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Application of the Hungarian Method (Assignment) in Optimizing the Division of Working Hours at CV. Comrade Gemilang's Participation (PKG)

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ABSTRACT

The purpose of writing "Application of the hungarianmethod (assignment) in optimizing the division of work hours at CV. Partpresisi Kawan Gemilang (PKG)" is to calculate the assignment problem so that work can be done evenly and minimize losses due to unemployed workers. As well as to streamline the division of tasks so that time is more optimal. With so many requests for brake bolts and components, they are trying to solve the problem with the duration of the process from checking to smoothing being shorter. In order not to delay the time until the refinement time is delayed. Then obtained the results of solving the assignment problem with the Hungarian method Mr. Agus with a small bolt smoothing job, Mr. Susanto with a nut smoothing job, Mr. Yanto with a matic motorbike brake lining job, Mr. Ahmad with a motorbike brake cap smoothing job, Mr. Wardi with a big bolt smoothing jobs.

Keywords : Hungarian Method, Assignment, Vehicle, Refinement

INTRODUCTION

At this time, one aspect that affects the success of a company in surviving and competing is through the distribution system process. From the distribution process, there are several problems that can be optimized, namely the division of working hours for each worker. In order to obtain the optimal division of working hours, it is necessary to use a method of dividing the working hours, one of which is the Hungarian method. CV. Partpresisi Kawan Gemilang (PKG) is engaged in refining and processing bolt and brake components on motorized vehicles consisting of various shapes and sizes. This company implements a stock system in handling demand from the market (Harini, 2017). Availability of sufficient labor to run the production process. In carrying out the production process, it is necessary to pay attention to several aspects such as the division of working hours in order to get maximum profit, the company needs a solution to optimize the cost of labor wages. From these problems, the Hungarian method can be used to find the optimal solution in the division of working hours for employees in this company. So that the costs incurred for labor costs are more optimal.

According to (Taha, 2015) Human Resources owned by every business are required to be able to increase efficiency and make their use effective. In running a business, the best way to get satisfactory results must be observed. All of that can be achieved by implementing strategies or techniques that would be able to increase the success of a business. Production management often faces problems related to the optimal allocation of various kinds of productive resources, especially labor. This problem is called the assignment problem, which is a special case of the linear problem.

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In general, the level of skill, work experience, educational background, and training of each employee is different. So that in the completion time of the same work it is also different. The Hungarian method is a method developed by a mathematician named D. Konig from Hungary in 1916, his application that each resource should be assigned only to one job (Ibnas, 2018).

For an nxn assignment problem, the number of possible assignments is equal to n! (n factorial) because it is a one-to-one pair. In the Hungarian method that resource should be assigned to only one job.

METHOD

Hungarian Method or Assignment

The Hungarian method is a method that modifies the rows and columns in the effectiveness matrix until a single zero component appears in each row or column that can be selected as an assignment allocation. All assignment allocations made are optimal allocations, and when applied to the initial effectiveness matrix, they will give the minimum assignment results. This algorithm is named the Hungarian Method which is based on the work of two Hungarian mathematicians, namely Denes Konig and Jeno Egervary (Herlawati, 2017). The use of the Hungarian method procedure with a weighted matrix consists of 3 stages, namely the preparation of an assignment matrix or table, an analysis of the feasibility of determining the optimum, and rearranging the matrix. (Taha, 2015)

Terms of the Hungarian Method or Assignment

The requirements for the Hungarian method are, among others, as follows; The number of i must be equal to the number of j that must be completed. Each source only does one task. If the number of sources is not equal to the number of tasks or vice versa, then a dummy woker or dummy job variable is added. There are two problems that are solved, namely minimizing losses (cost, time, distance and so on) or maximizing profits.

Research Sites

This research was conducted in a CV for the manufacture of brake linings and bolts for automatic motorcycles and motorcycles in Karawang. Problem formulation was carried out through observations carried out at the brake lining and bolt smoothing station. Analysis of the impact caused by existing conditions is the result of observations and interviews with related parties. Furthermore, a design for the application of the Hungarian method will be made and the results of its application will be evaluated.

RESULTS AND DISCUSSION

The data taken is data that can be obtained from research on a CV that is engaged in spare parts refinement services called CV. Comrade Gemilang's (PKG) participation. The problem used in this study is the assignment problem experienced, namely how to place mechanics on their proper duties so as to get optimal results. The number of employees in the workshop CV. The participation of Kawan Gemilang (PKG) consists of 5 people, each of whom has a different time in completing their tasks.

The following is data obtained from CV. The participation of Kawan Gemilang (PKG) regarding the division of labor hours to employees (the unit of time uses hours/day) is presented in Table 1. As follows:

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Table 1. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	17	35	19	21	33
Aligning Mur	11	24	20	16	15
Canvas Smoothing Motorcycle Brake Matic	22	17	31	8	24
Duck Motorcycle Brake Pad Smoothing	15	9	12	15	17
Bolt Smoothing Big	25	12	26	10	27

From the existing table, we can directly perform calculations using the Hungarian method by looking at the data in each row and looking for the smallest number, then subtracting the smallest number from each row as shown in Table 2. as follows:

Table 2. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	17-17	35-17	19-17	21-17	33-17
Aligning Mur	11-11	24-11	20-11	16-11	15-11
Canvas Smoothing Motorcycle Brake Matic	22-8	17-8	31-8	8-8	24-8
Duck Motorcycle Brake Pad Smoothing	15-9	9-9	12-9	15-9	17-9
Bolt Smoothing Big	25-10	12-10	26-10	10-10	27-10

After all the rows are subtracted, we get the results as in Table 3. as follows:

Table 3. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	0	18	2	4	16
Aligning Mur	0	13	9	5	4
Canvas Smoothing Motorcycle Brake Matic	14	9	23	0	16

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Duck Motorcycle Brake Pad Smoothing	6	0	3	6	8
Bolt Smoothing Big	15	2	16	0	17

Since there is no best result in columns 3 and 5, we look for the minimum value in each column to determine the best result as shown in Table 4. as follows:

Table 4. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	0	18	2-2	4	16-4
Aligning Mur	0	13	9-2	5	4-4
Canvas Smoothing Motorcycle Brake Matic	14	9	23-2	0	16-4
Duck Motorcycle Brake Pad Smoothing	6	0	3-2	6	8-4
Bolt Smoothing Big	15	2	16-2	0	17-4

Next, draw a line to find out whether the table is the best, and the line drawn must be equal to the number of rows as in Table 5. as follows:

Table 5. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Small Bolt Smoothing	0	1	0	4	12
Aligning Mur	0	1	7	5	0
Matic Motorcycle Brake Pad	14	9	21	0	12
Duck Motorcycle Brake Pad Smoothing	13	7	1	6	4
Large Bolt Smoothing	15	2	14	0	13

For numbers that are not affected by the line, subtract the minimum value, then add the smallest value to the pivot as shown in Table 6. as follows:

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Table 6. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	0	18+1	0	4+1	12
Aligning Mur	0	13+1	7	5+1	0
Canvas Smoothing Motorcycle Brake Matic	14-1	9	21-1	0	12-1
Duck Motorcycle Brake Pad Smoothing	13-1	7	1-1	6	4-1
Bolt Smoothing Big	15-1	2	14-1	0	13-1

For numbers that are not affected by the line, subtract the minimum value, then add the smallest value to the pivot as shown in Table 7. as follows:

Table 7. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Bolt Smoothing Small	0	1	0	5	12
Aligning Mur	0	1	7	0	0
Canvas Smoothing Motorcycle Brake Matic	13	9	2	0	11
Duck Motorcycle Brake Pad Smoothing	5	0	0	6	3
Bolt Smoothing Big	14	2	1	0	12

For numbers that are not hit by a straight line, subtract the minimum value, then add the minimum value to the pivot as shown in Table 8. as follows: Next, draw a line to find out whether the table is optimal or not, and the line drawn must be equal to the number of rows as in Table 10. as follows:

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Table 8. Observation Results CV. Comrade Gemilang's Participation (PKG)

	Mr. Agus	Mr. Susanto	Mr. Yanto	Mr. Ahmad	Mr. Wardi
Small Bolt Smoothing	0	20	0	8	10
Aligning Mur	0	17	1	1	0
Matic Motorcycle Brake Pad	1	7	2	0	6
Duck Motorcycle Brake Pad Smoothing	4	0	0	8	0
Large Bolt Smoothing	1	0	1	0	7

Then we get an optimal result for the five workers based on the place or type of work that is suitable for each worker and doing his job, obtained in Table 11. as follows:

Table 9. Observation Results CV. Comrade Gemilang's Participation (PKG)

Name Worker	Work	Time (hour/day)
Mr. Agus	Bolt Smoothing Small	17
Mr. Susanto	Bolt Smoothing Big	12
Mr. Yanto	Canvas Smoothing Duck Motorcycle Brake	12
Mr. Ahmad	Canvas Smoothing Motorcycle Brake Matic	8
Mr. Wardi	Nut Refining	15
Optimal Time		64

obtained as shown in Table 12. as follows:

Table 12. Observation Results CV. Comrade Gemilang's Participation (PKG)

Name Worker	Work	Time (hour/day)
Mr. Agus	Bolt Smoothing Small	17
Mr. Susanto	Bolt Smoothing Big	12
Mr. Yanto	Canvas Smoothing Duck Motorcycle	12

	Brake	
Mr. Ahmad	Canvas Smoothing Motorcycle Brake Matic	8
Mr. Wardi	Nut Refining	15
Optimal Time		64

It can be concluded from the table that has been calculated using the POM-QM application for Windows or the Operations Management Program – Quantitative Methods for Windows, so that optimal results and optimal costs are obtained only for the Assignment or Hungarian method which is called assignment, as shown in Figure 1. as follows :

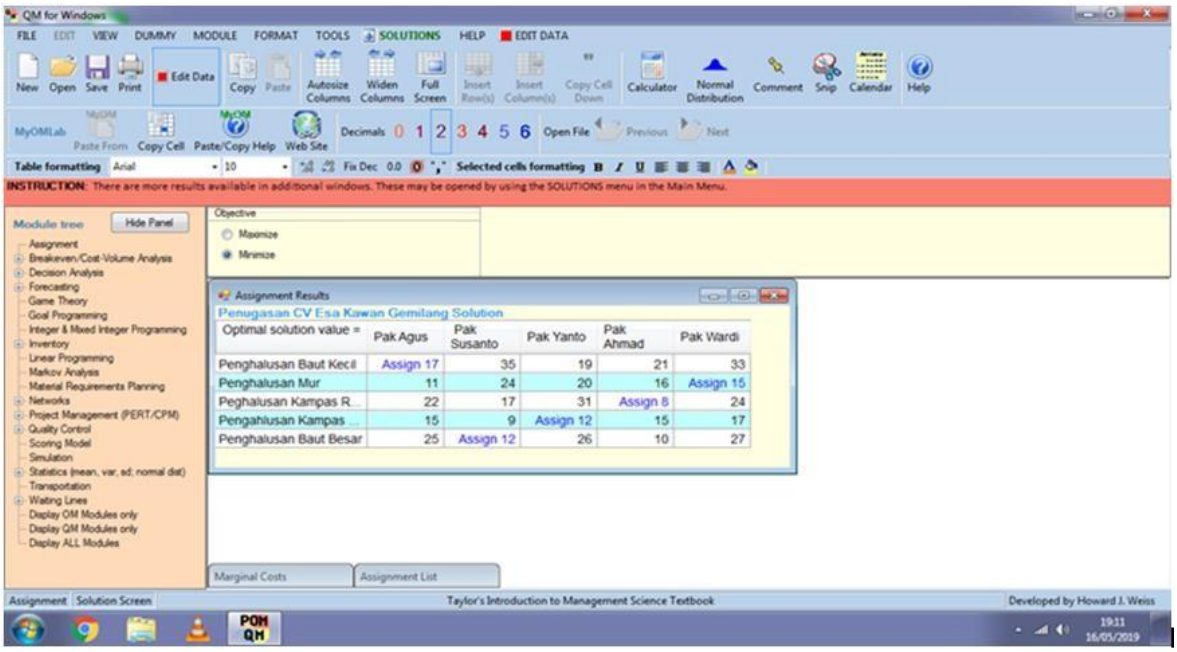

Figure 1. POM-QM for Windows or Program Operations Management – Quantitative Methods for Windows

The results on the POM-QM for Windows application or Program Operations Management – Quantitative Methods for Windows automatically and manually get the same results, this can be said to be true in terms of proof, both manual and automanual because the first one is calculated manually the same as programmed or manually. automanual, got the result optimal solution after searching for the smallest path, as shown in Figure 2. as follows:

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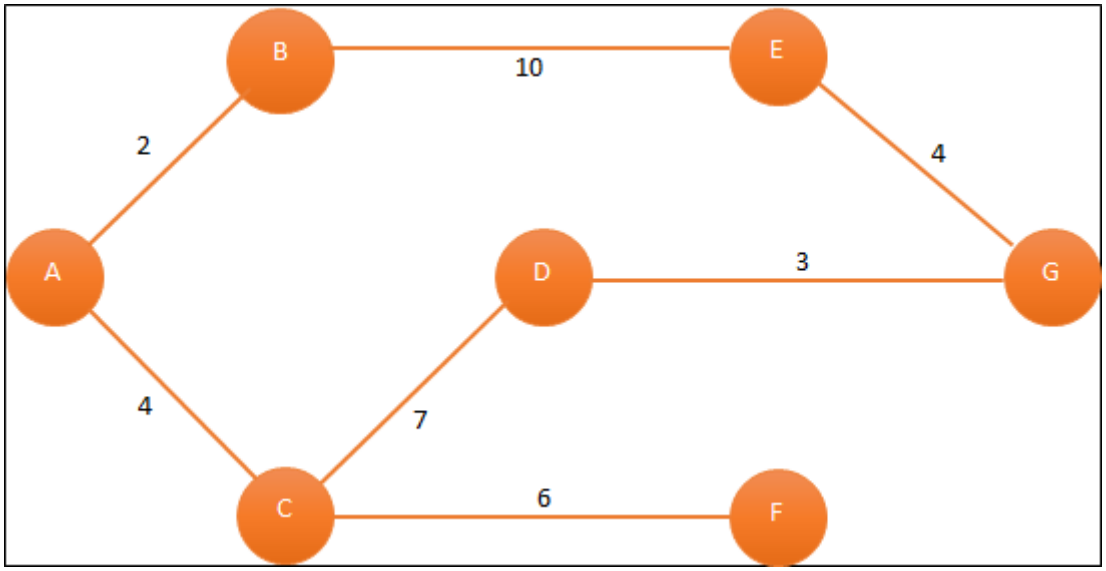

Figure 2. The Result of the Smallest Path of Optimizing the Division of Working Hours in CV. Comrade Brilliant Partpresion

$$= 2 + 3 + 4 + 4 + 6 + 7 + 8 + 10 + 12 = 56$$

And a little advice from us who do research on CV. Kawan Gemilang's participation is that this journal is expected to be used as a reference for improvement and improvement of CV. Kawan Gemilang's participation in the future to be more effective and selective in choosing and making work contracts for new employees and old employees.

CONCLUSION

After carrying out the Hungarian method in this research journal, it can be concluded that CV. The participation of Kawan Gemilang (PKG) can be said to be optimal in the division of working hours at work and in their respective positions, and conclusions are obtained from the Hungarian method which is said to be an assignment that has been calculated sequentially. manual, then an optimal result is obtained for the five workers based on the place or type of work that is suitable for each worker in carrying out their work.

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