Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th February 2026. Vol. 5. No. 2; e-ISSN: 2808-4519

Workforce Requirement Analysis Using Workload Analysis with a Full-Time Equivalent (FTE) Approach in the Planning & Control Division of PT PLN (Persero) Pusharlis UP2W VI

Anditta Aurellia Avisa[1]*, Moch Tutuk Safirin[2]

[1,2]*Industrial Engineering Study Program, Faculty of Engineering and Science, Universitas Pembangunan "Veteran" Jawa Timur*
22032010132@student.upnjatim.ac.id[1*], tutuks.ti@upnjatim.ac.id[2]

Abstract

This research was conducted at PT PLN (Persero) Pusharlis Unit Pelaksana Pemeliharaan Wilayah VI (UP2W VI), focusing on the Planning and Control Division. This study aims to analyze the suitability between workload and the number of employees and to determine the ideal workforce requirement to improve operational effectiveness. The method applied is workload analysis using the Full Time Equivalent (FTE) approach through the calculation of task completion time and annual effective working hours. The results indicate differences in workload levels among teams, where some teams experience overload conditions, while others operate under near-optimal workload conditions. The application of the Full Time Equivalent (FTE) method provides a quantitative overview of actual workload conditions and serves as a basis for determining and adjusting optimal workforce formation to support work efficiency in the Planning and Control Division of PT PLN (Persero) Pusharlis UP2W VI.

Keywords: *Workload; Full Time Equivalent (FTE); Workforce requirement; Work efficiency; PT PLN Pusharlis*

1. Introduction

PT PLN (Persero) as a state-owned enterprise plays a strategic role in providing reliable and sustainable national electricity. One of the units that supports the reliability of the electricity system is the Electricity Maintenance Center (Pusharlis), which is responsible for the maintenance, repair, and reconditioning of electrical equipment. PLN Pusharlis Workshop Implementation Unit 2 Region VI (UP2W VI) carries out these functions with a high level of work complexity, requiring effective and efficient resource management, particularly human resources. As the demands for operational reliability and work efficiency increase, PLN Pusharlis UP2W VI faces challenges in adjusting the workload to the availability of manpower. The imbalance between workload and personnel numbers has the potential to affect performance, work safety, and the quality of maintenance results. Therefore, a systematic analysis of working conditions in this unit is needed to support human resource planning and continuous improvement in operational performance.

Workforce planning is an important process for companies to ensure the availability of workers with the appropriate number, quality, and skills to achieve business objectives amid dynamic competition and change. External factors such as economic conditions, technology, market competition, and government policies, as well as internal factors such as company strategy, changes in business processes, or market expansion, greatly influence workforce requirements. The balance between the number of workers and the volume of work that must be completed on an ongoing basis [1] The workforce is an important aspect of a company. Workforce is managed by one of the departments, namely HR. Matters related to employment in the company will be managed by the HR department. Companies always implement all forms of HR policies so that employees can work effectively and efficiently, but in reality this has not been fully realized [2]. A person's work performance is influenced by internal motivation to fulfill their personal needs or satisfaction. Every company wants competent human resources (HR) that work synergistically and do not cause their employees to experience a decline in performance due to workloads that are not in line with their time capacity or the number of tasks they have[3].

Workload analysis is the process of determining the number of hours of work used or needed to complete a job within a certain period of time[4]. Workload analysis is an important step in human resource management to ensure the efficiency and effectiveness of company operations. Workload analysis serves as a tool for measuring employee performance based on working hours and results achieved, enabling management to evaluate productivity objectively. Excessive workloads can cause stress and fatigue, while workloads that are too light can lead to boredom. Therefore, workload analysis is very important for adjusting tasks to individual capabilities, thereby creating a balance that supports employee productivity. With optimally distributed workloads, companies can not only increase employee motivation and job satisfaction, but also achieve better overall performance[5].

Determining the number of workers is related to the volume of work targeted for completion in each work cycle, whether daily, monthly, or yearly. In this case, the target work volume, standard time, number of working days, and working hours are the benchmarks for completion. Several studies suggest increasing the number of workers to reduce excessive workloads and optimize the work system[6]. Full-Time Equivalent is one method of workload analysis based on time by measuring the duration of work completion and then converting it into an FTE value index. The method of calculating workload with full-time equivalent is a method where the time used to complete various tasks is compared to the effective working time available. With this FTE, it can be used to convert an employee's workload hours into the number of people needed to complete a particular job. The FTE value index is categorized into 3 parts, namely: underload, normal, and overload[7]. This calculation is done by comparing the time required to complete work with the available effective working time. The aim is to make it easier to determine the workload, because the total working hours can be directly converted into the amount of labor required to complete a job[8]. The workload assigned to employees can be in three conditions, namely in line with standards, exceeding capacity (over capacity), or below capacity (under capacity). Workload mismatches, whether too high or too low, can lead to inefficiency in work performance. Effective human resource management is key to achieving optimal productivity without waste[9]. Regarding excessive workloads on employees, this does not mean that the company will take the alternative of adding employees. The company needs to review the job analysis for each position[10].

PT PLN (Persero) Pusharlis UP2W VI is a work unit that plays a role in the maintenance, repair, and operational support of electrical equipment to maintain the reliability of the power system. Work activities in this unit are dynamic in nature with varying assignments and levels of complexity, which can potentially cause an imbalance in the workload between workers. This condition indicates the need for a systematic workload analysis to determine the actual workload and optimize staffing requirements. To date, there has been no research specifically analyzing workload using the Full Time Equivalent (FTE) method at PT PLN (Persero) Pusharlis UP2W VI. Therefore, this study was conducted to analyze the workload and determine the optimal workforce requirements as a basis for improving the effectiveness and efficiency of operations in this work unit.

2. Research Method

This study uses a quantitative approach with a case study method conducted at PT PLN (Persero) Pusharlis UP2W VI to analyze employee workload as an independent variable against labor requirements as a dependent variable. The research subjects include workers who are directly involved in operational and support activities, both routine and non-routine tasks, in accordance with their respective functions and responsibilities. The scope of the study focused on analyzing actual workload based on work activities during the observation period. The data used consisted of primary data obtained through direct observation, interviews, and recording of effective working hours, as well as secondary data sourced from company documents such as organizational structure, job descriptions, and effective working hours. The determination of workforce requirements is carried out using the Full Time Equivalent (FTE) method by comparing the total time required to complete all work activities with the effective working hours of employees, thereby obtaining an FTE value that is used to classify the workload into underload, normal, or overload categories as the basis for determining the optimal number of workers in each work unit.

3. Data Collection

Based on data collected through observation, interviews, and work time recording, an overview of employee work activities at PT PLN (Persero) Pusharlis UP2W VI was obtained, consisting of routine and non-routine activities. Each activity has a different duration and level of complexity, which affects the workload of each unit and position. The collected work time data was used as the basis for calculating the workload using the Full Time Equivalent (FTE) method. Before calculating the time required to complete the work and determining the workforce requirements, it was necessary to have a basis for calculation that reflected the actual working hours of the employees. Therefore, the initial stage of the analysis focused on calculating the effective working days and effective working hours. Effective working days are obtained by subtracting the number of days in a year from regular holidays, national holidays, and employees' annual leave allowances. Next, effective working hours are calculated based on the number of effective working days multiplied by the working hours per day and adjusted for the reduction in time not directly used for productive activities, such as meetings, coordination, and other non-task activities. With this calculation, workload analysis and workforce requirements can be determined more accurately in accordance with the company's operational conditions.

3.1. Effective working days

1. 1 year = 365 days
2. Number of Saturdays and Sundays in 1 year = 104 days (2 × 52 weeks)
3. National holidays = ± 15 days
4. Annual leave allowance = ± 12 days
5. Effective working days = 365 – 104 – 15 – 12 = 234 days

3.2. Effective working hours data

1. Effective working hours per employee/day = 8 hours
2. Total effective working hours = 234 days × 8 hours/day = 1,872 hours/year

Less non-task time (meetings and coordination) = 25%

a. 1,872 hours × 0.75 = 1,404 hours/year

3.3. Production Schedule Data Estimator Team

After obtaining the effective working days and effective working hours of employees, the next stage in this study is the collection of assignment data used as the basis for analyzing working time and labor requirements. This data collection was carried out from the beginning of September to December 2025. The data used is the 2024 assignment data sourced from the company's recapitulation archives, which covers the entire production process at PT PLN (Persero) Pusharlis UP2W VI. Specifically, the data calculation for the Estimator Team focuses on the schedule of each production process, which is an important component in supporting organizational performance and productivity. Based on data from January 2024 to December 2024, a total of 128 assignments were successfully completed.

Table 1 : production assignment schedule data 2024

No	*Drawing File*	*Total durasi penugasan*	*Start*	*Finish*	*Pembuatan WO dan jadwal*	*Perencanaan Pengadaan (RAB, KAK, Nota Dinas)*
1	Perbaikan Grinding Roller dan Table Mill dengan Finishing Hardfacing terkait SI #3 PLTU Indramayu	26 days	2024-01-08	2024-02-02	2	2
2	Penugasan Reverse Engineering Grinding Roll 6 (enam) buah & Grinding Segment 12 (dua belas) buah PLTU Tanjung Awar Awar	136 days	2024-02-08	2024-06-22	1	10
4	3. Penugasan LTSA Repair Grab Bucket Ship Unloader Unit 3-4 PLTU Tanjung Jati B (SPB ke 4)	26 days	2024-01-08	2024-02-02	2	2
5	Penugasan Sementara Pembuatan Extension Ring Mill PLTU Paiton 9	135 days	2024-02-08	2024-06-21	1	9
6	Penugasan Pembuatan Impeller dan Repair Shaft BFP PLTU Sumbawa Barat	77 days	2024-02-08	2024-04-24	1	2
8	6. Penugasan Tetap Pekerjaan Reverse Engineering Left Hook dan Right Hook Chain Grate PLTU Sumbawa Barat	53 days	2024-02-06	2024-03-29	1	7
9	Penugasan Refurbishment Of Rollwheel Assy and Grinding Ring Segments PLTU Tanjung Jati B (tanpa seal retainer)	62 days	2024-02-09	2024-04-10	1	5
10	Penugasan Pekerjaan Pembuatan 1 (satu) buah Grab Bucket Ship Unloader (GBSU) PLTU Pacitan	208 days	2024-03-07	2024-09-30	2	10
12	Penugasan Sementara Pekerjaan Pembuatan 220 buah Windcap Nozzle Furnace PLTU Bolok (PLN NP Services)	100 days	2024-02-23	2024-06-01	1	7
13	Penugasan Pembuatan 49 Unit Produk EWARS UIT JBT	97 days	2024-03-04	2024-06-08	4	3
14	Penugasan Prototipe Karya Inovasi APEL JUMP PDKB-TM Berjarak	50 days	2024-03-13	2024-04-30	1	1
15	Penugasan Sementara Pekerjaan Pengadaan dan Pemasangan Flange Downcomer HRSG PLTGU Grati	79 days	2024-03-01	2024-05-16	3	7
16	Penugasan Sementara Pekerjaan Reverse Engineering Inner Part ESP PLTU Paiton 1-2	47 days	2024-08-21	2024-10-06	2	3
17	Penugasan Sementara Pekerjaan Pembuatan Erosion Shield PLTU Tanjung Awar-Awar (repeat order)	79 days	2024-03-01	2024-05-16	3	7
18	Penugasan Sementara Pekerjaan Pembuatan 1 set Komponen Bearing Pompa CWP PLTGU Grati	76 days	2024-03-13	2024-05-24	1	1
19	Penugasan Sementara Rekondisi 9 buah Grinding Tyre PLTU Pelabuhan Ratu (Termin I)	34 days	2024-03-13	2024-04-13	1	10
20	Penugasan Sementara Pekerjaan Repair 1 buah Grab Bucket SU PLTU Paiton 1-2	121 days	2024-03-18	2024-07-16	2	3
21	Penugasan Sementara Pekerjaan Repair Inner dan Outer Grinding Roll Unit 2 PLTU Pacitan	78 days	2024-04-03	2024-06-19	1	5
22	Penugasan Pembuatan Design Drawing dan RAB Prototipe Siap Manufaktur IMUN RTU dan ALI MBELING	19 days	2024-03-15	2024-04-02	2	6
23	21. Penugasan Sementara LTSA Pembuatan Wheel Trolley dan Guide Roller Trolley Ship Unloader Unit #3-4 PLTU Tanjung Jati B (SPB-1)	109 days	2024-03-18	2024-07-04	2	3
24	Penugasan Sementara Pekerjaan Pembuatan Tooth and Jaw Plate Crusher Bottom Ash PLTU Tanjung Awar-Awar	64 days	2024-03-25	2024-06-05	1	1
25	Penugasan Sementara LTSA Repair Grab Bucket Ship Unloader Unit 1-2 PLTU Tanjung Jati B (SPB-3)	108 days	2024-03-27	2024-07-12	1	10
26	Penugasan Sementara Pekerjaan RE Komponen Chain Grate PLTU Sumbawa Barat	53 days	2024-04-04	2024-06-17	1	2

27	Penugasan Sementara Pembuatan dan Pemasangan Penahan Drum Screen PLTU Paiton 1-2	39 days	2024-03-22	2024-04-29	2	2
29	Penugasan Sementara Revitalisasi Chute Transfer Tower (1A dan 1B) dan Crusher A PLTU Tanjung Awar-Awar	168 days	2024-05-10	2024-10-24	3	6
30	Penugasan Sementara Pekerjaan Penggantian Line Inlet dan Outlet Condensor PLTU Tanjung Awar-Awar (Pemasangan)	82 days	2024-07-24	2024-10-13	1	1
31	Penugasan Sementara Pekerjaan Rehabilitasi Grab Bucket Ship Unloader PLTU Barru (Fabrikasi)	241.5 days	2024-04-16	2024-12-05	5	25
32	Penugasan Sementara Pekerjaan Rehabilitasi Grab Bucket Ship Unloader PLTU Barru (Perbaikan)	128 days	2024-04-16	2024-08-17	5	25
33	Penugasan Sementara Pengadaan Pulley Drive Finfan GT PLTGU Grati	109 days	2024-04-03	2024-07-17	3	7
34	Penugasan Sementara Pekerjaan Coal Nozzle Burner Unit 3-4 PLTU Tanjung Jati B	99 days	2024-04-16	2024-07-23	1	1
35	Penugasan Repair Inner dan Outer Grinding Roll PLTU Rembang (Tahap I) (6 pcs)	78 days	2024-04-03	2024-06-19	1	5
36	Penugasan Repair Hardfacing 9 Grinding Roll Unit 1 PLTU Pacitan (OH 2025)	100 days	2024-04-16	2024-07-24	3	5
37	Penugasan Penggantian 2 Ducting PAF PLTU Pacitan	159 days	2024-04-17	2024-09-17	3	7
38	Penugasan Pembuatan 12 EWARS UPT Tanjung Karang UIP3B Sumatera	37 days	2024-04-03	2024-05-23	1	4
39	Penugasan Repair 3 (Tiga) Unit Grinding Roll dan 12 Unit Table Mill PLTU Indramayu	32 days	2024-04-17	2024-05-18	1	2
40	Penugasan Pekerjaan Penggantian Line Sirkulasi Tangki B20 PLTU Paiton 9	85 days	2024-04-17	2024-07-10	1	1
41	Penugasan Pembuatan Coal Pipe PLTU Pacitan	108 days	2024-04-16	2024-08-01	2	10
42	Penugasan Pekerjaan Inner Part CWP PLTU Paiton 9	88 days	2024-04-16	2024-07-25	5	10
43	Penugasan Overhaul Grab Bucket Ship Unloader #1 PLTU Indramayu	92 days	2024-05-17	2024-08-13	5	15
44	Penugasan Sementara Pekerjaan Pembuatan 1 (satu) buah Stop Log Intake CWP PLTU Pacitan	113 days	2024-05-06	2024-08-26	5	14
45	Penugasan Sementara 9 unit Grinding Roll dan 36 unit Grinding Segment PLTU Tanjung Awar-Awar	113 days	2024-05-06	2024-08-26	5	14
46	Penugasan Sementara Revitalisasi Grab Bucket Ship Unloader PLTU Lontar	140 days	2024-05-07	2024-09-19	2	14
47	Penugasan Perbaikan Hydraulic Cylinder PLTU Tanjung Jati B Unit 1-2	36 days	2024-05-28	2024-07-02	1	1
48	Penugasan Sementara Pembuatan SSCC Seal Skirt (SI 2024) PLTU Tanjung Jati B	85 days	2024-05-28	2024-09-19	2	6
49	Penugasan LTSA Repair Grab Bucket Ship Unloader Unit 3-4 PLTU Tanjung Jati B (SPB Ke-5)	115 days	2024-05-27	2024-09-15	3	20
50	Penugasan Sementara Pekerjaan Jasa Revitalisasi Roller Screen 2 UBP Jeranjang	123 days	2024-06-03	2024-10-03	3	10
51	Penugasan Tetap Pekerjaan Pembuatan Fender Jetty PLTU Pacitan	133 days	2024-06-14	2024-10-24	1	5
52	Penugasan Sementara Pekerjaan Jasa Penggantian Hammer Crusher 1 UBP Jeranjang (Fabrikasi)	110 days	2024-06-14	2024-10-01	1	6
53	Penugasan Sementara Pekerjaan Jasa Penggantian Hammer Crusher 1 UBP Jeranjang (Pemasangan)	30 days	2024-10-16	2024-11-14	2	1
54	Penugasan Sementara Pekerjaan Repair Inner dan Outer Grinding Roll PLTU Paiton 1-2	77 days	2024-06-14	2024-08-16	5	10
55	Penugasan Sementara Pembuatan Shaft Sleeve CWP PLTGU Gresik	62 days	2024-06-21	2024-08-21	2	10
56	Penugasan Pekerjaan Pembuatan 1 Buah Shaft Chain Grate PLTU Sumbawa Barat	98 days	2024-06-14	2024-09-16	3	10
57	Penugasan Pekerjaan Pembuatan 12 Unit Produk Karya Inovasi E-Wars UPT Baturaja	19 days	2024-07-08	2024-08-01	1	3
58	Pekerjaan Upgrade Piping dan Valve Chlorination Plant PLTU Paiton 9 (Fabrikasi)	159 days	2024-07-01	2024-12-06	2	14
59	Pekerjaan Upgrade Piping dan Valve Chlorination Plant PLTU Paiton 9 (Pemasangan)	54 days	2024-12-09	2025-01-31	2	6
60	Penugasan Pekerjaan Penggantian Tube Shelter MAC A dan B PLTU Paiton 9 (Fabrikasi)	134 days	2024-07-01	2024-11-11	3	12
61	Penugasan Pekerjaan Penggantian Tube Shelter MAC A dan B PLTU Paiton 9 (Pemasangan)	62 days	2024-12-05	2025-02-04	1	1
62	Penugasan Sementara Pembuatan Primary Coal Nozzle Burner PLTU Pacitan	170 days	2024-07-15	2024-12-31	2	7
63	Penugasan Sementara Pekerjaan Penggantian Air Damper PA Fan PLTU Pacitan	108 days	2024-08-20	2024-10-23	2	11
64	Penugasan Rekondisi Shaft Boom Hydraulic Stacker Reclaimer PLTU Tanjung Jati B Unit 3-4	73 days	2024-07-04	2024-09-14	2	6

65	Penugasan Sementara Pembuatan Mur Baut HIP Outer dan Inner Casing Part PLTU Pacitan	106 days	2024-07-12	2024-10-25	2	10
66	Penugasan Sementara Pekerjaan Penggantian Piping OCCWP System Unit 2 PLTU Tanjung Awar-Awar	154 days	2024-07-24	2024-12-24	11	10
67	Penugasan Sementara Pekerjaan Retubing HPH PLTU Sumbawa Barat	229 days	2024-07-12	2025-02-25	3	7
68	Penugasan Sementara Pekerjaan Pembuatan Roller Shaft PLTU Sumbawa Barat	83 days	2024-07-11	2024-10-01	2	3
69	Penugasan Sementara Pekerjaan Pembuatan 33 Buah Alutrol UP2D Kaltimra	29 days	2024-07-08	2024-08-05	1	5
70	Pembuatan 10 Unit Pengembangan Karya Inovasi E-Wars Puslitbang	19 days	2024-07-24	2024-09-02	1	3
71	Penugasan LTSA Repair Grab Bucket Ship Unloader Unit 3-4 PLTU Tanjung Jati B (SPB Ke-6)	119 days	2024-07-24	2024-11-15	2	23
72	Penugasan LTSA Pembuatan dan Repair Wheel Trolley Ship Unloader Unit 1-2 PLTU Tanjung Jati B (SPB Ke-2)	95 days	2024-08-05	2024-11-07	1	5
73	Penugasan LTSA Repair Grab Bucket Ship Unloader Unit 1-2 PLTU Tanjung Jati B (SPB Ke-4)	96 days	2024-08-05	2024-11-08	1	10
74	Penugasan Sementara Pekerjaan Tiny Oil Burner PLTU Paiton	90 days	2024-08-05	2024-11-03	2	2
75	Penugasan Pekerjaan Pembuatan Shield Chain Grate PLTU Sumbawa Barat	89 days	2024-08-08	2024-11-01	3	7
76	Penugasan Pembuatan 23 Unit Alutrol UID Aceh	29 days	2024-07-08	2024-08-05	1	5
77	Penugasan Pembuatan 20 Unit Alutrol UID Sumatera Utara	27 days	2024-11-22	2024-12-18	2	2
78	Penugasan Tetap Reverse Engineering Bolt Tie ROD PLTD B Pesanggaran (Reverse Engineering)	47 days	2024-08-21	2024-10-06	2	3
79	Penugasan Sementara Pekerjaan Jasa Uji Phased Array Ultrasonic Testing Pekerjaan Retubing Economizer PLTU Bolok Unit 1	65 days	2025-01-20	2025-04-16	2	1
80	Penugasan Sementara Pengadaan Material Grinding Roll UPK Bukit Asam Unit 1-2	146 days	2024-08-26	2025-01-18	2	3
81	Penugasan Pembuatan 6 Unit E-Wars PLN SC	13 days	2024-08-19	2024-09-01	1	2
82	Penugasan Pembuatan Rigdata UID Aceh	9 days	2024-09-01	2024-09-09	1	1
83	Penugasan Sementara Pekerjaan Revitalisasi Elbow Pipe Stage 3 PLTU Paiton 9 (Fabrikasi)	94 days	2024-08-26	2024-11-27	4	7
84	Penugasan Sementara Pekerjaan Revitalisasi Elbow Pipe Stage 3 PLTU Paiton 9 (Pemasangan)	31 days	2024-11-27	2024-12-27	1	1
85	Penugasan Sementara Fabrikasi Material Boiler Inspection PLTU Sumbawa Barat Unit 1	118 days	2024-08-28	2024-12-23	2	2
86	Penugasan Sementara Revitalisasi Struktur Conveyor 107 B PLTU Tanjung Jati B Unit 3-4 (Fabrikasi)	31 days	2024-08-29	2024-09-26	1	1
87	Penugasan Sementara Revitalisasi Struktur Conveyor 107 B PLTU Tanjung Jati B Unit 3-4 (Pemasangan)	15 days	2024-10-06	2024-10-20	1	1
88	Penugasan Sementara Pembuatan Sprocket TWS PLTU Tanjung Awar-Awar	92 days	2024-09-21	2024-12-16	2	3
89	Penugasan Sementara Pengadaan Silincer FDF PLTU Tanjung Awar-Awar (Fabrikasi)	75 days	2024-09-16	2024-11-29	1	3
90	Penugasan Sementara Pengadaan Main Part Mill Pulverizer #1 PLTU Tanjung Awar-Awar	90 days	2024-09-16	2024-12-14	3	4
91	Penugasan Sementara Pengadaan Coal Pipe Mill #1 PLTU Tanjung Awar-Awar (Fabrikasi)	80 days	2024-09-16	2024-12-04	2	3
92	Penugasan Sementara Pengadaan Coal Pipe Mill #1 PLTU Tanjung Awar-Awar (Pemasangan)	95 days	2024-09-02	2024-12-09	2	5
93	Penugasan Pembuatan 20 Imun RTU dan 100 MQ Reader UID Jawa Timur	60 days	2024-09-12	2024-11-10	2	2
94	Penugasan Pembuatan 200 MQ Reader UID Jawa Timur	55 days	2024-09-11	2024-11-04	2	2
95	Penugasan Repair Inner dan Outer Grinding Roll PLTU Rembang (Tahap II) (9 pcs)	78 days	2024-09-11	2024-12-01	1	5
96	Penugasan LTSA Refurbishment of Rollwheel Assy and Grinding Ring Segment PLTU Tanjung Jati B (SPB Ke-2)	39 days	2024-09-30	2024-11-07	2	5
97	Penugasan Pembuatan Komponen Inner Part CWP (Shaft Sleeve dan Thordon Bearing) PLTU Paiton 9	25 days	2024-10-15	2024-11-10	2	3

98	Penugasan Fabrikasi Grinding Roll Mill PLTU Bukit Asam Unit 3	90 days	2024-10-18	2024-12-23	2	3
99	Penugasan Pembuatan 10 Unit E-Wars UPT Medan	40 days	2024-10-01	2024-11-09	2	2
100	Penugasan Pembuatan 13 Unit E-Wars UPT Pematang Siantar	40 days	2024-10-01	2024-11-09	2	2
101	Penugasan Pembuatan Manhole Area Hot Primary Air Duct A-B PLTU Paiton 9 (Fabrikasi)	31 days	2024-10-28	2024-11-27	2	2
102	Penugasan Pembuatan Manhole Area Hot Primary Air Duct A-B PLTU Paiton 9 (Pemasangan)	32 days	2024-11-28	2024-12-29	2	3
103	Penugasan Perbaikan Rail Travelling Screen A PLTU Paiton 9	42 days	2024-09-30	2024-11-10	1	2
104	Penugasan Pembuatan 19 Unit E-Wars UPT Padang Sidempuan (Inovation)	50 days	2024-10-09	2024-11-27	2	2
105	Penugasan Pembuatan 34 Unit E-Wars UPT Bengkulu	55 days	2024-10-15	2024-12-08	2	2
106	Penugasan Pembuatan Penahan Drum Screen PLTU Paiton 1-2 (Fabrikasi)	34 days	2024-10-15	2024-11-17	2	4
107	Penugasan Pengadaan Penahan Drum Screen PLTU Paiton 1-2 (Pemasangan)	23 days	2024-11-18	2024-12-10	2	2
108	Penugasan Pembuatan Online Monitoring Losses Sistem Waisai UIW P2B (Fabrikasi)	29 days	2024-11-11	2024-12-09	2	2
109	Penugasan Pembuatan Online Monitoring Losses Sistem Waisai UIW P2B (Pemasangan)	15 days	2024-12-10	2024-12-24	2	2
110	Penugasan Pembuatan Komponen Fuel Oil Filter PLTMG Kupang	40 days	2024-11-04	2024-12-13	2	2
111	Penugasan Pembuatan 6 Unit E-Wars UPT Pekanbaru	40 days	2024-10-24	2024-12-02	2	2
112	Penugasan Sementara Pembuatan Heat Exchanger CVP PLTGU Grati	40 days	2024-11-06	2024-12-31	1	1
113	Penugasan Pembuatan 5 Unit E-Wars UPT Banda Aceh	26 days	2024-10-25	2024-11-19	1	2
114	Penugasan Pembuatan Prototipe IMUN RTU dan ALI MBELING Puslitbang	105 days	2024-08-28	2024-12-10	3	3
115	Pekerjaan Jasa Pabrikasi Silincer dan Damper PAF Unit 2 PLTU Jeranjang	55 days	2024-11-07	2024-12-31	2	2
116	Pekerjaan Jasa Fabrikasi Chute dan Skirt Board Energi Primer PLTU Jeranjang	54 days	2024-11-08	2024-12-31	1	5
117	PEMBUATAN 13 UNIT E-WARS UPT PEMATANG SIANTAR TAHAP 2	40 days	2024-11-15	2024-12-24	2	2
118	Penugasan Sementara Revitalisasi Ship Unloader Jetty PLTU Tanjung Jati B Unit 3-4	133 days	2024-06-14	2024-10-24	1	5
119	Penugasan Fabrikasi 250 Pcs Frame Pulley ACSR UIP MPA (Tahap I)	51 days	2024-11-11	2024-12-31	2	2
120	Penugasan Pembuatan 24 Unit Alutrol 1 Jurusan UID S2JB	27 days	2024-11-22	2024-12-18	2	2
121	Penugasan Pembuatan 13 Unit Rigdata 1 Jurusan dan 7 Unit Rigdata 3 Jurusan UID Sumut	22 days	2024-11-28	2024-12-19	2	2
122	Penugasan Pembuatan 19 Unit Rigdata 4 Jurusan UID Kalselteng	22 days	2024-11-28	2024-12-19	2	2
123	Penugasan Pembuatan 14 Unit Alutrol 1 Jurusan UID S2JB	29 days	2024-07-08	2024-08-05	1	5
124	Penugasan Sementara Repair Inner dan Outer 15 Unit Grinding Roll PLTU Paiton 1-2	100 days	2024-04-16	2024-07-24	3	5
125	Penugasan Pembuatan 20 Unit Alutrol 1 Jurusan UID RKR	29 days	2024-07-08	2024-08-05	1	5
126	Penugasan Tetap Repair Inner dan Outer 15 Unit Grinding Roll PLTU Paiton 1-2 (Tahap II)	100 days	2024-04-16	2024-07-24	3	5
127	Penugasan Pembuatan 10 Unit E-Wars UPT Medan	40 days	2024-10-01	2024-11-09	2	2
128	Penugasan Pembuatan 13 Unit E-Wars UPT Pematang Siantar	40 days	2024-10-01	2024-11-09	2	2

3.4. Work time calculation data for the Drafting and Engineering Team

The working time calculation data for the Drafting and Engineering Teams does not refer to the schedule data above, because the activities of these two divisions are in the pre-assignment stage. Therefore, the working time data was obtained based on interview results. Based on interviews with employees in the Drafting and Engineering Teams, it was found that both teams generally conduct surveys before starting new assignments. However, not all assignments in a year require a survey, given the existence of repeat orders. The interview results show that of the 128 assignments in 2024, there were 47 new assignments (36.7%) and 81 repeat orders (63.3%). Furthermore, new assignments are classified into several types, namely light-medium assignments and heavy assignments, with a proportion of 70% for light-medium assignments and 30% for heavy assignments. The following presents data on the duration of work for new assignments and repeat orders.

Table 2 : Duration of New Assignment Work

Assignment Type	Duration	Survey Requirements
Light to Moderate Assignment	5 working days	4 days × 24 hours
Heavy Assignment	8 working days	-

Table 3 : Duration of Repeat Order Assignments

Assignment Type	Duration	Survey Requirements
Repeat Order Assignment (Revising as-built drawings, revising KAK RAB / creating new KAK RAB adjusted to order quantity).	3 working days	-

4. Results and Discussion

Workload analysis per sub-division is conducted to determine the distribution of workload in each sub-division involved in the production process. This analysis aims to identify the level of work time utilization, the balance of workload between sub-divisions, and the potential for excess or insufficient workload. By conducting the analysis at the sub-division level, it is hoped that a more specific and detailed picture of each sub-division's contribution to the completion of assignments can be obtained. In practice, the workload analysis is carried out by processing data on the duration of work and the number of assignments in each sub-division, which is then compared with the available effective working time capacity. The results of this analysis are used as a basis for evaluating the effectiveness of work distribution and as material for consideration in planning and adjusting the workforce formation to align with the company's operational needs.

4.1. Estimator Team

Based on calculations from the 2024 Assignment Data (Work order and schedule creation + RAB, KAK & Official Memorandum planning)
The average is 8 days/assignment.

a. Labor Calculation

8 days × 8 hours/day = 64 hours/assignment
64 hours × 128 assignment = 8.192 hours/128 assignment
Labor Requirements $= \frac{Total\ work\ time}{Waktu\ keEffective\ work\ time\ per\ personrja\ efektif\ per\ orang}$
$= \frac{8.192}{1.404}$
= 5 5.8 rounded up to 6

Analysis:

Based on the results of the workload analysis of the Estimator Team, it is known that the actual number of employees in 2024 will still be 4 people. On the other hand, the results of the labor requirement calculation show that the number of employees needed to optimally support the completion of all assignments is 6 people. The difference between the actual condition and the labor requirement indicates that the availability of employees is not yet proportional to the workload that must be handled. This condition shows that the Estimator Team is experiencing an overload.

b. Calculation of Work Utilization and Efficiency

Based on labor requirements, it is known that there is an imbalance in the workload of the estimation team. To calculate work utilization, the following formula is used:

Tabel 4 : Components of working hours person/year

Component	Value
Actual working hours/person/year	2048 hour
Effective working hours (standard)/person/year	1404 hour

Actual hours worked per person/year $= \frac{8.192}{4}$
= 2048 hours / year

1. Utilization Calculation $= \frac{Total\ Actual\ Working\ Hours}{Total\ Effective\ Working\ Hours} \times 100\%$
$= \frac{2.048}{1.404} \times 100\%$
= 145%

2. Work Effeciency

In the 2024 assignment data, there is standard output data listed as 90 assignments, whereas in 2024 the output produced reached 128 assignments.

Calculation $= \frac{Actual\ output}{Standard\ output} \times 100\%$
$= \frac{128}{90} \times 100\%$
= 142%

Analysis:

Based on the utilization calculation results, each person on the team has a workload that is 45% higher than the recommended effective working hours limit (significant overload). Meanwhile, based on work efficiency calculations for 2024 assignment data, where actual output (128 assignments) exceeded standard output (90 assignments), an efficiency level of 142% was obtained. These results indicate that the workforce is capable of completing a significant volume of work, exceeding the set targets. Thus, the team's performance is categorized as highly efficient in optimizing resources to achieve above-standard output.

4.2 Drafting and Engineering Team

Based on interviews with employees in the Drafting and Engineering Team, it was found that the Drafting and Engineering Team always conducts surveys before starting new assignments. However, within a year, the drafting and engineering team does not always conduct surveys because there are several assignments that are repeat orders. According to the interview results, data shows that out of 128 assignments in 2024, there were 47 new assignments (36.7%) and 81 repeat orders (59.3%). The new assignments were divided into several types, namely light-medium assignments and heavy assignments, with a distribution of 30% heavy assignments and 70% light-medium assignments. The following is data containing the duration of new assignments and repeat orders.

a. Calculation of New Assignment Manpower

New Assignments (47 assignments)

1. 33 Light-Medium Assignments (70%)
   Calculating = 33 assignment × 5 days × 8 hours
   = 1320 hours
2. 14 Heavy Assignments (30%)
   Calculating = 14 assignment × 8 days × 8 hours
   = 896 hours
3. Survey time calculation = 4 days × 24 hours × 47 assignment
   = 4152 hours

   Each survey was conducted by two people (one drafter and one engineer) out of a total of six people.
   Survey Distribution Calculation = $4152 \times \frac{2}{6}$
   = 1384 hours/people

b. Calculation Repeat Order Assignment

Repeat Order Assignments (96 assignments)
Calculation = 3 days × 8 hours × 81 assignment
= 1994 hours

c. Total Workload = 1320 hours + 896 hours + 1384 hours + 1994 hours
= 8304 hours

d. Labor Requirements = $\frac{Total\ work\ time}{Effective\ work\ time/person}$
= $\frac{8304}{1404}$
= 5.9 rounded up to 6

Analysis:
Based on the workload calculations, the assignments analyzed consisted of new assignments and repeat orders. The new assignments included 47 assignments divided into light and heavy assignments with different workload contributions. In addition, each assignment required a survey activity lasting four working days, which cumulatively resulted in a significant workload. On the other hand, the 96 repeat orders also add to the workload with a relatively shorter completion time. The accumulation of all these activities results in a total workload of 8,304 hours. If this total workload is compared to the effective working time per person of 1,404 hours per year, the manpower requirement is 5.9 people, rounded up to 6 people. These results show that the actual number of workers currently available, namely 6 people, is in line with the labor requirements based on the workload analysis, so that the Team's workload is in the normal category and can be handled optimally without excess or shortage of workers.

e. Calculation of Work Utilization and Efficiency

Based on labor requirements, it is known that the drafting and engineering teams have a balanced workload. Next, calculate work utilization as follows:

Tabel 5 : Components of working hours person/year

Component	Value
Actual working hours/person/year	2048 hour
Effective working hours (standard)/person/year	1404 hour

Actual hours worked per person/year = $\frac{8.192}{4}$
= 2048 hours / year

4. Utilization Calculation = $\frac{Total\ Actual\ Working\ Hours}{Total\ Effective\ Working\ Hours} \times 100\%$
   = $\frac{2.048}{1.404} \times 100\%$
   = 145%
5. Work Effeciency

In the 2024 assignment data, there is standard output data listed as 90 assignments, whereas in 2024 the output produced reached 128 assignments.

$$\text{Calculation} = \frac{Actual\ output}{Standard\ output} \times 100\%$$
$$= \frac{128}{90} \times 100\%$$
$$= 142\%$$

Analysis:
Based on the utilization calculation results, each person on the team has a workload that is 45% higher than the recommended effective working hours limit (significant overload). Meanwhile, based on work efficiency calculations for 2024 assignment data, where actual output (128 assignments) exceeded standard output (90 assignments), an efficiency level of 142% was obtained. These results indicate that the workforce is capable of completing a significant volume of work, exceeding the set targets. Thus, the team's performance is categorized as highly efficient in optimizing resources to achieve above-standard output.

5. Conclusion

Based on the results of the 2024 workload analysis using the Full Time Equivalent (FTE) method, it was found that the utilization of manpower in the Estimator Team and the Drafter and Engineering Team showed different conditions. The FTE method plays a role in converting the total annual workload into the ideal number of manpower requirements based on standard effective working hours, thereby enabling the quantitative identification of workload imbalances. The analysis results show that the Estimator Team has a total workload of 8,192 hours per year with an ideal workforce requirement of 6 people, while the actual available workforce is only 4 people, resulting in an excess workload as indicated by a utilization rate of 145%. Although the Estimator Team's work efficiency rate reached 142%, this condition has the potential to cause work fatigue and a decline in performance in the long term if it is not balanced with adjustments to human resources. In contrast, the Drafter and Engineering Teams show a relatively balanced workload, where the total workload of 8,304 hours per year can be handled optimally by 6 employees with a utilization rate of 98% and work efficiency of 142%. Overall, the application of the FTE method in this study proved to be effective as a tool for analyzing workload and workforce planning, as it was able to identify differences in workforce utilization between teams and served as a basis for formulating recommendations for human resource adjustments.

References

[1] P. P. T. Xyz, “Fte (Full Time Equivalent) Sebagai,” Pp. 433–443.
[2] R. R. Cahyani, “Studi Literatur : Analisis Beban Kerja Dengan Metode Full Time Equivalent (Fte),” Vol. 13, No. 1, Pp. 51–56, 2024.
[3] M. N. Rasit And R. A. Hidayati, “Analisis Beban Kerja Karyawan Di Departemen Produksi Menggunakan Metode Full Time Equivalent (Fte) Pt . Klm,” Vol. 6, No. 6, Pp. 113–125, 2025.
[4] F. T. Equivalent, S. Supervisor, J. Supervisor, K. Kunci, And F. T. Equivalent, “Jitmi Vol . 5 Nomor 1 , Maret 2022 Analisis Beban Kerja Dengan Metode Full Time Equivalent (Fte) Pada Fungsi Rsd (Receiving , Storage And Distribution) Di Pt . X Nur Fajriah , Santika Sari Program Studi Teknik Industri , Universitas Pembangunan Nasional Veteran Jakarta , Indonesia,” Vol. 5, Pp. 37–41, 2022.
[5] V. Issue, R. W. Syahfitri, Y. Mauliddina, And G. Ranti, “Jutin : Jurnal Teknik Industri Terintegrasi Penerapan Metode Full Time Equivalent (Fte) Dalam Analisis Workload Untuk Efisiensi Sumber Daya Manusia Di Departemen Procurement Pt . Abc,” Vol. 8, No. 2, Pp. 2067–2071, 2025.
[6] E. Sulistyowati, F. Lukiastuti, And R. Retnosary, “Jurnal Magisma Vol. Xiii No. 1 – Tahun 2025 | 66 Analisis Beban Kerja Dan Kebutuhan Sumber Daya Manusia Dalam Aktivitas Bisnis Supplier Buah Dan Sayur Cahaya Buah Semarang Menggunakan Metode Full Time Equivalent (Fte),” Vol. Xiii, No. 1, Pp. 66–84, 2025.
[7] M. Alamsyah And R. Anwar, “Analisis Beban Kerja Karyawan Dengan Metode Full Time Equivalent (Fte) Pada Unit Pemupukan Perkebunan Kelapa,” Vol. 27, No. 1, Pp. 9–15, 2023, Doi: 10.46984/Sebatik.V27i1.2232.
[8] K. Khotimah, T. Industri, F. Teknik, And U. M. Gresik, “No Title,” Vol. 8, Pp. 1534–1540, 2025.
[9] F. R. Hidayat, “Analisis Jumlah Tenaga Kerja Optimal Pada Proses Pengolahan Pisang Cavendish Guna Memenuhi Target Permintaan,” Vol. 12, No. 1, Pp. 303–311, 2025.
[10] A. Yanto, W. Pasaribu, And P. Lumbanraja, “Workload Analysis To Determine The Optimal Number Of Employees After The Holding-Subholding Transformation In The Business Support Division Of,” Vol. 4, No. 10, Pp. 3359–3392, 2025.