).

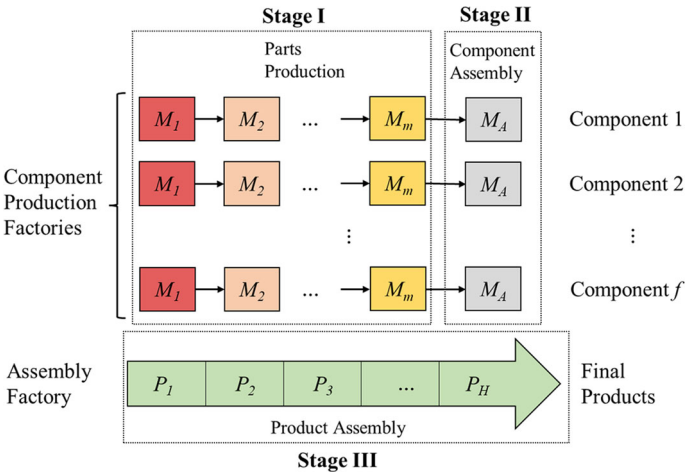

Fig. 1 Visual illustration of the three-stage scheduling problem

3.2 Solution algorithm

This study introduces the NCH algorithm as an alternative to the NEH-based algorithms with various initial sorting and tie-breaking rules. Inspired by the N-list technique (Puka et al., 2021), the NCH algorithm adjusts every step of the algorithm considering the problem characteristics. The N-list technique uses a list of N jobs that are candidates for establishing the job sequence. At each stage of the algorithm, each job candidate in the current N-list is individually inserted into all possible positions in the partial sequence, and the one with the best performance index is assigned. The procedure continues until all jobs are assigned and a complete solution is obtained. Employing the N-list technique enables the NEH-based algorithm to run the search procedure in parallel computing environments, which is complicated, if not impossible, to accomplish with traditional methods.

The Fig. 2 shows the pseudocode of the developed NCH algorithm. The computational procedure consists of four steps: (1) sorting the initial sequence of parts within each component; (2) sorting the initial sequence of components within each product; (3) sorting the initial sequence of products; and (4) sorting sequence of parts within each factory and the assembly sequence of the products. These procedures are explained in two phases, one at the component level and the other at the product level.

We now elaborate on the computational steps.

Procedure NCH Algorithm_for_DTrSAPFSP
1 **begin** NCH Algorithm
2 **Group** parts belonging to the same component
3 **Rank** each parts in same group in decreasing order of total processing time
4 β = Number of all the components
5 **for** c = 1 to β do
6 **Remove** first parts of ranked list for c
7 **Insert** it as first element of current part sequence
8 j = 1
9 **do** {
10 **Take** the first and second parts of ranked list for c
11 **Insert** them separately in all of j+1 possible places of current part sequence
12 **Evaluate** all of $2(j+1)$ resulting part sequences between two parts
13 **Keep** the better part with best sequence as new current part sequence
14 **Put** back unselected part back to ranked list
15 $j = j+1$
16 }
17 **While** ($j \leq$ Number of the parts belonging to component c)
18 $C_{\max}(\pi_c)$ = the makespan of the best part sequence of component c
19 **Endfor**
20 **Group** components belonging to the same product
21 **Rank** each components belonging to the same product in increasing order of $C_{\max}(\pi_c)$
22 **Rank** products in increasing order of $C_{\max}(\pi_p)$
23 F = Number of components manufacturing factories
24 $\alpha = 0$
25 **do** {
26 **Take** the first and second products of ranked list
27 $c = 0$
28 **do** {
29 **Take** the first component of ranked list for first and second products
30 **Put** the first component separately at the end of F possible places of current partial sequence
31 **Evaluate** all of F resulting partial sequences
32 **Keep** the best sequence as new current partial sequence
33 $c = c+1$
34 }
35 **While** ($c \leq$ Number of the components belonging to the product to be scheduled)
36 $\alpha = \alpha+1$
37 **Evaluate** current partial sequence of two products
38 **Keep** the better product as new current partial sequence
39 **Put** back unselected product back to ranked list
40 }
41 **While** ($p \leq$ Number of the products to be scheduled)

Fig. 2 Pseudocode of the N-list-enhanced Constructive Heuristic

3.2.1 Phase I. Component-level sequencing

Step 1. Calculate the total processing time of each part on every machine, i.e., $SUM_j = \sum_{m=1}^{M} P_{j,m}$, where $P_{j,m}$ represents the processing time of part j $(j = 1,2,...,\chi)$ on machine m $(m = 1,...,M)$.

Step 2. Group the parts associated with the same component and sort them in descending order of SUM_j. Let $\pi_c^{PL} = \{j_{[1]}^c, j_{[2]}^c, ..., j_{[c_n]}^c\}$ represents the resulting rank list of parts of the component c $(c = 1,2,...,\beta)$, where c_n refers to the number of parts of the component c

Step 3. Use the following procedure to obtain the part sequence for each component c $(c = 1,2,...,\beta)$.

Step 3.1 Extract $j_{[1]}^c$ from π_c^{PL} and insert it into the temporary part sequence of component c, π_c^{part}, and set the remaining part list as π_c^{RPL}.

Step 3.2 Extract the first two parts from π_c^{RPL}, separately insert each one of the two selected parts into every possible position in π_c^{part}, and set the one with minimum completion time as the new temporary part sequence of component 'c'. Continue with putting back the unselected part into π_c^{RPL}.

Step 3.3 Go back to step 3.2 and repeat the process until all parts in π_c^{RPL} are inserted into π_c^{part}. Assembly component c after all the corresponding parts have been completed.

An illustrative example is now provided to clarify the above steps. Assume a small example with ten parts, two machines, four components, two products, and two factories. In the first assembly phase, the first and second components each contain three parts, while the third and fourth components each contain two parts. In the second assembly phase, each product is made from two components. Table 1 summarizes the processing times in the illustrative example.

In Step 1, the total processing time of each part is calculated as follows: $SUM_1 = 5$, $SUM_2 = 6$, $SUM_3 = 6$, $SUM_4 = 6$, $SUM_5 = 5$, $SUM_6 = 4$, $SUM_7 = 5$, $SUM_8 = 3$, $SUM_9 = 5$, $SUM_{10} = 7$. In Step 2, the initial order of the parts of each component considering the total processing time is: $\pi_1^{PL} = \{j_2\ j_3\ j_1\}$, $\pi_2^{PL} = \{j_4\ j_5\ j_6\}$, $\pi_3^{PL} = \{j_7\ j_8\}$, and $\pi_4^{PL} = \{j_{10}\ j_9\}$. Taking the component c_1 as an example, after setting $\pi_1^{part} = \{j_2\}$ and $\pi_1^{RPL} = \{j_3\ j_1\}$, Step 3 consists of extracting the first two parts, i.e., j_3 and j_1, making permutations of two parts,$\{j_3\ j_2\}$, $\{j_2\ j_3\}$, $\{j_1\ j_2\}$, and $\{j_2\ j_1\}$, as shown in Fig. 3a–d. At this stage, the sequence with minimum completion time are $\{j_1\ j_2\}$ and $\{j_2\ j_1\}$, in which $\{j_1\ j_2\}$ is randomly selected and set as π_1^{part}. Then, the part j_3 is inserted into all possible positions of π_1^{part}, as shown in Fig. 3e–g, in which $\{j_3\ j_1\ j_2\}$ is the best part sequence of the component

Table 1 Configuration of the illustrative example

Part (j)	j_1	j_2	j_3	j_4	j_5	j_6	j_7	j_8	j_9	j_{10}
Part processing time on M_1	2	2	1	2	1	2	3	1	2	3
Part processing time on M_2	3	4	5	4	4	2	2	2	3	4
Component (c)	c_1			c_2			c_3		c_4	
The component assembly time on M_A	3			2			5		6	
Product (p)	p_1						p_2			
The product assembly time on M_F	3						4			

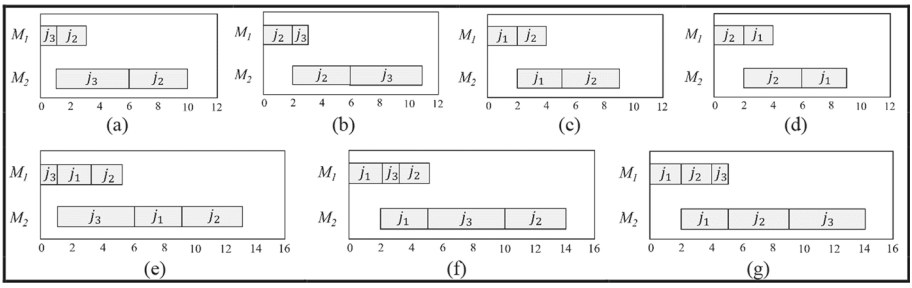

Fig. 3 An illustrative example for ordering parts of a component

c_1. The above procedure is repeated for the rest components to obtain the best part sequences at the component level, as shown in Fig. 4.

3.2.2 Phase II. Product-level sequencing

Based on the best part sequences from Phase I, the following steps determine the order of parts at the product level.

Step 1. Group the components that belong to the same product and sort them in ascending order of their completion time, $CT(\pi_c)$. Save the resulting component list of the product p $(p = 1,2,...,\alpha)$ as $\pi_p^{CL} = \{c_{[1]}^p, c_{[2]}^p, ..., c_{[p_n]}^p\}$, where p_n denotes the number of components in the product p.

Step 2. Sum up the completion time of all components in the product p $(p = 1,2,...,\alpha)$, that is, $CT(\pi_p) = \sum_{i=1}^{p_n} CT(c_{[i]}^p)$. Sort the products in ascending order of $CT(\pi_p)$ to get the product list, $\pi^{PdL} = \{p_{[1]}, p_{[2]}, ..., p_{[\alpha]}\}$.

Step 3. Sequentially extract a component from the component list of the product $p_{[1]}$ and assign it to the last position of every factory to find the alternative with the smallest completion time. Set the resulting sequence as the temporary component sequence $\pi^{component}$ and the remaining product list as π^{RPdL}.

Step 4. Extract the first two products from π^{RPdL}, and separately assign each component of the two selected products into $\pi^{component}$. Assembly product c after all its parts have been completed and save the one with minimum completion time as $\pi^{component}$. Continue with putting back the unselected product into π^{RPdL}. At this stage, each component in the component list of the assigned product is sequentially inserted into the last position of every factory to find the alternative with the smallest completion time.

Step 5 Go back to step 4 and repeat the process until all components in π^{RPdL} are inserted into π_p^{CL} and the final order of parts at the product level results.

The procedure of phase II is illustrative by applying it to the previous example (Table 1). In Step 1, given the completion time of each component, as shown in Fig. 4, the resulting component lists of the product p_1 and p_2 are: $\pi_1^{CL} = \{c_2,\ c_1\}$ and $\pi_2^{CL} = \{c_3,\ c_4\}$, respectively. Given that $CT(\pi_1) = 13 + 16 = 29$ and $CT(\pi_2) = 11 + 15 = 26$, the resulting product list after applying Step 2 is $\pi^{PdL} = \{p_2,\ p_1\}$. In Step 3, the first product in π^{PdL}, i.e., p_2, is extracted and its associated components c_3 and c_4 are sequentially inserted into factory 1 and factory 2, respectively; the result is shown in Fig. 5.

Steps 4 – 5 begin with inserting the first component of the first unassigned product, i.e., c_2 of product 1, into the last position of every factory to find the alternative with the smallest completion time (round 1). As shown in Fig. 6, the resulting sequence in alternative Fig. 6a is preferred, hence, factory 1 is selected for assigning c_2. The next component from π_1^{CL}, i.e., c_1 of product 1, should then be extracted and inserted into the last position of every factory to find the best alternative (round 2). As shown in Fig. 7, the resulting sequence shown in Fig. 7b is better with a smaller completion time, hence, factory 2 should be selected for the permanent insertion. With assigning the last component of product 1, the final order of parts at the product level has been resulted; the result is shown in Fig. 7b.

With more components involved in the instance, the chances of perceiving the advantages of the developed method are expected to be greater. In the next section, the performance of NCH in various operational situations is evaluated and compared with the state-of-the-art.

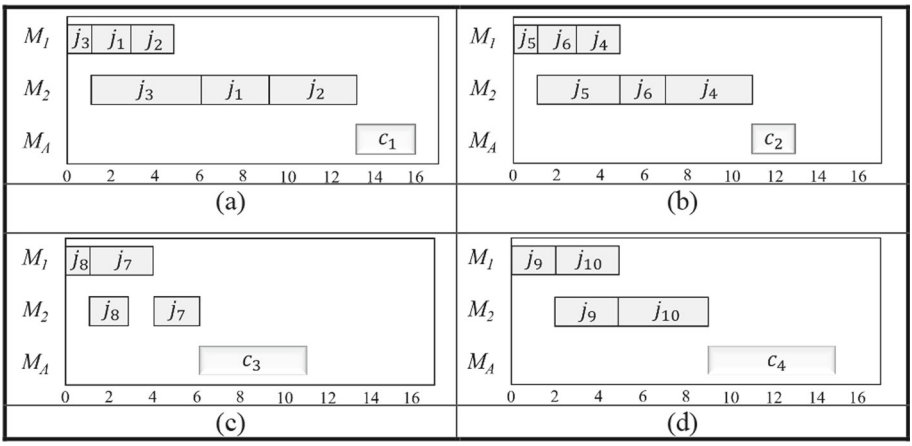

Fig. 4 Best part sequences at the component level

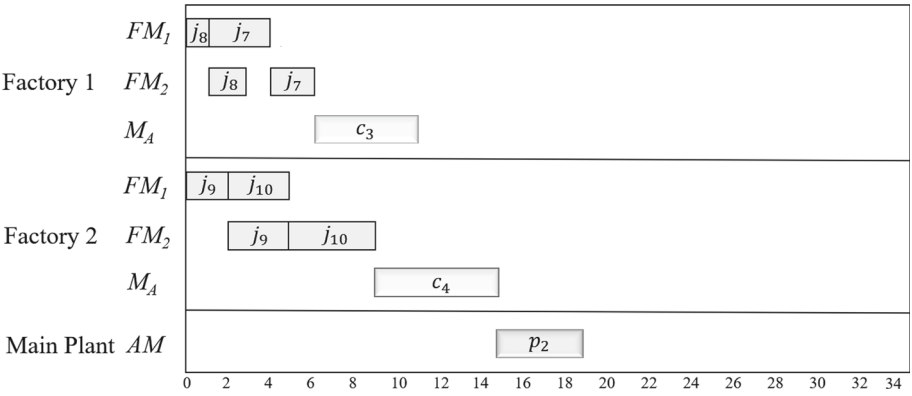

Fig. 5 The output of Step 3 in the illustrative example

4 Numerical experiments

The performance of the NCH algorithm is now evaluated by comparing it with the best-performing constructive heuristic in the literature of DTSAPFSP and DAPFSP. For this purpose, an adjusted version of the NEH$^+$-based constructive heuristic, hereafter called ANEH$^+$, is considered as a baseline. Besides, three variants of the most recent and state-of-the-art metaheuristic, which were also developed to solve DAPFSP, are included as benchmarks to increase the strength of our numerical analysis.

(Hao et al., 2022) improved the SSO algorithm to solve the DTrSAPFSP. Then they employed three local search methods to develop the Social Spider Optimization hybridized with Local Search Strategies (HSSO). Finally, they introduced the 'Restart' and 'Self-adaptive Selection Probability' to better regulate the local search and restart strategies in HSSO With Restart Procedures (HSSOR), and HSSOR with Self-adaptive Selection Probability (HSSOPR). Their experiments showed that these algorithms outperform the state-of-the-art

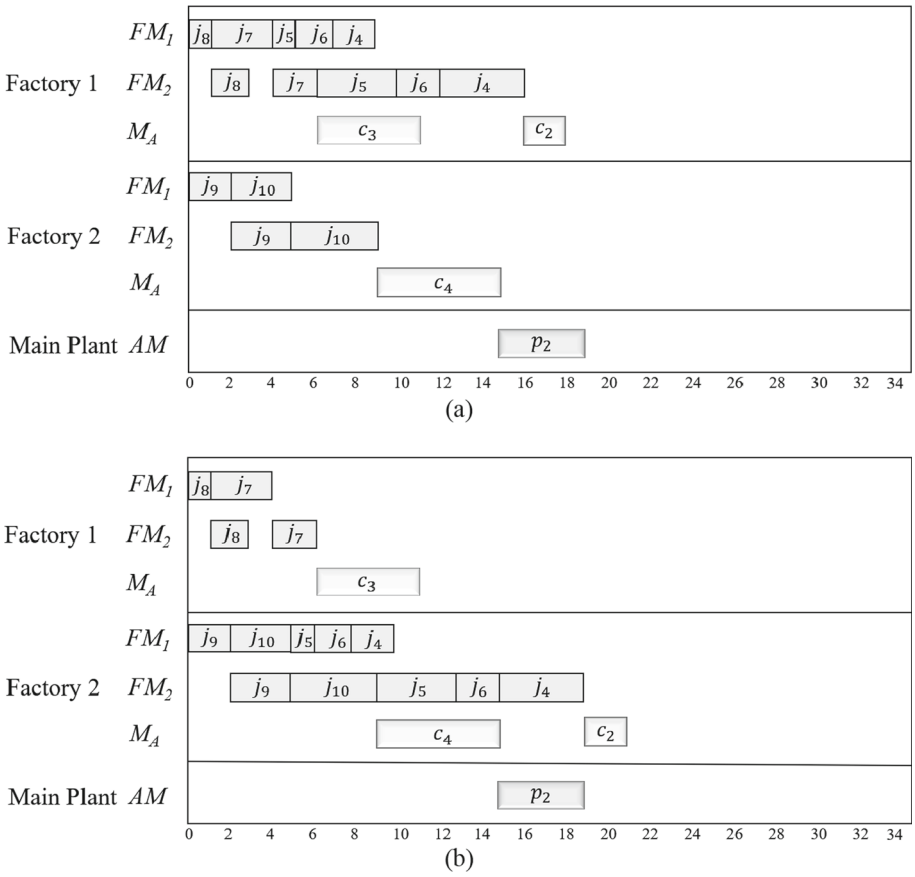

Fig. 6 Round 1 of applying Steps 4 – 5 on the illustrative example

in solving distributed assembly flow shops, i.e., the Competitive Memetic Algorithm (CMA; (Deng et al., 2016)) and the Estimation of Distribution Algorithm (EDA; (S.-Y. Wang & Wang, 2016)).

All compared algorithms are coded and compiled using C + + programming language on a personal computer with the Intel® Core™ i5-10210U CPU (1.60CHz) and 8 GB RAM. The same testbed configurations considered in the earlier study for testing the base algorithms are used for the numerical experiments. On this basis, the instances can be grouped by 100, 200, and 500 parts; 4, 6, and 8 factories for producing the components; 5, 10, and 20 machines for the production stage in these factories; 30, 40, and 50 components; and, finally, 10, 15, and 20 products. The identity format 100_5_4_30_10_1 represents the first (out of ten) instance characterized by 100 parts, 5 machines, 4 factories, 30 components, and 10 products. Considering these configurations, and 10 distinct instances under each configuration, a total of 810 instances are considered for conducting the experiments. The processing time parameters are generated as follows. The production time of parts (subcomponents at the first stage) is generated randomly using uniform distribution U [1, 99]; the assembly time at the second and third stages are also generated randomly, and separately considering U $[1 \times n,\ 99 \times n]$.

The maximum computation time is considered as a stopping criterion for the metaheuristic algorithms, as suggested by (Hao et al., 2022); $20 \times \chi \times M$, $40 \times \chi \times M$, and $60 \times \chi \times M$

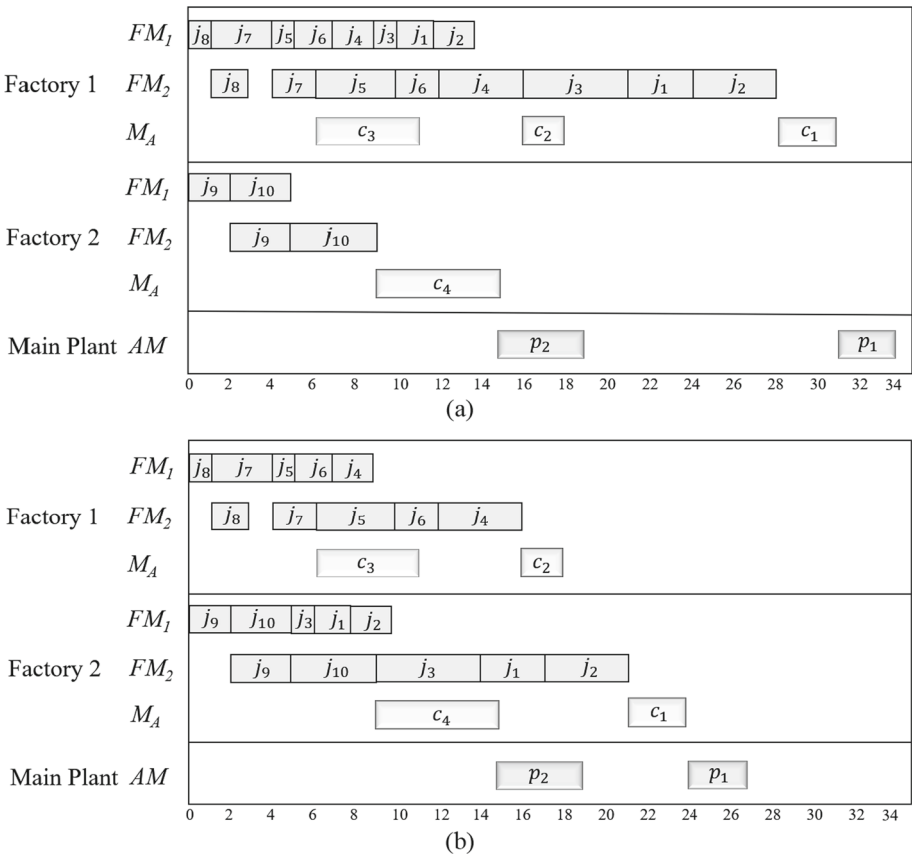

Fig. 7 Round 2 of applying Steps 4–5 on the illustrative example

milliseconds are applied for the largest instance under the small-, medium-, and large-scale problems, respectively. The developed heuristics in the present study stop operating as soon as having a complete solution, i.e., the production schedule for all products.

Each of the compared constructive heuristics is executed in one run for each test instance. Then, the best solution after 20 runs for solving each of the test instances using every metaheuristic is considered for further analysis. Given the best-found solution (BFS; see the Appendix), the Average Relative Percentage Deviation (*ARPD*) measure is considered to compare the quality of solutions between algorithms; the measure can be calculated using $RPD = \frac{C_{max}(X) - C_{max}(X_{best})}{C_{max}(X_{best})} \times 100\%$, where X_{best} and X represent the best solution and the solution under consideration, respectively; smaller *RPD* values represent better outcomes. The computational results are summarized in Table 2. As shown in Table 2, the proposed NCH algorithm outperforms the best-performing constructive heuristics and state-of-the-art metaheuristics concerning different operational categories.

Next, different numbers of parts (subcomponents), components, products, machines, and factories are considered to analyze the impact of these operational parameters on the performance of the benchmark algorithms. The analytical results are visualized in Fig. 8. The first notable observation is that with an increase in the number of components, products, machines, and factories, the outperformance of NCH becomes larger. However, an increase

in the number of parts (subcomponents) closes the performance gap between the algorithms. This may be due to the random ordering of items at the part level. Having many components and products in the instances enabled the NCH algorithm to generate better solutions even when the number of parts increased. That is, with more components involved in scheduling, the average number of parts per component is smaller, hence, the impact of the parts order on the quality of the final solution becomes smaller.

Statistical tests are now performed to verify the significance of the difference between the quality of the results obtained by NCH and those obtained by the benchmark algorithms. For this purpose, 0.05 is considered as the p value's threshold to check whether the differences are statistically significant. The analytical results of the analysis of variance (ANOVA) and the t test are summarized in Tables 3 and 4, respectively.

As the statistical results of ANOVA shown in Table 3, the difference amongst the sets of BFSs obtained by different algorithms can be regarded as statistically significant because the F-statistic is greater than the critical value with 95 percent of confidence. According to Table 4, since all the p values are less than 0.05, the null hypothesis, which implies that the NCH and each of the benchmark algorithms have equivalent effectiveness, can be confidently rejected. In other words, it can be concluded that the performance of NCH is significantly better than that of each benchmark algorithm. Considering that ANEH is a constructive heuristic, its weak performance compared to the three metaheuristics may not be surprising. However, we found the effectiveness of NCH, as a constructive heuristic, in outperforming the state-of-the-art metaheuristics quite remarkable.

As a final step of the numerical analysis, the algorithms' computational time (CPU time in seconds) is compared considering different problem sizes, i.e., workload and number of machines. The results in Table 5 show that the efficiency of the NCH algorithm is meaningfully

Table 2 Computational results considering different operational categories (best in bold)

Factor	Parameter	*ARPD*				
		HSSO	HSSOR	HSSORP	ANEH$^+$	NCH
Parts	100	3.019	2.887	2.909	4.336	**0.673**
	200	3.218	3.165	3.164	8.829	**1.290**
	500	4.177	**4.047**	4.104	20.441	4.419
Components	30	3.317	**3.186**	3.205	14.222	3.540
	40	3.301	3.227	3.275	10.840	**1.897**
	50	3.796	3.687	3.698	8.544	**0.945**
Machines	5	2.054	**1.945**	1.983	10.243	3.375
	10	3.208	3.108	3.134	11.523	**2.155**
	20	5.153	5.046	5.062	11.840	**0.852**
Factories	4	4.004	3.896	3.917	14.717	**2.003**
	6	3.139	3.075	3.081	10.578	**2.378**
	8	3.272	3.128	3.180	8.311	**2.001**
Products	10	3.317	**3.186**	3.205	14.222	3.540
	15	3.301	3.227	3.275	10.840	**1.897**
	20	3.796	3.687	3.698	8.544	**0.945**
Total average		3.471	3.366	3.393	11.202	**2.127**

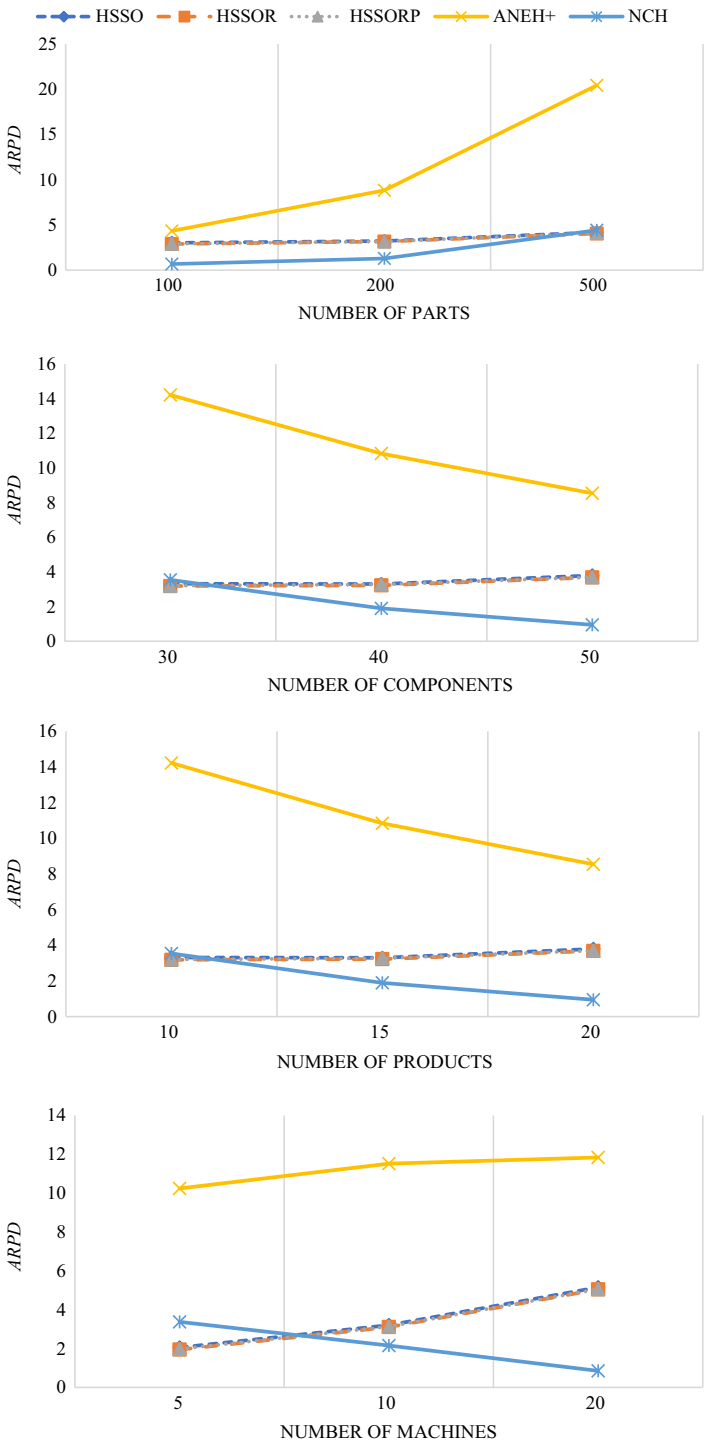

Fig. 8 Category-based analysis of the results

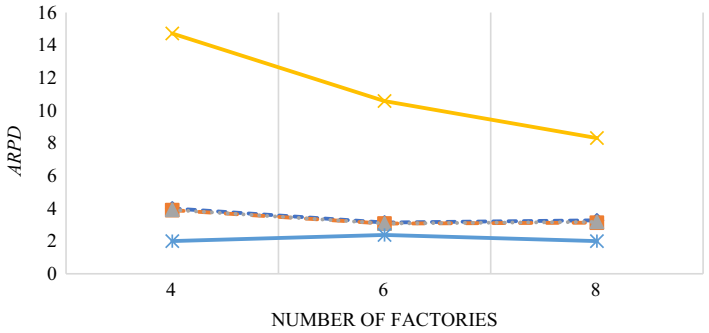

Fig. 8 continued

Table 3 The ANOVA test results for comparing NCH with the benchmarks

Source of variation	Sum of square (SS)	DoF	Mean SS	*F*	*P* value	*F* critical
Between Algorithms	154,204,972,7605	4	38,551,243,1901	9,7968	0,0000	2,3741
Within Algorithms	15,917,395,354,6778	4045	3,935,079,1977			
Total	16,071,600,327,4382	4049				

Table 4 The *t* test results for comparing NCH with the benchmarks

NCH vs	DoF	*t* Stat	$P\ (T \leq t)$ one-tail	*t* Critical one-tail	$P\ (T \leq t)$ two-tail	*t* Critical two-tail
ANEH^{+}	809	20,80	0,0000	1,6467	0,0000	1,9629
HSSORP	809	2,93	0,0017	1,6467	0,0034	1,9629
HSSOR	809	2,84	0,0023	1,6467	0,0046	1,9629
HSSO	809	3,18	0,0008	1,6467	0,0015	1,9629

better than that of the benchmarks. A computationally efficient constructive heuristic for solving DTrSAPFSP will not only contribute to the development of its literature but also facilitate the industrial reach of this new scheduling extension.

5 Conclusions

Optimization of distributed three-stage production operations was explored in this research article. Under this production setting, the parts (subcomponents) are manufactured and assembled by OEMs to form the product components. The produced components from multiple OEMs then arrive at the main manufacturer for the assembly and preparation of the final products. Many supply chains, like those in the automotive, heavy equipment, and home

Table 5 The computational time of the benchmark algorithms (best in bold)

Workload	Machines	CPU time (s)			
		HSSO	HSSOP	HSSOPR	NCH
100	5	100	100	100	**0.014**
	10	200	200	200	**0.021**
	20	400	400	400	**0.034**
200	5	200	200	200	**0.022**
	10	400	400	400	**0.037**
	20	800	800	800	**0.066**
500	5	500	500	500	**0.054**
	10	1000	1000	1000	**0.084**
	20	2000	2000	2000	**0.128**
Average		622.22	622.22	622.22	**0.050**

appliance industries, operate under similar conditions. Coordinated production scheduling benefits the supply chain through cost reduction and improved responsiveness. A new constructive heuristic algorithm is put forward for solving DTrSAPFSP, which forms the basis for further developments in the field of distributed production planning and control. The developed method is particularly beneficial for running the search procedure in parallel computing environments.

Extensive numerical analyzes were conducted to compare the performance of NCH with the state-of-the-art; NEH$^+$ constructive heuristic and three of the state-of-the-art metaheuristics, i.e., HSSO, HSSOR, and HSSORP, were adapted for solving DTrSAPFSP. The major findings are summarized as follows. First, the performance of the proposed constructive heuristic is significantly better than the constructive heuristic that is being widely used in the distributed flowshop scheduling literature. Second, the CPU time of the NCH algorithm showed to be meaningfully less than those of the metaheuristic benchmarks. Third, the analysis of the results considering *RPD* shows that NCH performs better than the metaheuristics, from an overall perspective, which is quite remarkable. Considering instances with various operational characteristics, we observed that NCH yields the best solution in the majority of test instances except for instances characterized by many parts and only a small number of components and products. The statistical test confirmed the significance of the superior performance. Overall, the *N*-List technique appeared to be very effective and should be considered in other optimization contexts.

Future studies may extend our research in one of the following directions. First, the mathematical model of DTrSAPFSP can be extended to allow for a more realistic representation of the real-world situation. For example, including the transportation cost of components between facilities and considering the operational efficiencies of the component producers may result in more reliable outcomes. Second, the scheduling approach can be improved to work with the dynamic arrival of new orders, considering different order priorities, emergency changes of those priorities, partial acceptance/rejection of the orders, and the assignment of components to new OEMs. Third, considering the significant improvement compared to the best-performing constructive heuristic in the literature of distributed flowshop scheduling, NCH should be incorporated as a constructive heuristic in metaheuristic algorithms

for more effectively solving the problems. As a fourth direction for future research, formulating mathematical models for DTrSAPFSP and the possible new extensions, as well as developing effective metaheuristics are worthwhile topics to pursue. Finally, we feel that the results obtained by NCH can be further improved using machine learning-based approaches; a direction that should be considered for future development of the DTrSAPFSP literature.

Author contributions K-C.Y. conceptualized the study and supervised it. Material preparation and numerical analysis were performed by P-J.F. Investigations and writing the submitted manuscript were done by P.P. All authors read and approved the final manuscript.

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Data availability The raw/processed data required to reproduce these findings can be provided upon reasonable request.

Declarations

Competing interests The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
1	[100_5_4_30_10_1]	2693	2691	2692	2691	2617	2617	406	[200_10_6_40_15_6]	4010	4009	4034	4134	4078	4009
2	[100_5_4_30_10_2]	2611	2612	2611	2978	2808	2611	407	[200_10_6_40_15_7]	3992	3992	3986	4149	3852	3852
3	[100_5_4_30_10_3]	2504	2495	2499	2606	2521	2495	408	[200_10_6_40_15_8]	3785	3789	3787	4067	3735	3735
4	[100_5_4_30_10_4]	2359	2352	2352	2706	2360	2352	409	[200_10_6_40_15_9]	3819	3819	3817	3783	3812	3783
5	[100_5_4_30_10_5]	2691	2691	2691	2820	2869	2691	410	[200_10_6_40_15_10]	3819	3805	3818	3885	3885	3805
6	[100_5_4_30_10_6]	2867	2864	2858	2858	2858	2858	411	[200_10_6_50_20_1]	5623	5623	5582	5582	5373	5373
7	[100_5_4_30_10_7]	2405	2399	2406	2399	2205	2205	412	[200_10_6_50_20_2]	4744	4727	4727	4727	4638	4638
8	[100_5_4_30_10_8]	2780	2772	2780	2880	2743	2743	413	[200_10_6_50_20_3]	4240	4240	4240	4218	3925	3925
9	[100_5_4_30_10_9]	2380	2379	2379	2524	2363	2363	414	[200_10_6_50_20_4]	5474	5443	5473	5443	5184	5184
10	[100_5_4_30_10_10]	2249	2249	2249	2426	2208	2208	415	[200_10_6_50_20_5]	4744	4720	4722	4782	4556	4556
11	[100_5_4_40_15_1]	3275	3277	3275	3274	3274	3274	416	[200_10_6_50_20_6]	4434	4426	4418	4396	4441	4396
12	[100_5_4_40_15_2]	3490	3490	3520	3490	3709	3490	417	[200_10_6_50_20_7]	4618	4610	4614	4762	4593	4593
13	[100_5_4_40_15_3]	3324	3323	3332	3323	3407	3323	418	[200_10_6_50_20_8]	4410	4410	4421	4427	4430	4410
14	[100_5_4_40_15_4]	3351	3351	3336	3458	3502	3336	419	[200_10_6_50_20_9]	4918	4930	4918	4925	4925	4918
15	[100_5_4_40_15_5]	3205	3204	3204	3169	2934	2934	420	[200_10_6_50_20_10]	4663	4663	4652	4649	4649	4649
16	[100_5_4_40_15_6]	3385	3382	3383	3535	3548	3382	421	[200_10_8_30_10_1]	3429	3381	3381	3331	3329	3329
17	[100_5_4_40_15_7]	3140	3140	3136	3136	3136	3136	422	[200_10_8_30_10_2]	3399	3396	3399	3398	3399	3396
18	[100_5_4_40_15_8]	2938	2938	2953	2940	2938	2938	423	[200_10_8_30_10_3]	3337	3305	3337	3520	3442	3305
19	[100_5_4_40_15_9]	3603	3600	3603	3636	3586	3586	424	[200_10_8_30_10_4]	3126	3126	3126	3378	3283	3126
20	[100_5_4_40_15_10]	3366	3382	3382	3366	3366	3366	425	[200_10_8_30_10_5]	3396	3396	3390	3675	3718	3390
21	[100_5_4_50_20_1]	4117	4117	4117	4108	4132	4108	426	[200_10_8_30_10_6]	3109	3109	3098	3235	3121	3098
22	[100_5_4_50_20_2]	4588	4567	4588	4567	4567	4567	427	[200_10_8_30_10_7]	3289	3264	3289	3536	3116	3116
23	[100_5_4_50_20_3]	4437	4437	4437	4438	4247	4247	428	[200_10_8_30_10_8]	3291	3312	3304	3331	3513	3291
24	[100_5_4_50_20_4]	4407	4407	4407	4469	4164	4164	429	[200_10_8_30_10_9]	3077	3077	3066	3336	3041	3041
25	[100_5_4_50_20_5]	4705	4714	4705	4705	4772	4705	430	[200_10_8_30_10_10]	3333	3333	3330	3564	3191	3191
26	[100_5_4_50_20_6]	4207	4191	4191	4244	3957	3957	431	[200_10_8_40_15_1]	3793	3793	3835	3864	3819	3793
27	[100_5_4_50_20_7]	4190	4178	4178	4194	4175	4175	432	[200_10_8_40_15_2]	3719	3719	3722	3773	3773	3719

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
28	[100_5_4_50_20_8]	3580	3631	3590	3611	3540	3540	433	[200_10_8_40_15_3]	4181	4181	4176	4161	4161	4161
29	[100_5_4_50_20_9]	4918	4894	4918	4894	4894	4894	434	[200_10_8_40_15_4]	3847	3857	3835	3946	3835	3835
30	[100_5_4_50_20_10]	4102	4091	4091	4115	3979	3979	435	[200_10_8_40_15_5]	3823	3817	3823	3808	3808	3808
31	[100_5_6_30_10_1]	1979	1971	1975	2116	1927	1927	436	[200_10_8_40_15_6]	3450	3444	3450	3413	3099	3099
32	[100_5_6_30_10_2]	2489	2487	2489	2487	2562	2487	437	[200_10_8_40_15_7]	3806	3775	3775	3783	3819	3775
33	[100_5_6_30_10_3]	2396	2390	2396	2390	2239	2239	438	[200_10_8_40_15_8]	3368	3388	3366	3447	3239	3239
34	[100_5_6_30_10_4]	2494	2477	2487	2550	2563	2477	439	[200_10_8_40_15_9]	3744	3744	3748	3742	3550	3550
35	[100_5_6_30_10_5]	2538	2521	2521	2652	2658	2521	440	[200_10_8_40_15_10]	3259	3253	3253	3375	3034	3034
36	[100_5_6_30_10_6]	2244	2252	2252	2317	2284	2244	441	[200_10_8_50_20_1]	4853	4863	4859	4853	4787	4787
37	[100_5_6_30_10_7]	2689	2680	2680	2676	2676	2676	442	[200_10_8_50_20_2]	4515	4509	4515	4509	4509	4509
38	[100_5_6_30_10_8]	2520	2520	2514	2514	2514	2514	443	[200_10_8_50_20_3]	4500	4497	4500	4512	4367	4367
39	[100_5_6_30_10_9]	2229	2221	2229	2383	2221	2221	444	[200_10_8_50_20_4]	5058	5089	5089	5101	5049	5049
40	[100_5_6_30_10_10]	2212	2212	2212	2209	2162	2162	445	[200_10_8_50_20_5]	4132	4132	4132	4243	4276	4132
41	[100_5_6_40_15_1]	3109	3115	3109	3109	3109	3109	446	[200_10_8_50_20_6]	4835	4826	4826	4948	4905	4826
42	[100_5_6_40_15_2]	3552	3552	3567	3552	3423	3423	447	[200_10_8_50_20_7]	4641	4641	4639	4638	4333	4333
43	[100_5_6_40_15_3]	3197	3197	3197	3175	2914	2914	448	[200_10_8_50_20_8]	4302	4277	4298	4262	4114	4114
44	[100_5_6_40_15_4]	4174	4158	4174	4158	4165	4158	449	[200_10_8_50_20_9]	5351	5351	5346	5383	5244	5244
45	[100_5_6_40_15_5]	3429	3429	3429	3401	3242	3242	450	[200_10_8_50_20_10]	4856	4823	4823	4823	4823	4823
46	[100_5_6_40_15_6]	3613	3613	3579	3560	3560	3560	451	[200_20_4_30_10_1]	5216	5215	5215	5727	5219	5215
47	[100_5_6_40_15_7]	3265	3265	3265	3319	3428	3265	452	[200_20_4_30_10_2]	5208	5181	5192	5706	5014	5014
48	[100_5_6_40_15_8]	3661	3632	3632	3632	3568	3568	453	[200_20_4_30_10_3]	5147	5120	5147	5762	5195	5120
49	[100_5_6_40_15_9]	3706	3677	3697	3677	3438	3438	454	[200_20_4_30_10_4]	5053	5053	5043	5849	4807	4807
50	[100_5_6_40_15_10]	3347	3330	3330	3330	3069	3069	455	[200_20_4_30_10_5]	5401	5420	5420	5953	5511	5401
51	[100_5_6_50_20_1]	4174	4141	4148	4141	3940	3940	456	[200_20_4_30_10_6]	5250	5250	5250	5631	5118	5118
52	[100_5_6_50_20_2]	4702	4665	4673	4677	4545	4545	457	[200_20_4_30_10_7]	5003	4976	4976	5711	4795	4795
53	[100_5_6_50_20_3]	4986	4916	4933	4966	4677	4677	458	[200_20_4_30_10_8]	5048	5048	5048	5619	4476	4476
54	[100_5_6_50_20_4]	3939	3929	3929	3932	3932	3929	459	[200_20_4_30_10_9]	5237	5247	5237	5829	4947	4947
55	[100_5_6_50_20_5]	4789	4817	4795	4789	4581	4581	460	[200_20_4_30_10_10]	5287	5315	5272	5812	4575	4575

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
56	[100_5_6_50_20_6]	3976	3976	3972	3972	3757	3757	461	[200_20_4_40_15_1]	5137	5135	5135	5569	4680	4680
57	[100_5_6_50_20_7]	4330	4311	4326	4354	4302	4302	462	[200_20_4_40_15_2]	4834	4838	4831	5235	4486	4486
58	[100_5_6_50_20_8]	4281	4281	4281	4275	4313	4275	463	[200_20_4_40_15_3]	5264	5264	5278	5940	5265	5264
59	[100_5_6_50_20_9]	4163	4178	4178	4156	4078	4078	464	[200_20_4_40_15_4]	5263	5263	5263	5645	5006	5006
60	[100_5_6_50_20_10]	4805	4800	4805	4800	4542	4542	465	[200_20_4_40_15_5]	5195	5200	5195	5630	4828	4828
61	[100_5_8_30_10_1]	2243	2239	2239	2231	2239	2231	466	[200_20_4_40_15_6]	4931	4931	4918	5113	4199	4199
62	[100_5_8_30_10_2]	2208	2181	2192	2109	2109	2109	467	[200_20_4_40_15_7]	5239	5239	5239	5580	4807	4807
63	[100_5_8_30_10_3]	2942	2916	2916	2916	2916	2916	468	[200_20_4_40_15_8]	4992	4992	4992	5467	4450	4450
64	[100_5_8_30_10_4]	2210	2210	2210	2210	2027	2027	469	[200_20_4_40_15_9]	5309	5285	5285	5748	5045	5045
65	[100_5_8_30_10_5]	2481	2471	2472	2471	2471	2471	470	[200_20_4_40_15_10]	5144	5124	5138	5585	4480	4480
66	[100_5_8_30_10_6]	2340	2355	2355	2340	2216	2216	471	[200_20_4_50_20_1]	5177	5166	5177	5509	4960	4960
67	[100_5_8_30_10_7]	2480	2480	2480	2484	2381	2381	472	[200_20_4_50_20_2]	5193	5175	5175	5442	5016	5016
68	[100_5_8_30_10_8]	2430	2422	2422	2397	2397	2397	473	[200_20_4_50_20_3]	5324	5300	5314	5680	5209	5209
69	[100_5_8_30_10_9]	2811	2804	2804	2821	2417	2417	474	[200_20_4_50_20_4]	5432	5432	5433	5883	5304	5304
70	[100_5_8_30_10_10]	2345	2345	2337	2323	2378	2323	475	[200_20_4_50_20_5]	5114	5086	5092	5328	4861	4861
71	[100_5_8_40_15_1]	3046	3041	3041	3047	2951	2951	476	[200_20_4_50_20_6]	5671	5665	5670	5563	5671	5563
72	[100_5_8_40_15_2]	3187	3187	3196	3181	3181	3181	477	[200_20_4_50_20_7]	6190	6158	6190	6306	6058	6058
73	[100_5_8_40_15_3]	3272	3268	3272	3268	3197	3197	478	[200_20_4_50_20_8]	5341	5355	5337	5540	5306	5306
74	[100_5_8_40_15_4]	3318	3313	3318	3313	3071	3071	479	[200_20_4_50_20_9]	5508	5472	5508	5657	5781	5472
75	[100_5_8_40_15_5]	3867	3867	3834	3829	3765	3765	480	[200_20_4_50_20_10]	5194	5188	5150	5533	4754	4754
76	[100_5_8_40_15_6]	3473	3466	3466	3458	3496	3458	481	[200_20_6_30_10_1]	4505	4488	4505	4608	4285	4285
77	[100_5_8_40_15_7]	2914	2910	2914	2881	2592	2592	482	[200_20_6_30_10_2]	4477	4477	4477	4840	4160	4160
78	[100_5_8_40_15_8]	3909	3909	3909	3878	3606	3606	483	[200_20_6_30_10_3]	4539	4513	4519	4776	3901	3901
79	[100_5_8_40_15_9]	2386	2372	2386	2372	2372	2372	484	[200_20_6_30_10_4]	4411	4398	4398	4785	4042	4042
80	[100_5_8_40_15_10]	3723	3723	3723	3689	3689	3689	485	[200_20_6_30_10_5]	4453	4490	4490	4907	3963	3963
81	[100_5_8_50_20_1]	3880	3880	3880	3880	3787	3787	486	[200_20_6_30_10_6]	4323	4323	4323	4405	4343	4323
82	[100_5_8_50_20_2]	3915	3915	3915	3947	3947	3915	487	[200_20_6_30_10_7]	4417	4436	4426	4810	3756	3756
83	[100_5_8_50_20_3]	3972	3946	3958	3946	3851	3851	488	[200_20_6_30_10_8]	4154	4135	4128	4401	4029	4029

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
84	[100_5_8_50_20_4]	3739	3710	3716	3716	3716	3710	489	[200_20_6_30_10_9]	4443	4444	4418	4739	4241	4241
85	[100_5_8_50_20_5]	4129	4116	4129	4116	3875	3875	490	[200_20_6_30_10_10]	4179	4179	4190	4482	3817	3817
86	[100_5_8_50_20_6]	4231	4227	4191	4191	3943	3943	491	[200_20_6_40_15_1]	4330	4391	4330	4384	4173	4173
87	[100_5_8_50_20_7]	4462	4430	4430	4430	4307	4307	492	[200_20_6_40_15_2]	4458	4504	4488	4856	4785	4458
88	[100_5_8_50_20_8]	4507	4535	4509	4507	4307	4307	493	[200_20_6_40_15_3]	4600	4614	4594	4734	4039	4039
89	[100_5_8_50_20_9]	4357	4338	4340	4338	4241	4241	494	[200_20_6_40_15_4]	4851	4825	4825	4842	4860	4825
90	[100_5_8_50_20_10]	4044	4032	4044	4027	3848	3848	495	[200_20_6_40_15_5]	5059	5027	5027	5071	5148	5027
91	[100_10_4_30_10_1]	2611	2611	2624	3027	2607	2607	496	[200_20_6_40_15_6]	4928	4948	4924	4891	4924	4891
92	[100_10_4_30_10_2]	3153	3167	3167	3153	2698	2698	497	[200_20_6_40_15_7]	4735	4719	4732	4719	4719	4719
93	[100_10_4_30_10_3]	2643	2643	2643	2902	2516	2516	498	[200_20_6_40_15_8]	4369	4366	4366	4627	4216	4216
94	[100_10_4_30_10_4]	2789	2787	2789	2883	2809	2787	499	[200_20_6_40_15_9]	4457	4514	4512	4457	4379	4379
95	[100_10_4_30_10_5]	3204	3199	3200	3370	3378	3199	500	[200_20_6_40_15_10]	4421	4421	4421	4532	4406	4406
96	[100_10_4_30_10_6]	3100	3124	3118	3312	3179	3100	501	[200_20_6_50_20_1]	5057	5057	5020	5070	4858	4858
97	[100_10_4_30_10_7]	2440	2458	2437	2708	2330	2330	502	[200_20_6_50_20_2]	5841	5841	5837	5836	5836	5836
98	[100_10_4_30_10_8]	2787	2766	2766	3048	2912	2766	503	[200_20_6_50_20_3]	5729	5721	5721	5718	5708	5708
99	[100_10_4_30_10_9]	2689	2699	2699	2756	2687	2687	504	[200_20_6_50_20_4]	5730	5715	5730	5793	5555	5555
100	[100_10_4_30_10_10]	2928	2928	2928	3130	2960	2928	505	[200_20_6_50_20_5]	5338	5338	5338	5480	5583	5338
101	[100_10_4_40_15_1]	4167	4160	4160	4187	4187	4160	506	[200_20_6_50_20_6]	5912	5912	5912	5917	5597	5597
102	[100_10_4_40_15_2]	3649	3647	3647	3675	3306	3306	507	[200_20_6_50_20_7]	5203	5191	5203	5203	4974	4974
103	[100_10_4_40_15_3]	3898	3898	3879	3983	3706	3706	508	[200_20_6_50_20_8]	4980	4980	4980	5196	5052	4980
104	[100_10_4_40_15_4]	3263	3243	3263	3410	3296	3243	509	[200_20_6_50_20_9]	4738	4762	4732	4693	4443	4443
105	[100_10_4_40_15_5]	3625	3640	3640	3739	3379	3379	510	[200_20_6_50_20_10]	5153	5146	5146	5146	4868	4868
106	[100_10_4_40_15_6]	3032	3030	3033	3234	2872	2872	511	[200_20_8_30_10_1]	4174	4153	4165	4262	4065	4065
107	[100_10_4_40_15_7]	3786	3786	3771	3771	3771	3771	512	[200_20_8_30_10_2]	3900	3895	3899	4071	3645	3645
108	[100_10_4_40_15_8]	4174	4174	4174	4208	4148	4148	513	[200_20_8_30_10_3]	3745	3745	3750	3788	3710	3710
109	[100_10_4_40_15_9]	3445	3445	3422	3512	3512	3422	514	[200_20_8_30_10_4]	4245	4234	4234	4290	4147	4147
110	[100_10_4_40_15_10]	4125	4125	4124	4175	4224	4124	515	[200_20_8_30_10_5]	4167	4159	4167	4213	3674	3674
111	[100_10_4_50_20_1]	4689	4683	4689	4683	4424	4424	516	[200_20_8_30_10_6]	4036	4017	4017	4424	3696	3696

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
112	[100_10_4_50_20_2]	4496	4493	4494	4493	4493	4493	517	[200_20_8_30_10_7]	4645	4631	4634	5146	3667	3667
113	[100_10_4_50_20_3]	4853	4818	4833	4928	4818	4818	518	[200_20_8_30_10_8]	4074	4074	4080	4192	4072	4072
114	[100_10_4_50_20_4]	4666	4654	4673	4701	4428	4428	519	[200_20_8_30_10_9]	3877	3877	3877	4318	4073	3877
115	[100_10_4_50_20_5]	4840	4823	4840	4895	4616	4616	520	[200_20_8_30_10_10]	4378	4352	4374	4338	4260	4260
116	[100_10_4_50_20_6]	4431	4419	4405	4466	4260	4260	521	[200_20_8_40_15_1]	4129	4129	4135	4061	4048	4048
117	[100_10_4_50_20_7]	4273	4273	4273	4374	4320	4273	522	[200_20_8_40_15_2]	4462	4450	4450	4472	4456	4450
118	[100_10_4_50_20_8]	4978	4974	4978	4974	4720	4720	523	[200_20_8_40_15_3]	4365	4365	4365	4349	4226	4226
119	[100_10_4_50_20_9]	4798	4785	4766	4854	4766	4766	524	[200_20_8_40_15_4]	4524	4524	4523	4479	4592	4479
120	[100_10_4_50_20_10]	4368	4348	4353	4446	4444	4348	525	[200_20_8_40_15_5]	4192	4192	4204	4192	3928	3928
121	[100_10_6_30_10_1]	2698	2671	2671	2692	2671	2671	526	[200_20_8_40_15_6]	4722	4697	4717	4610	4411	4411
122	[100_10_6_30_10_2]	2864	2864	2864	2997	2736	2736	527	[200_20_8_40_15_7]	4605	4624	4622	4702	4606	4605
123	[100_10_6_30_10_3]	2791	2791	2791	2816	2923	2791	528	[200_20_8_40_15_8]	4251	4251	4251	4230	4191	4191
124	[100_10_6_30_10_4]	2949	2922	2946	2946	3109	2922	529	[200_20_8_40_15_9]	4666	4676	4670	4670	4521	4521
125	[100_10_6_30_10_5]	2613	2607	2613	2652	2473	2473	530	[200_20_8_40_15_10]	4366	4370	4370	4291	4291	4291
126	[100_10_6_30_10_6]	2965	2969	2965	2965	2965	2965	531	[200_20_8_50_20_1]	4902	4912	4909	4912	4904	4902
127	[100_10_6_30_10_7]	2726	2717	2717	2711	2742	2711	532	[200_20_8_50_20_2]	5219	5219	5218	5163	5003	5003
128	[100_10_6_30_10_8]	2783	2782	2783	2901	2815	2782	533	[200_20_8_50_20_3]	5694	5683	5694	5683	5683	5683
129	[100_10_6_30_10_9]	2959	2959	2959	2956	2956	2956	534	[200_20_8_50_20_4]	5662	5651	5651	5640	5409	5409
130	[100_10_6_30_10_10]	2629	2629	2629	2769	2703	2629	535	[200_20_8_50_20_5]	5160	5149	5160	5171	5149	5149
131	[100_10_6_40_15_1]	3884	3857	3871	3857	3857	3857	536	[200_20_8_50_20_6]	5393	5393	5393	5347	5331	5331
132	[100_10_6_40_15_2]	3586	3586	3586	3526	3283	3283	537	[200_20_8_50_20_7]	6136	6143	6143	6126	6126	6126
133	[100_10_6_40_15_3]	3500	3493	3493	3490	3160	3160	538	[200_20_8_50_20_8]	5912	5912	5907	5903	5958	5903
134	[100_10_6_40_15_4]	3490	3480	3490	3480	3516	3480	539	[200_20_8_50_20_9]	4751	4746	4751	4738	4399	4399
135	[100_10_6_40_15_5]	3408	3408	3408	3350	3132	3132	540	[200_20_8_50_20_10]	5832	5823	5829	5823	5823	5823
136	[100_10_6_40_15_6]	3281	3276	3271	3271	3271	3271	541	[500_5_4_30_10_1]	8988	8988	8979	10,753	10,743	8979
137	[100_10_6_40_15_7]	3657	3653	3657	3653	3478	3478	542	[500_5_4_30_10_2]	8209	8204	8204	9075	8898	8204
138	[100_10_6_40_15_8]	3498	3498	3498	3606	3606	3498	543	[500_5_4_30_10_3]	8262	8260	8260	10,989	9160	8260
139	[100_10_6_40_15_9]	3926	3923	3926	3913	3935	3913	544	[500_5_4_30_10_4]	8413	8358	8388	11,204	9260	8358

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
140	[100_10_6_40_15_10]	3352	3352	3352	3421	3432	3352	545	[500_5_4_30_10_5]	8777	8777	8757	10,190	9521	8757
141	[100_10_6_50_20_1]	4453	4453	4453	4446	4135	4135	546	[500_5_4_30_10_6]	8651	8563	8563	10,737	9327	8563
142	[100_10_6_50_20_2]	4851	4845	4845	4853	4571	4571	547	[500_5_4_30_10_7]	8457	8467	8451	9796	8876	8451
143	[100_10_6_50_20_3]	4390	4390	4387	4373	4076	4076	548	[500_5_4_30_10_8]	8369	8319	8358	9113	8413	8319
144	[100_10_6_50_20_4]	4142	4131	4134	4134	4162	4131	549	[500_5_4_30_10_9]	7927	7895	7918	10,447	6858	6858
145	[100_10_6_50_20_5]	4145	4145	4148	4194	4194	4145	550	[500_5_4_30_10_10]	8895	8881	8884	10,737	10,330	8881
146	[100_10_6_50_20_6]	4967	5017	5002	4967	4748	4748	551	[500_5_4_40_15_1]	7830	7767	7783	10,036	8557	7767
147	[100_10_6_50_20_7]	4888	4888	4888	4888	4627	4627	552	[500_5_4_40_15_2]	8592	8530	8592	11,956	8233	8233
148	[100_10_6_50_20_8]	4414	4408	4408	4425	4285	4285	553	[500_5_4_40_15_3]	7991	7927	7988	10,624	9048	7927
149	[100_10_6_50_20_9]	5291	5284	5284	5237	5066	5066	554	[500_5_4_40_15_4]	8316	8295	8316	10,304	9449	8295
150	[100_10_6_50_20_10]	4433	4423	4426	4423	4237	4237	555	[500_5_4_40_15_5]	8100	8100	8079	8888	8278	8079
151	[100_10_8_30_10_1]	3084	3054	3068	3054	3054	3054	556	[500_5_4_40_15_6]	8611	8602	8602	10,308	9578	8602
152	[100_10_8_30_10_2]	3133	3123	3126	3140	3188	3123	557	[500_5_4_40_15_7]	8528	8528	8505	9739	9689	8505
153	[100_10_8_30_10_3]	2612	2612	2612	2612	2375	2375	558	[500_5_4_40_15_8]	8044	8044	7984	9568	8166	7984
154	[100_10_8_30_10_4]	2839	2839	2838	2836	2726	2726	559	[500_5_4_40_15_9]	8057	8035	8052	9901	11,562	8035
155	[100_10_8_30_10_5]	2843	2842	2842	2837	2837	2837	560	[500_5_4_40_15_10]	8119	8111	8119	9430	8277	8111
156	[100_10_8_30_10_6]	3039	3030	3039	3076	3149	3030	561	[500_5_4_50_20_1]	8213	8213	8160	9020	8819	8160
157	[100_10_8_30_10_7]	3024	3025	3023	3023	3023	3023	562	[500_5_4_50_20_2]	8206	8246	8242	9408	7966	7966
158	[100_10_8_30_10_8]	3032	3014	3032	3069	2977	2977	563	[500_5_4_50_20_3]	7554	7524	7528	8479	6460	6460
159	[100_10_8_30_10_9]	2850	2841	2843	2964	2964	2841	564	[500_5_4_50_20_4]	8175	8175	8221	8977	8900	8175
160	[100_10_8_30_10_10]	2620	2620	2620	2708	2702	2620	565	[500_5_4_50_20_5]	7998	8023	8023	9895	8418	7998
161	[100_10_8_40_15_1]	3198	3194	3194	3198	3048	3048	566	[500_5_4_50_20_6]	7842	7842	7853	9341	7878	7842
162	[100_10_8_40_15_2]	4043	4043	4032	4025	3888	3888	567	[500_5_4_50_20_7]	7838	7838	7800	9266	7054	7054
163	[100_10_8_40_15_3]	3881	3859	3862	3859	3619	3619	568	[500_5_4_50_20_8]	7881	7891	7881	8878	8725	7881
164	[100_10_8_40_15_4]	3917	3901	3917	3901	3660	3660	569	[500_5_4_50_20_9]	7758	7758	7858	9035	7724	7724
165	[100_10_8_40_15_5]	3852	3844	3844	3853	3853	3844	570	[500_5_4_50_20_10]	8071	8022	8071	10,241	7800	7800
166	[100_10_8_40_15_6]	3652	3645	3645	3645	3550	3550	571	[500_5_6_30_10_1]	6013	5999	5999	7288	7744	5999
167	[100_10_8_40_15_7]	3740	3740	3740	3740	3740	3740	572	[500_5_6_30_10_2]	6518	6518	6518	8269	7136	6518

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
168	[100_10_8_40_15_8]	3698	3745	3741	3698	3698	3698	573	[500_5_6_30_10_3]	6974	6974	6974	8095	7914	6974
169	[100_10_8_40_15_9]	4224	4222	4222	4222	4286	4222	574	[500_5_6_30_10_4]	6573	6547	6573	8095	7233	6547
170	[100_10_8_40_15_10]	3416	3416	3423	3416	3502	3416	575	[500_5_6_30_10_5]	6599	6599	6563	7706	7112	6563
171	[100_10_8_50_20_1]	4483	4483	4481	4480	4378	4378	576	[500_5_6_30_10_6]	6480	6509	6509	7828	7053	6480
172	[100_10_8_50_20_2]	4618	4595	4595	4649	4426	4426	577	[500_5_6_30_10_7]	6077	6077	6122	6642	6585	6077
173	[100_10_8_50_20_3]	4993	4993	4993	4993	4701	4701	578	[500_5_6_30_10_8]	5807	5741	5792	7585	5631	5631
174	[100_10_8_50_20_4]	4219	4219	4219	4230	4159	4159	579	[500_5_6_30_10_9]	6329	6273	6329	6984	6836	6273
175	[100_10_8_50_20_5]	4930	4869	4899	4869	4635	4635	580	[500_5_6_30_10_10]	6690	6690	6686	8010	7299	6686
176	[100_10_8_50_20_6]	5019	5019	5019	4987	4646	4646	581	[500_5_6_40_15_1]	5750	5750	5775	6238	6076	5750
177	[100_10_8_50_20_7]	4889	4864	4870	4864	4699	4699	582	[500_5_6_40_15_2]	5842	5842	5842	8180	6085	5842
178	[100_10_8_50_20_8]	4506	4521	4518	4506	4415	4415	583	[500_5_6_40_15_3]	5863	5863	5820	6850	6714	5820
179	[100_10_8_50_20_9]	5153	5106	5106	5106	4908	4908	584	[500_5_6_40_15_4]	6098	6098	6098	7222	6218	6098
180	[100_10_8_50_20_10]	4127	4121	4121	4121	4121	4121	585	[500_5_6_40_15_5]	6239	6206	6239	7194	6521	6206
181	[100_20_4_30_10_1]	3625	3625	3619	3735	3434	3434	586	[500_5_6_40_15_6]	5969	5969	5969	7089	5975	5969
182	[100_20_4_30_10_2]	3685	3671	3671	3870	3573	3573	587	[500_5_6_40_15_7]	6247	6247	6268	7394	6673	6247
183	[100_20_4_30_10_3]	3501	3515	3501	3834	3494	3494	588	[500_5_6_40_15_8]	5676	5637	5651	6622	5799	5637
184	[100_20_4_30_10_4]	3763	3773	3763	4011	3748	3748	589	[500_5_6_40_15_9]	5801	5795	5795	6438	5680	5680
185	[100_20_4_30_10_5]	3534	3534	3548	3832	3453	3453	590	[500_5_6_40_15_10]	6213	6219	6213	7222	6328	6213
186	[100_20_4_30_10_6]	3361	3352	3342	3570	3330	3330	591	[500_5_6_50_20_1]	6049	6065	6049	7574	5903	5903
187	[100_20_4_30_10_7]	3526	3493	3493	3736	3389	3389	592	[500_5_6_50_20_2]	5992	5991	5991	6474	6396	5991
188	[100_20_4_30_10_8]	3228	3228	3228	3802	3105	3105	593	[500_5_6_50_20_3]	5861	5915	5915	6788	5285	5285
189	[100_20_4_30_10_9]	3552	3562	3552	3947	3441	3441	594	[500_5_6_50_20_4]	5974	6018	6018	6857	5185	5185
190	[100_20_4_30_10_10]	3554	3548	3548	3950	3662	3548	595	[500_5_6_50_20_5]	6379	6399	6387	7186	5544	5544
191	[100_20_4_40_15_1]	3684	3684	3686	3795	3725	3684	596	[500_5_6_50_20_6]	5872	5834	5872	7593	5986	5834
192	[100_20_4_40_15_2]	4059	4065	4065	4236	4059	4059	597	[500_5_6_50_20_7]	6077	6097	6077	6528	6196	6077
193	[100_20_4_40_15_3]	4054	4051	4051	4099	4063	4051	598	[500_5_6_50_20_8]	6349	6331	6349	7488	6122	6122
194	[100_20_4_40_15_4]	4595	4580	4585	4580	4673	4580	599	[500_5_6_50_20_9]	6450	6460	6442	7657	7347	6442
195	[100_20_4_40_15_5]	3961	3952	3967	4088	3961	3952	600	[500_5_6_50_20_10]	6026	6026	6064	7269	6448	6026

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
196	[100_20_4_40_15_6]	3794	3794	3803	4230	4019	3794	601	[500_5_8_30_10_1]	5442	5421	5442	6469	5790	5421
197	[100_20_4_40_15_7]	4178	4185	4185	4234	3572	3572	602	[500_5_8_30_10_2]	5759	5772	5772	6356	6604	5759
198	[100_20_4_40_15_8]	4336	4357	4336	4428	4395	4336	603	[500_5_8_30_10_3]	5859	5872	5872	7455	7228	5859
199	[100_20_4_40_15_9]	3986	3993	3986	3986	3986	3986	604	[500_5_8_30_10_4]	5514	5514	5500	6913	5586	5500
200	[100_20_4_40_15_10]	4375	4399	4399	4589	4421	4375	605	[500_5_8_30_10_5]	5549	5462	5462	6450	6520	5462
201	[100_20_4_50_20_1]	5103	5103	5103	5102	5089	5089	606	[500_5_8_30_10_6]	5097	5097	5104	6436	5830	5097
202	[100_20_4_50_20_2]	4686	4673	4686	4797	4633	4633	607	[500_5_8_30_10_7]	5605	5599	5605	6222	6236	5599
203	[100_20_4_50_20_3]	5482	5444	5444	5435	5304	5304	608	[500_5_8_30_10_8]	5647	5634	5647	6081	6031	5634
204	[100_20_4_50_20_4]	4675	4675	4650	4649	4430	4430	609	[500_5_8_30_10_9]	5304	5314	5230	6403	4950	4950
205	[100_20_4_50_20_5]	5030	5023	5030	5088	4621	4621	610	[500_5_8_30_10_10]	5556	5544	5549	7364	5806	5544
206	[100_20_4_50_20_6]	5416	5396	5409	5396	5237	5237	611	[500_5_8_40_15_1]	5415	5415	5409	6250	5404	5404
207	[100_20_4_50_20_7]	5125	5125	5125	5125	5125	5125	612	[500_5_8_40_15_2]	5547	5488	5550	6505	5912	5488
208	[100_20_4_50_20_8]	4864	4861	4862	5005	4797	4797	613	[500_5_8_40_15_3]	5261	5261	5253	5844	5772	5253
209	[100_20_4_50_20_9]	4914	4904	4906	5146	4705	4705	614	[500_5_8_40_15_4]	5531	5555	5540	6444	5603	5531
210	[100_20_4_50_20_10]	5452	5424	5436	5588	4807	4807	615	[500_5_8_40_15_5]	4926	4926	4926	6259	5654	4926
211	[100_20_6_30_10_1]	3270	3260	3269	3445	3181	3181	616	[500_5_8_40_15_6]	5149	5203	5203	6185	6466	5149
212	[100_20_6_30_10_2]	3228	3228	3207	3261	3204	3204	617	[500_5_8_40_15_7]	4903	4895	4903	5353	5277	4895
213	[100_20_6_30_10_3]	3404	3404	3404	3460	3357	3357	618	[500_5_8_40_15_8]	5141	5134	5134	6410	5166	5134
214	[100_20_6_30_10_4]	3173	3161	3168	3196	3086	3086	619	[500_5_8_40_15_9]	5253	5253	5253	5906	5992	5253
215	[100_20_6_30_10_5]	3557	3556	3557	3563	3588	3556	620	[500_5_8_40_15_10]	5162	5160	5155	6107	4988	4988
216	[100_20_6_30_10_6]	3160	3166	3158	3202	3268	3158	621	[500_5_8_50_20_1]	5045	5034	5045	5625	5439	5034
217	[100_20_6_30_10_7]	3646	3616	3616	3616	3616	3616	622	[500_5_8_50_20_2]	5576	5620	5620	6002	5695	5576
218	[100_20_6_30_10_8]	3462	3475	3462	3453	3197	3197	623	[500_5_8_50_20_3]	5347	5347	5338	5954	5623	5338
219	[100_20_6_30_10_9]	3331	3331	3327	3385	3327	3327	624	[500_5_8_50_20_4]	4986	4986	4991	5761	5401	4986
220	[100_20_6_30_10_10]	3350	3356	3356	3475	3475	3350	625	[500_5_8_50_20_5]	5177	5170	5176	5661	5465	5170
221	[100_20_6_40_15_1]	4236	4236	4226	4265	4010	4010	626	[500_5_8_50_20_6]	5587	5566	5573	5832	5761	5566
222	[100_20_6_40_15_2]	3703	3700	3700	3698	3698	3698	627	[500_5_8_50_20_7]	5112	5078	5112	5358	5662	5078
223	[100_20_6_40_15_3]	4498	4494	4496	4494	4518	4494	628	[500_5_8_50_20_8]	5525	5525	5517	5511	5456	5456

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
224	[100_20_6_40_15_4]	4323	4323	4312	4292	4415	4292	629	[500_5_8_50_20_9]	5684	5671	5671	6052	5472	5472
225	[100_20_6_40_15_5]	4399	4399	4396	4540	4407	4396	630	[500_5_8_50_20_10]	5469	5425	5466	5598	5635	5425
226	[100_20_6_40_15_6]	4004	4004	4004	4039	3989	3989	631	[500_10_4_30_10_1]	8882	8882	8882	10,303	10,102	8882
227	[100_20_6_40_15_7]	4279	4266	4276	4279	4280	4266	632	[500_10_4_30_10_2]	8460	8440	8460	11,136	9575	8440
228	[100_20_6_40_15_8]	3921	3917	3913	3924	3924	3913	633	[500_10_4_30_10_3]	8797	8818	8812	10,950	8207	8207
229	[100_20_6_40_15_9]	4470	4470	4448	4447	4310	4310	634	[500_10_4_30_10_4]	8767	8722	8745	10,420	7239	7239
230	[100_20_6_40_15_10]	4078	4078	4078	4078	4028	4028	635	[500_10_4_30_10_5]	9279	9276	9279	11,733	9813	9276
231	[100_20_6_50_20_1]	4835	4835	4833	4827	4695	4695	636	[500_10_4_30_10_6]	9023	8997	9020	11,009	8928	8928
232	[100_20_6_50_20_2]	5300	5315	5300	5298	4709	4709	637	[500_10_4_30_10_7]	8968	8915	8915	11,759	11,074	8915
233	[100_20_6_50_20_3]	5370	5325	5332	5325	5385	5325	638	[500_10_4_30_10_8]	9163	9187	9142	10,915	8945	8945
234	[100_20_6_50_20_4]	4740	4740	4743	4776	4540	4540	639	[500_10_4_30_10_9]	9344	9295	9326	11,231	8877	8877
235	[100_20_6_50_20_5]	5647	5696	5647	5647	5444	5444	640	[500_10_4_30_10_10]	8734	8733	8713	10,429	8757	8713
236	[100_20_6_50_20_6]	4839	4839	4870	4912	4642	4642	641	[500_10_4_40_15_1]	8872	8858	8872	10,455	8860	8858
237	[100_20_6_50_20_7]	4977	4959	4959	4959	4879	4879	642	[500_10_4_40_15_2]	8709	8723	8723	10,054	8575	8575
238	[100_20_6_50_20_8]	5015	5014	5015	5065	4764	4764	643	[500_10_4_40_15_3]	9260	9260	9260	11,603	8573	8573
239	[100_20_6_50_20_9]	5426	5426	5377	5382	4954	4954	644	[500_10_4_40_15_4]	8616	8616	8653	9635	8492	8492
240	[100_20_6_50_20_10]	5294	5294	5294	5319	5159	5159	645	[500_10_4_40_15_5]	8664	8678	8664	9010	9071	8664
241	[100_20_8_30_10_1]	3348	3354	3351	3400	3381	3348	646	[500_10_4_40_15_6]	8384	8384	8386	9224	8234	8234
242	[100_20_8_30_10_2]	3165	3165	3167	3413	3279	3165	647	[500_10_4_40_15_7]	8709	8709	8615	9831	8634	8615
243	[100_20_8_30_10_3]	3025	3025	3025	3010	2654	2654	648	[500_10_4_40_15_8]	8674	8674	8669	10,322	7815	7815
244	[100_20_8_30_10_4]	3393	3398	3392	3392	3435	3392	649	[500_10_4_40_15_9]	8506	8529	8506	10,657	8275	8275
245	[100_20_8_30_10_5]	3519	3509	3509	3509	3509	3509	650	[500_10_4_40_15_10]	8708	8617	8668	10,211	9089	8617
246	[100_20_8_30_10_6]	3498	3500	3498	3489	3579	3489	651	[500_10_4_50_20_1]	8905	8909	8905	10,082	9527	8905
247	[100_20_8_30_10_7]	3174	3174	3166	3298	3038	3038	652	[500_10_4_50_20_2]	8511	8498	8498	9730	6957	6957
248	[100_20_8_30_10_8]	2901	2892	2892	2953	3032	2892	653	[500_10_4_50_20_3]	8349	8349	8349	9227	7557	7557
249	[100_20_8_30_10_9]	3342	3338	3342	3335	3111	3111	654	[500_10_4_50_20_4]	8517	8517	8487	9870	7422	7422
250	[100_20_8_30_10_10]	2954	2937	2954	3044	3080	2937	655	[500_10_4_50_20_5]	8527	8527	8527	9639	8471	8471
251	[100_20_8_40_15_1]	4440	4440	4462	4440	4440	4440	656	[500_10_4_50_20_6]	9431	9490	9478	10,598	9318	9318

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
252	[100_20_8_40_15_2]	4067	4031	4067	4100	3825	3825	657	[500_10_4_50_20_7]	8686	8671	8648	9868	7884	7884
253	[100_20_8_40_15_3]	4828	4819	4819	4819	4608	4608	658	[500_10_4_50_20_8]	8829	8797	8829	10,021	9217	8797
254	[100_20_8_40_15_4]	4182	4159	4182	4159	4328	4159	659	[500_10_4_50_20_9]	8462	8462	8474	10,698	8598	8462
255	[100_20_8_40_15_5]	4200	4200	4207	4200	3846	3846	660	[500_10_4_50_20_10]	8491	8469	8485	10,043	7424	7424
256	[100_20_8_40_15_6]	4289	4285	4285	4289	4189	4189	661	[500_10_6_30_10_1]	7087	7079	7087	8448	6824	6824
257	[100_20_8_40_15_7]	4213	4213	4209	4282	4138	4138	662	[500_10_6_30_10_2]	6794	6794	6775	7821	8600	6775
258	[100_20_8_40_15_8]	4855	4845	4855	4855	4458	4458	663	[500_10_6_30_10_3]	7250	7248	7248	8046	7024	7024
259	[100_20_8_40_15_9]	3603	3590	3603	3646	3626	3590	664	[500_10_6_30_10_4]	7139	7108	7139	8884	7627	7108
260	[100_20_8_40_15_10]	4728	4699	4710	4699	4126	4126	665	[500_10_6_30_10_5]	7240	7240	7240	9262	8460	7240
261	[100_20_8_50_20_1]	4857	4853	4853	4848	4573	4573	666	[500_10_6_30_10_6]	6665	6691	6665	8739	7662	6665
262	[100_20_8_50_20_2]	4451	4451	4410	4410	4343	4343	667	[500_10_6_30_10_7]	6541	6589	6556	7974	7196	6541
263	[100_20_8_50_20_3]	4930	4961	4930	4906	4616	4616	668	[500_10_6_30_10_8]	6711	6711	6695	7256	6595	6595
264	[100_20_8_50_20_4]	5382	5374	5426	5382	5237	5237	669	[500_10_6_30_10_9]	7219	7219	7219	8702	9631	7219
265	[100_20_8_50_20_5]	4928	4919	4928	4919	4860	4860	670	[500_10_6_30_10_10]	7211	7211	7192	9368	8489	7192
266	[100_20_8_50_20_6]	5374	5374	5372	5372	5141	5141	671	[500_10_6_40_15_1]	6769	6823	6769	7972	7793	6769
267	[100_20_8_50_20_7]	5109	5156	5109	5105	4759	4759	672	[500_10_6_40_15_2]	6362	6426	6426	7589	6256	6256
268	[100_20_8_50_20_8]	4986	4957	4971	4989	4800	4800	673	[500_10_6_40_15_3]	6790	6782	6782	7858	7149	6782
269	[100_20_8_50_20_9]	4542	4547	4545	4635	4019	4019	674	[500_10_6_40_15_4]	6814	6720	6802	8283	6844	6720
270	[100_20_8_50_20_10]	5072	5023	5072	5023	4782	4782	675	[500_10_6_40_15_5]	6718	6713	6713	7755	6334	6334
271	[200_5_4_30_10_1]	3707	3705	3705	4036	4190	3705	676	[500_10_6_40_15_6]	6574	6487	6487	7316	6166	6166
272	[200_5_4_30_10_2]	3743	3756	3737	4727	3416	3416	677	[500_10_6_40_15_7]	6680	6625	6656	8174	7403	6625
273	[200_5_4_30_10_3]	3607	3606	3606	4173	4055	3606	678	[500_10_6_40_15_8]	6760	6760	6779	8184	7009	6760
274	[200_5_4_30_10_4]	3609	3586	3586	4089	3387	3387	679	[500_10_6_40_15_9]	6621	6673	6654	7449	6870	6621
275	[200_5_4_30_10_5]	3761	3776	3776	4162	3681	3681	680	[500_10_6_40_15_10]	6456	6482	6480	7857	5949	5949
276	[200_5_4_30_10_6]	3604	3602	3604	4562	3475	3475	681	[500_10_6_50_20_1]	6417	6437	6410	7709	6647	6410
277	[200_5_4_30_10_7]	3595	3595	3614	4032	3267	3267	682	[500_10_6_50_20_2]	7102	7102	7102	8286	7082	7082
278	[200_5_4_30_10_8]	3492	3490	3469	4290	3966	3469	683	[500_10_6_50_20_3]	6472	6472	6472	6990	6720	6472
279	[200_5_4_30_10_9]	3842	3839	3824	5076	3503	3503	684	[500_10_6_50_20_4]	6377	6363	6363	7263	6293	6293

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
280	[200_5_4_30_10_10]	3896	3876	3891	4897	4256	3876	685	[500_10_6_50_20_5]	6653	6659	6653	8136	7900	6653
281	[200_5_4_40_15_1]	4121	4121	4121	4602	4142	4121	686	[500_10_6_50_20_6]	6940	6940	6861	7584	6966	6861
282	[200_5_4_40_15_2]	3877	3886	3886	4159	3870	3870	687	[500_10_6_50_20_7]	6712	6658	6702	7418	6248	6248
283	[200_5_4_40_15_3]	3762	3760	3760	4142	3904	3760	688	[500_10_6_50_20_8]	6731	6702	6702	8834	6576	6576
284	[200_5_4_40_15_4]	3616	3616	3608	4008	3848	3608	689	[500_10_6_50_20_9]	6451	6462	6451	7186	6247	6247
285	[200_5_4_40_15_5]	4117	4117	4090	4296	4419	4090	690	[500_10_6_50_20_10]	6748	6680	6748	8217	6333	6333
286	[200_5_4_40_15_6]	3611	3640	3632	3939	3511	3511	691	[500_10_8_30_10_1]	5590	5615	5615	6902	5747	5590
287	[200_5_4_40_15_7]	3666	3682	3666	4258	3432	3432	692	[500_10_8_30_10_2]	5978	5978	5986	7418	5829	5829
288	[200_5_4_40_15_8]	3872	3878	3876	4601	3768	3768	693	[500_10_8_30_10_3]	5994	5981	5988	7800	7203	5981
289	[200_5_4_40_15_9]	3637	3637	3670	3938	3587	3587	694	[500_10_8_30_10_4]	6204	6204	6228	7225	7036	6204
290	[200_5_4_40_15_10]	4164	4164	4170	4376	4170	4164	695	[500_10_8_30_10_5]	6082	6082	6067	6846	5720	5720
291	[200_5_4_50_20_1]	4333	4321	4321	4321	4383	4321	696	[500_10_8_30_10_6]	6264	6257	6262	6723	6398	6257
292	[200_5_4_50_20_2]	4593	4592	4593	4627	4477	4477	697	[500_10_8_30_10_7]	5822	5817	5822	6391	5639	5639
293	[200_5_4_50_20_3]	4670	4655	4655	4750	4886	4655	698	[500_10_8_30_10_8]	6064	6049	6056	7266	6481	6049
294	[200_5_4_50_20_4]	5094	5090	5091	5097	5090	5090	699	[500_10_8_30_10_9]	5517	5517	5487	6532	6158	5487
295	[200_5_4_50_20_5]	4584	4584	4584	4733	4728	4584	700	[500_10_8_30_10_10]	5381	5374	5400	6916	6382	5374
296	[200_5_4_50_20_6]	4150	4146	4148	4180	4146	4146	701	[500_10_8_40_15_1]	5928	5908	5908	6320	5773	5773
297	[200_5_4_50_20_7]	4846	4836	4836	4839	4871	4836	702	[500_10_8_40_15_2]	5492	5478	5484	5834	5681	5478
298	[200_5_4_50_20_8]	4415	4407	4415	4445	4424	4407	703	[500_10_8_40_15_3]	5818	5818	5805	6145	5284	5284
299	[200_5_4_50_20_9]	4565	4552	4565	4844	4493	4493	704	[500_10_8_40_15_4]	5822	5799	5799	6045	5246	5246
300	[200_5_4_50_20_10]	4862	4854	4860	4854	4854	4854	705	[500_10_8_40_15_5]	6120	6099	6120	7701	6350	6099
301	[200_5_6_30_10_1]	2944	2934	2934	3222	2770	2770	706	[500_10_8_40_15_6]	6094	6090	6094	7021	6159	6090
302	[200_5_6_30_10_2]	3238	3243	3243	3746	3337	3238	707	[500_10_8_40_15_7]	6036	6036	6035	6492	5610	5610
303	[200_5_6_30_10_3]	3315	3304	3315	3599	3047	3047	708	[500_10_8_40_15_8]	5935	5928	5935	7551	6132	5928
304	[200_5_6_30_10_4]	3117	3117	3108	3638	3317	3108	709	[500_10_8_40_15_9]	5712	5719	5740	6812	6663	5712
305	[200_5_6_30_10_5]	3323	3323	3321	3866	3746	3321	710	[500_10_8_40_15_10]	5850	5850	5850	6284	5278	5278
306	[200_5_6_30_10_6]	3357	3357	3359	3618	3380	3357	711	[500_10_8_50_20_1]	5482	5482	5499	6518	5880	5482
307	[200_5_6_30_10_7]	3110	3110	3110	3371	3233	3110	712	[500_10_8_50_20_2]	5966	5966	5944	6235	6015	5944

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
308	[200_5_6_30_10_8]	2991	2981	2981	3453	3413	2981	713	[500_10_8_50_20_3]	6082	6082	6082	6568	5479	5479
309	[200_5_6_30_10_9]	3832	3827	3832	4142	3921	3827	714	[500_10_8_50_20_4]	5557	5552	5556	6098	5000	5000
310	[200_5_6_30_10_10]	3344	3344	3344	3493	3508	3344	715	[500_10_8_50_20_5]	5787	5767	5787	6124	5722	5722
311	[200_5_6_40_15_1]	3605	3602	3605	3602	3602	3602	716	[500_10_8_50_20_6]	6233	6233	6233	6855	6138	6138
312	[200_5_6_40_15_2]	3040	3040	3040	3509	3231	3040	717	[500_10_8_50_20_7]	6474	6462	6474	6732	5958	5958
313	[200_5_6_40_15_3]	3873	3865	3873	3865	3722	3722	718	[500_10_8_50_20_8]	6294	6246	6246	6416	5714	5714
314	[200_5_6_40_15_4]	2860	2860	2865	2960	2514	2514	719	[500_10_8_50_20_9]	5692	5692	5692	6028	6052	5692
315	[200_5_6_40_15_5]	3796	3796	3794	4005	3831	3794	720	[500_10_8_50_20_10]	5564	5564	5574	6035	4992	4992
316	[200_5_6_40_15_6]	4318	4307	4309	4307	4306	4306	721	[500_20_4_30_10_1]	9995	9956	9995	12,400	9995	9956
317	[200_5_6_40_15_7]	3669	3694	3682	3700	3563	3563	722	[500_20_4_30_10_2]	10,050	10,050	10,050	10,977	10,299	10,050
318	[200_5_6_40_15_8]	3733	3726	3733	3735	3775	3726	723	[500_20_4_30_10_3]	9934	9934	9934	11,586	9434	9434
319	[200_5_6_40_15_9]	3249	3248	3248	3242	3242	3242	724	[500_20_4_30_10_4]	10,189	10,174	10,174	11,376	10,071	10,071
320	[200_5_6_40_15_10]	3387	3387	3402	3713	3259	3259	725	[500_20_4_30_10_5]	9866	9858	9880	11,513	9522	9522
321	[200_5_6_50_20_1]	4362	4362	4360	4360	4282	4282	726	[500_20_4_30_10_6]	9498	9494	9468	11,866	7601	7601
322	[200_5_6_50_20_2]	5184	5171	5178	5209	5215	5171	727	[500_20_4_30_10_7]	10,023	10,051	10,062	11,502	7922	7922
323	[200_5_6_50_20_3]	5182	5182	5182	5173	5184	5173	728	[500_20_4_30_10_8]	10,030	10,030	10,030	11,117	9997	9997
324	[200_5_6_50_20_4]	4442	4439	4436	4471	4604	4436	729	[500_20_4_30_10_9]	10,117	9972	10,107	11,145	8448	8448
325	[200_5_6_50_20_5]	4105	4096	4105	4096	4096	4096	730	[500_20_4_30_10_10]	9841	9833	9841	12,059	8932	8932
326	[200_5_6_50_20_6]	4710	4713	4710	4707	4710	4707	731	[500_20_4_40_15_1]	9774	9774	9796	11,182	8869	8869
327	[200_5_6_50_20_7]	4115	4110	4113	4110	3925	3925	732	[500_20_4_40_15_2]	9825	9825	9834	11,643	8130	8130
328	[200_5_6_50_20_8]	4243	4265	4243	4243	4336	4243	733	[500_20_4_40_15_3]	9875	9875	9875	11,064	8569	8569
329	[200_5_6_50_20_9]	4068	4062	4068	4118	4085	4062	734	[500_20_4_40_15_4]	10,048	10,048	9987	11,413	8447	8447
330	[200_5_6_50_20_10]	4388	4388	4390	4386	4404	4386	735	[500_20_4_40_15_5]	10,137	10,055	10,046	12,908	9789	9789
331	[200_5_8_30_10_1]	2855	2839	2848	2915	3351	2839	736	[500_20_4_40_15_6]	10,197	10,197	10,177	11,862	10,182	10,177
332	[200_5_8_30_10_2]	2944	2944	2929	3051	2862	2862	737	[500_20_4_40_15_7]	9899	9852	9875	11,638	9145	9145
333	[200_5_8_30_10_3]	2861	2859	2859	3131	2967	2859	738	[500_20_4_40_15_8]	9610	9555	9610	11,039	9073	9073
334	[200_5_8_30_10_4]	3481	3481	3481	3494	3532	3481	739	[500_20_4_40_15_9]	9924	9931	9924	11,471	10,038	9924
335	[200_5_8_30_10_5]	3012	3012	3014	3155	2979	2979	740	[500_20_4_40_15_10]	10,235	10,235	10,232	11,811	9628	9628

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
336	[200_5_8_30_10_6]	2790	2801	2790	3101	3069	2790	741	[500_20_4_50_20_1]	9684	9687	9687	10,585	9987	9684
337	[200_5_8_30_10_7]	2827	2827	2817	3330	2655	2655	742	[500_20_4_50_20_2]	9671	9592	9627	10,525	8649	8649
338	[200_5_8_30_10_8]	3032	3050	3048	3000	3000	3000	743	[500_20_4_50_20_3]	9706	9723	9694	11,599	9528	9528
339	[200_5_8_30_10_9]	3151	3137	3147	3142	3145	3137	744	[500_20_4_50_20_4]	9808	9767	9774	10,626	9466	9466
340	[200_5_8_30_10_10]	2955	2955	2934	3229	3043	2934	745	[500_20_4_50_20_5]	9760	9751	9751	11,260	7957	7957
341	[200_5_8_40_15_1]	3427	3409	3409	3514	3499	3409	746	[500_20_4_50_20_6]	9650	9650	9645	11,070	8905	8905
342	[200_5_8_40_15_2]	3506	3505	3505	3493	3429	3429	747	[500_20_4_50_20_7]	9817	9817	9840	11,575	8438	8438
343	[200_5_8_40_15_3]	3729	3729	3730	3729	3574	3574	748	[500_20_4_50_20_8]	9967	9950	9848	10,964	8853	8853
344	[200_5_8_40_15_4]	3424	3424	3424	3424	3445	3424	749	[500_20_4_50_20_9]	10,108	10,094	10,108	11,173	8066	8066
345	[200_5_8_40_15_5]	3821	3821	3821	3817	3611	3611	750	[500_20_4_50_20_10]	9872	9872	9865	10,430	8910	8910
346	[200_5_8_40_15_6]	3049	3048	3048	3049	3054	3048	751	[500_20_6_30_10_1]	7780	7755	7777	9293	6982	6982
347	[200_5_8_40_15_7]	3128	3128	3128	3143	3253	3128	752	[500_20_6_30_10_2]	7371	7371	7377	9474	7462	7371
348	[200_5_8_40_15_8]	3948	3937	3943	3937	3937	3937	753	[500_20_6_30_10_3]	7781	7790	7781	8773	8376	7781
349	[200_5_8_40_15_9]	3857	3865	3858	3820	3960	3820	754	[500_20_6_30_10_4]	8014	7950	7950	8833	8528	7950
350	[200_5_8_40_15_10]	3291	3291	3291	3305	3249	3249	755	[500_20_6_30_10_5]	7723	7723	7670	8971	8828	7670
351	[200_5_8_50_20_1]	4221	4232	4221	4245	4212	4212	756	[500_20_6_30_10_6]	7802	7802	7802	8565	7726	7726
352	[200_5_8_50_20_2]	4141	4140	4141	4131	4141	4131	757	[500_20_6_30_10_7]	7334	7313	7334	7904	7681	7313
353	[200_5_8_50_20_3]	4458	4482	4458	4458	4458	4458	758	[500_20_6_30_10_8]	7842	7842	7823	8655	7294	7294
354	[200_5_8_50_20_4]	4870	4851	4851	4851	4833	4833	759	[500_20_6_30_10_9]	8019	8019	8013	9514	9160	8013
355	[200_5_8_50_20_5]	4193	4230	4230	4264	4236	4193	760	[500_20_6_30_10_10]	8252	8223	8223	9444	9977	8223
356	[200_5_8_50_20_6]	4572	4570	4572	4590	4649	4570	761	[500_20_6_40_15_1]	7649	7645	7645	9187	7568	7568
357	[200_5_8_50_20_7]	4113	4108	4108	4086	4086	4086	762	[500_20_6_40_15_2]	7590	7590	7595	9477	6439	6439
358	[200_5_8_50_20_8]	4089	4090	4088	4088	3861	3861	763	[500_20_6_40_15_3]	7240	7193	7231	8072	6676	6676
359	[200_5_8_50_20_9]	4091	4062	4083	4066	3957	3957	764	[500_20_6_40_15_4]	7795	7746	7765	9016	8334	7746
360	[200_5_8_50_20_10]	4230	4236	4230	4247	4247	4230	765	[500_20_6_40_15_5]	7695	7690	7692	9380	7456	7456
361	[200_10_4_30_10_1]	3948	3938	3948	4617	3519	3519	766	[500_20_6_40_15_6]	7566	7555	7558	8029	6935	6935
362	[200_10_4_30_10_2]	4145	4128	4128	4670	3720	3720	767	[500_20_6_40_15_7]	7632	7632	7702	8366	6883	6883
363	[200_10_4_30_10_3]	4310	4310	4335	4930	3964	3964	768	[500_20_6_40_15_8]	7453	7453	7452	8271	6409	6409

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
364	[200_10_4_30_10_4]	4147	4150	4139	4776	4133	4133	769	[500_20_6_40_15_9]	7565	7512	7549	8540	7134	7134
365	[200_10_4_30_10_5]	4057	4057	4057	4698	3946	3946	770	[500_20_6_40_15_10]	7607	7680	7667	8249	6471	6471
366	[200_10_4_30_10_6]	4300	4298	4298	4536	3940	3940	771	[500_20_6_50_20_1]	7565	7599	7565	8563	6331	6331
367	[200_10_4_30_10_7]	4262	4255	4262	4686	3779	3779	772	[500_20_6_50_20_2]	7732	7732	7732	8459	7467	7467
368	[200_10_4_30_10_8]	4284	4284	4283	4996	3426	3426	773	[500_20_6_50_20_3]	7657	7649	7649	8499	6750	6750
369	[200_10_4_30_10_9]	4149	4141	4145	4918	3907	3907	774	[500_20_6_50_20_4]	7680	7652	7663	8405	7730	7652
370	[200_10_4_30_10_10]	4272	4272	4261	4594	4021	4021	775	[500_20_6_50_20_5]	7620	7616	7620	8523	7063	7063
371	[200_10_4_40_15_1]	4385	4377	4377	4950	4468	4377	776	[500_20_6_50_20_6]	7727	7725	7725	8448	8304	7725
372	[200_10_4_40_15_2]	4313	4299	4308	5016	4143	4143	777	[500_20_6_50_20_7]	7787	7787	7810	8197	7464	7464
373	[200_10_4_40_15_3]	4181	4175	4181	5058	4585	4175	778	[500_20_6_50_20_8]	7945	7949	7957	8926	7450	7450
374	[200_10_4_40_15_4]	4718	4709	4717	5311	4803	4709	779	[500_20_6_50_20_9]	7647	7624	7647	8135	7656	7624
375	[200_10_4_40_15_5]	4177	4213	4187	4779	3831	3831	780	[500_20_6_50_20_10]	7424	7444	7417	8045	6594	6594
376	[200_10_4_40_15_6]	4087	4062	4083	4953	4008	4008	781	[500_20_8_30_10_1]	6690	6704	6704	7745	6607	6607
377	[200_10_4_40_15_7]	4195	4195	4195	5120	4524	4195	782	[500_20_8_30_10_2]	6601	6601	6601	7558	5736	5736
378	[200_10_4_40_15_8]	4345	4324	4324	5092	4631	4324	783	[500_20_8_30_10_3]	7089	7089	7089	8245	6654	6654
379	[200_10_4_40_15_9]	4517	4504	4517	4866	4269	4269	784	[500_20_8_30_10_4]	6951	6941	6951	8247	7778	6941
380	[200_10_4_40_15_10]	4443	4443	4443	4799	4533	4443	785	[500_20_8_30_10_5]	7001	6955	6955	8244	6836	6836
381	[200_10_4_50_20_1]	4693	4678	4693	4882	4698	4678	786	[500_20_8_30_10_6]	6943	6932	6939	7735	7376	6932
382	[200_10_4_50_20_2]	4536	4536	4536	5010	4746	4536	787	[500_20_8_30_10_7]	6679	6679	6679	7482	6805	6679
383	[200_10_4_50_20_3]	5278	5278	5278	5570	5333	5278	788	[500_20_8_30_10_8]	6913	6897	6897	7763	6320	6320
384	[200_10_4_50_20_4]	4773	4758	4766	5110	5014	4758	789	[500_20_8_30_10_9]	6565	6561	6561	7251	6749	6561
385	[200_10_4_50_20_5]	4539	4527	4530	4747	4628	4527	790	[500_20_8_30_10_10]	7135	7127	7127	7608	6626	6626
386	[200_10_4_50_20_6]	4506	4534	4506	4915	4357	4357	791	[500_20_8_40_15_1]	6968	6853	6938	7801	6429	6429
387	[200_10_4_50_20_7]	5378	5358	5358	5478	5404	5358	792	[500_20_8_40_15_2]	6581	6581	6572	7595	5556	5556
388	[200_10_4_50_20_8]	4604	4570	4570	4889	4539	4539	793	[500_20_8_40_15_3]	6686	6617	6684	7496	6483	6483
389	[200_10_4_50_20_9]	5430	5404	5404	5445	5471	5404	794	[500_20_8_40_15_4]	7098	7098	7065	7316	7045	7045
390	[200_10_4_50_20_10]	5059	5057	5057	5050	4863	4863	795	[500_20_8_40_15_5]	6586	6540	6540	7446	5444	5444
391	[200_10_6_30_10_1]	3388	3402	3388	4540	3706	3388	796	[500_20_8_40_15_6]	6597	6588	6597	7513	6749	6588

No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS	No	Identity	HSSO	HSSOR	HSSORP	ANEH +	NCH	BFS
392	[200_10_6_30_10_2]	3685	3663	3672	4212	3593	3593	797	[500_20_8_40_15_7]	7019	7019	7060	7655	6333	6333
393	[200_10_6_30_10_3]	3633	3633	3633	4026	3818	3633	798	[500_20_8_40_15_8]	6430	6412	6423	7619	7424	6412
394	[200_10_6_30_10_4]	3572	3563	3563	3960	3695	3563	799	[500_20_8_40_15_9]	6623	6557	6557	7436	6344	6344
395	[200_10_6_30_10_5]	4083	4098	4080	4414	3458	3458	800	[500_20_8_40_15_10]	6488	6472	6488	7278	6400	6400
396	[200_10_6_30_10_6]	3199	3210	3210	3802	3058	3058	801	[500_20_8_50_20_]	6543	6575	6590	7415	5912	5912
397	[200_10_6_30_10_7]	3934	3920	3920	4177	3432	3432	802	[500_20_8_50_20_]	6882	6878	6878	7216	6487	6487
398	[200_10_6_30_10_8]	3787	3787	3787	4117	3687	3687	803	[500_20_8_50_20_]	6874	6888	6874	7156	7109	6874
399	[200_10_6_30_10_9]	3554	3552	3554	3828	3292	3292	804	[500_20_8_50_20_]	6620	6620	6604	7101	6109	6109
400	[200_10_6_30_10_10]	3699	3699	3690	3938	3495	3495	805	[500_20_8_50_20_]	6836	6804	6812	6988	6474	6474
401	[200_10_6_40_15_1]	3484	3515	3515	3859	3552	3484	806	[500_20_8_50_20_]	7008	7018	6998	7223	5954	5954
402	[200_10_6_40_15_2]	4777	4770	4769	4749	4830	4749	807	[500_20_8_50_20_]	6579	6578	6578	6821	6176	6176
403	[200_10_6_40_15_3]	4000	4000	3999	4179	4122	3999	808	[500_20_8_50_20_]	6881	6857	6866	7489	6119	6119
404	[200_10_6_40_15_4]	3770	3814	3817	4208	3457	3457	809	[500_20_8_50_20_]	6575	6541	6548	7184	5739	5739
405	[200_10_6_40_15_5]	3841	3891	3891	4099	3881	3841	810	[500_20_8_50_20_]	6406	6406	6377	7163	6132	6132

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