Petikan
SURAT KEPUTUSAN DEKAN
FAKULTAS TEKNOLOGI INDUSTRI
INSTITUT SAINS & TEKNOLOGI AKPRIND YOGYAKARTA
Nomor : 061 /SK/Dek/FTI/III/2021

Tentang:

PENUGASAN DOSEN DALAM PENYUSUNAN LUARAN PENELITIAN
ATAU PENGABDIAN KEPADA MASYARAKAT PADA SEMESTER GENAP
TAHUN AKADEMIK 2020/2021

DEKAN FAKULTAS TEKNOLOGI INDUSTRI

MENIMBANG : 1. Bahwa Dosen di Fakultas Teknologi Industri Institut Sains & Teknologi AKPRIND Yogyakarta diwajibkan menyusun luaran penelitian maupun pengabdian kepada masyarakat, yang dapat berupa Publikasi Ilmiah Jurnal atau Seminar serta Kekayaan Intelektual.
2. Bahwa untuk pelaksanaan tugas tersebut perlu diberi penugasan melalui Surat Keputusan Dekan.

MENGINGAT : 1. Undang- undang nomor 20 tahun 2003 tentang Sistem Pendidikan Nasional pasal 20.
2. Undang-undang nomor 12 tahun 2012 tentang Pendidikan Tinggi pasal 45
3. Peraturan Menteri Riset, Teknologi dan Pendidikan Tinggi (Permenristekdikti) Republik Indonesia nomor 44 tahun 2015 tentang Standar Nasional Pendidikan Tinggi pasal 1.
4. Buku Panduan Dosen Institut Sains & Teknologi AKPRIND Yogyakarta Tahun 2017.

MEMPERHATIKAN : Tugas dan Kewajiban Dosen dalam Pelaksanaan Tri Dharma Perguruan Tinggi.

MEMUTUSKAN

MENETAPKAN : Surat Keputusan Dekan tentang "Penugasan Dosen dalam Penyusunan Luaran Penelitian atau Pengabdian Kepada Masyarakat pada Semester Genap Tahun Akademik 2020/2021

Surat Keputusan ini berlaku sejak tanggal ditetapkan dan apabila dikemudian hari ternyata terdapat kekeliruan dalam Surat Keputusan ini, akan dibetulkan sebagaimana mestinya.

Dikeluarkan di : Yogyakarta
Pada Tanggal : 15 Maret 2021
Plh. Dekan

Ir. Murni Yuniwati, M.T.
NIK. 88.0661.344.E

Petikan disampaikan :
Kepada Yth.
Cyrilla Indri Parwati, S.T., M.T.
Dosen FTI-IST AKPRIND Yogyakarta

# The Measurement of Key Performance Indicators (KPI) at Final Assembly Line and Delivery Center Division Using Sink's Seven Performance Criteria Method in Indonesian Aerospace Industry

**Cyrilla Indri Parwati[1*], TitinIsna Oesman[1],Rahayu Khasanah[1], Ratih Desviana[1]**
[1] Faculty of Industrial Technology, AKPRIND Institute of Science & Technology, Yogyakarta, Indonesia
cindriparwati@akprind.ac.id

## ABSTRACT

The research objective is to evaluate the measurement process and parameters of KPI at Final Assembly Line and Delivery Division (FD), comparing and analyzing the objectives with the actual data.The methods used to analyze and evaluate the measurement process and parameters of KPI are descriptive analysis method, and Sink's Seven Performance Criteria method. The result of descriptive analysis method shows that the work schedule is not right, data entry error, and different names but the same meaning. The result of Sink's Seven Performance Criteria method shows that four parameters representingeffectiveness, efficiency, quality and profitability criteria need to be modified. The proposed parameters are percentage of machine productivity and standard working hours, percentage of downtime, machine runtime percentage, cost efficiency, the development of process and technological innovations, level of job satisfaction, percentage of workplace accidents, and percentage of operating expenses. The evaluation of the current parameters and the proposed parameters for the KPI criteria can be use as good recommendation for the aircraft industry in Indonesia to modify their KPI parameters and improve the KPI goal.

**Key words**: KPI, Quality Objective, Actual Quality

## 1. INTRODUCTION

The current era of strategic industry competition requires companies to survive, both in terms of markets and production processes, so it is very necessary for workers who have high professional expertise so that companies can face global developments and competition both now and in the future. Companies that want to continue to compete must have a company target and have a tool to find out whether the set target has been achieved. Increasing demand and variation in markets makes it necessary to use a more responsive approach and focus on the activities of each organization [1]. High productivity in engineering means high design output per engineer (detail, complexity, number of errors, etc.) [2]. Every organization must measure its performance in terms of achieving goals [1, 3, 4]. The main purpose of an organization is a success, which can be achieved with the right strategy [5]. Performance measurement is very important to review the functions of past and present facilities and to make decisions about future strategies [6]. In other words, performance measurement can be defined as a process of measuring the efficiency and effectiveness of an action [7]. Performance indicators are designed from objective variables and decisions [6]. 'Quantitative' or 'qualitative' indicators can be presented with numbers; 'Leading' indicators are designed to predict future results; 'Process' indicators measure efficiency and so on [8]. Based on strategic objectives, further performance indicators have been formulated as a feature of achieving organizational goals and objectives [9].

PT. Dirgantara Indonesia (PTDI) is one of the strategic industries in Indonesia. PTDI is one of the original aerospace companies in Asia that has core competencies in aircraft design and development, aircraft structure manufacturing, aircraft assembly, and aircraft services for light and medium civil and military aircraft. PTDI in its production process has a Final Assembly Line and Delivery Center Division (FD) Division. FD is a division that has two departments, namely Final Assembly Line (FAL) / assembly department and Delivery Center Division (DC) / shipping department. In the FD Division, there are measurements of Key Performance Indicators (KPI). KPI aims to measure progress achieved in accordance with quality objectives because oriented traditional accounting and financial performance measurement systems are no longer sufficient to evaluate company performance [10-11]. The KPI provides a tool to measure progress towards the goals and objectives of the institution. There are three types of indicators: main outcome indicators, performance indicators, and KPIs [12]. The task of setting targets is very difficult and the results of targeting at work seem unable to achieve satisfaction [13]. Evaluation by comparing actual performance and estimates in terms of effectiveness, efficiency and quality in terms of workmanship and products [14].

The KPI in the Final Assembly Line (FAL) department has four parameters and the data taken comes from System Analysis and Program Development (SAP). The four parameters include Cycle Time Adherence (CTA), On-Time Delivery (OTD), Non-conforming by Operator (NcbO), and Barcode Time Utilization (BTU). Measurement of KPI in

division FD often actual quality obtained is not in accordance with the defined quality objectives, so it has not been able to meet the company's targets.

The research aims to find out the cause of the problem that causes actual quality not in accordance with quality objective. So it is necessary to evaluate the measurement process from the parameters or the process of retrieving and processing data until analyzing the results of monthly calculations. The descriptive analysis processing sample measurement process was selected in March 2018 because the two results obtained were at least in accordance with the quality objectives determined by the company over the past six months. Descriptive analysis is a quantitative method used to obtain a systematic, factual and accurate picture of the facts/data, the characteristics and relationships between the events to be studied. After analyzing the measurement process and finding the errors that occur, proceed to find the root cause of the problem with the Fish Bone Diagram method. Fish Bone Diagram is a diagram that shows the relationship between quality characteristics and factors. After being evaluated, it continued to review existing parameters using the Sink's Seven Performance Criteria method. Sink's Seven Performance Criteria is one model that is able to provide clear descriptions of each performance criterion [16-17]. So by reviewing the parameters and the measurement process, it can be seen that the error is in the parameters or measurement process. Whereas twelve months of data during 2018 will be used.

## 2. RESEARCH METHODOLOGY

### 2.1 Descriptive Analysis

Descriptive analysis methods and quantitative methods are used to obtain a systematic, factual and accurate picture of the facts, characteristics and relationships between the events being studied.

Data obtained from SAP Division FD will be calculated with formulas in Excel that have been made by the company before. Then calculate the data in accordance with the parameters needed in the FD Division after documentation is carried out from the beginning of data collection to the actual comparison process with objectives, then analyze the documentation with Descriptive Analysis Method to find out the cause of the error that occurred.

### 2.2 Fishbone Diagram

Fish Bone Diagram or cause and effect diagram is a diagram that shows the relationship between quality characteristics and its factors. This diagram is used to find the cause of a problem or aberration [15]. Data collection for making Fish Bone Diagrams was conducted with a small group discussion to exchange opinions on the causes of the problem.

### 2.3 Sink's Seven Performance Criteria

Sink's Seven Performance Criteria is one of the initial models that able to provide clear descriptions of each of the performance criteria. Research and coverage/reviews from various literature verify that there are at least seven

performance criteria that can relate to each other and depend on an organizational system [15], namely:

a. Effectiveness

It involves "doing the right thing, at the right time, with the right quality" and in practice, effectiveness is expressed as the ratio of the actual output to the expected output. The formula of effectiveness is the actual output divided by the planned output.

b. Efficiency

It simply means "doing the right things", and is defined as the ratio of the resources expected to be consumed to the resources that are actually consumed. The efficiency formula is the expected input divided by the actual input.

c. Quality

Quality is a very broad concept. To make the term more real.

d. Productivity

Productivity is defined as the traditional ratio of output to input.

e. Quality of work-life

The quality of work life is an important contribution to a system that is performing well.

f. Innovation

Innovation is a key element in maintaining and improving performance.

g. Profitability / budget ability

Profit is the main goal for every organization.

Processing with the Sink's Seven Performance Criteria method by comparing seven criteria from Sink's Seven Performance Criteria with KPI goals and parameters in the FD Division.

## 3. RESULT AND DISCUSSION

### 3.1 Descriptive and Documentation Analysis

Descriptive analysis and documentation are used to determine what errors occur in the kpi measurement process, both in data, formulas, or processing. actual results in the fal department in 2018 are shown in figure 1, figure 2, figure 3, and figure 4.
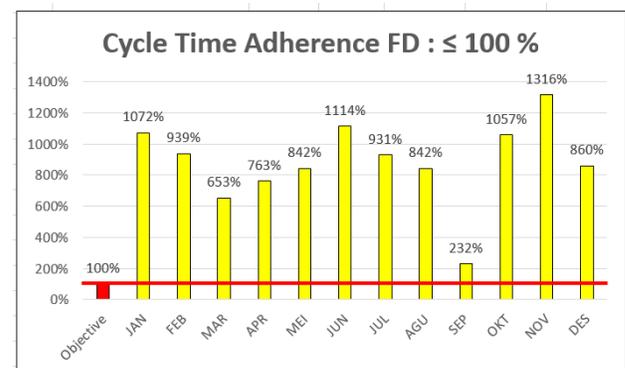


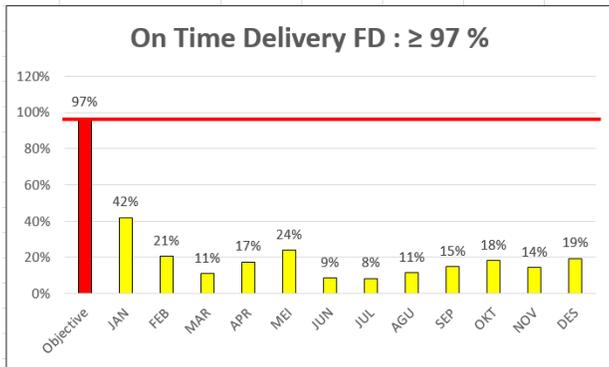**Figure 1:** Graph of Actual Quality Cycle Time Adherence in 2018 in the FAL Department.

**Figure 2:** Graph of Actual Quality On-Time Delivery in 2018 in the FAL Department.
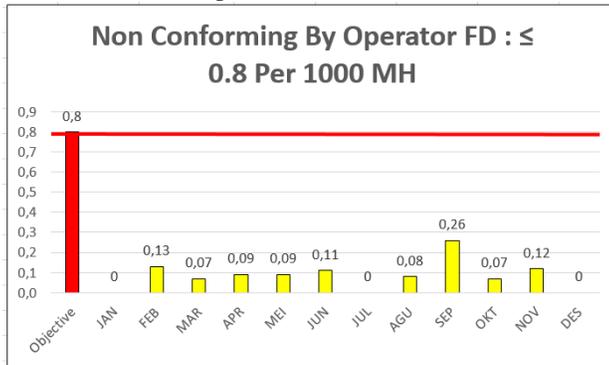


**Figure 3:** Graph of Actual Quality Non-conforming by Operator in 2018 in the FAL Department.
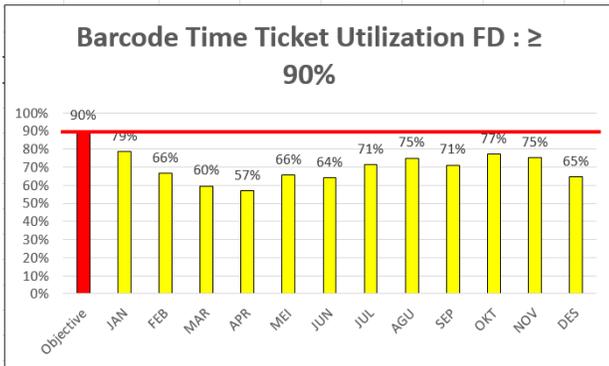


**Figure 4:** Graph of Actual Quality Barcode Time Utilization in 2018 in the FAL Department

The results of processing KPI data in the FAL Department in March 2018 with Descriptive Analysis and Documentation are shown in Table 1.

### 3.2 Review Of KPI Goals And Parameters With Sink's Seven Performance Criteria

Based on a review of the four parameters of KPI in the fourth division FD, both are focused in time. Data is processed also time data, so it can be concluded that all four are in accordance with the goals set and included in four of the seven Sink's Seven Performance Criteria. So it is necessary to extract parameters that contain parameters that do not yet exist.

Goals in the FD division are:
1. Producing and delivering high-quality aircraft and helicopters based on effectiveness, efficiency, on-time delivery, and optimal costs.

2. Prepare and/or improve facilities, equipment, and the readiness and effectiveness of operators based on programs/projects that are implemented continuously.

The result of the goal comparison in the FD Division with the Sink's Seven Performance Criteria method is that the first goal includes parameters of productivity, effectiveness, efficiency, quality, innovation, and profitability. The second goal includes parameters of productivity, effectiveness, efficiency, quality, innovation, and quality of work life.

The comparison of KPI parameters in the FD Division with the Sink's Seven Performance Criteria method is the Cycle Time Adherence parameter (formula: actual time / plan lead) entered into the criteria of effectiveness and efficiency, Non Conforming by Operator (formula: if actual finish date < schedule finish time then not on time, if the actual finish date> basic finish date) falls into the criteria of effectiveness and efficiency, Barcode Time Utilization (if real-time then the transaction code and stop transaction code must always be ZCO11O, if edited time is the transaction code or stop transaction code ZCO11) is included in the criteria of effectiveness and efficiency, and the Non Conforming by Operator parameters (formula: reject / man-hours x 1000) fall into the parameters of quality and profitability.

The new parameter proposed for the Sink criteria are:
1. Productivity. This parameter shows the percentage of machine productivity with the formula for the number of outputs / number of machine working hours x 100% and the percentage of standard working hours productivity with the formula for the number of outputs produced / standard number of hours of work x 100%.
2. Effectiveness, the proposed parameter is the percentage of machine downtime with the formula for the number of actual machine downtime / target engine downtime.
3. Efficiency, the proposed parameter is the machine runtime percentage with the actual formula runtime engine / target machine usage x 100% and cost efficiency with the actual formula cost / plan cost x 100%.
4. Innovation, the proposed parameter is the development of process innovation in the organization and the development of technological innovation within the organization.
5. Quality of work life, the proposed parameters are the level of job satisfaction by means of job satisfaction surveys, and the percentage of workplace accidents based on the number of workplace accidents per year.

Profitability, the proposed parameter is the percentage of operating / expenses with the formula for the amount of operational expenditure / total operational budget.

**Table 1:** Recapitulation of KPI in Final Assembly Line Division.

| Parameter | Cycle Time Adherence | On-Time Delivery | Non Conforming By Operator | Barcode Time Ticket Utilization |
|---|---|---|---|---|
| Quality Objective Company | ≤ 100 % | ≥ 97 % | ≤ 0,8 per 1000 man hours | ≥ 90 % |
| Actual Quality FAL Department | 653 % | 11 % | 0,07 per 1000 man hours | 66 % |
| Evaluation | The actual quality from cycle time adherence obtained is greater than the quality objective that has been determined because actual lead time is far greater than the plan lead time. The plan lead time here is very small because of the scheduled finish time = scheduled start time. | The actual quality from on-time delivery obtained is smaller than the quality objective because the actual finish date > finish date schedule is more than the actual finish date < basic finish date. | The Actual quality obtained is in accordance with the quality objective that is determined by the number of defects of less than 0.8 per 100 man-hours. | The actual quality from the barcode time utilization obtained is smaller than the quality objective that has been determined. Checks that need to be checked again are the understanding of barcode time utilization, transaction code, and actual stop transaction code, to know whether the objective quality is really achieved or not. |

## 4. CONCLUSION

1. KPI in the FD Division has four parameters, and in the measurement process there are errors that occur in the measurement process, among others, the determination of the work schedule is not correct, errors entering data, names used are different when they have the same purpose.
2. One year KPI analysis results show that there is one Key Performance Indicator (KPI) parameter that is suitable, namely the Non Conforming by Operator parameter, while the Cycle Time Adherence, On Time Delivery, and Barcode Time Utilization parameters are not appropriate. Of all the months in one year 2018 all the results obtained are equally not in accordance with the three objectives that have been determined.
3. Based on the root cause analysis of the problem, it is found that due to the wrong measurement process, damage / error in part processing, entering data errors, because the parts / materials come late from the previous process. New parameters then proposed to be added to fulfillcriteriathe Sink's Seven Perfection Criteria can be fulfilled.

## REFERENCES

1. Kennerley, M., & Neely, A. (2003). Measuring performance in a changing business environment. In International Journal of Operations and Production Management. https://doi.org/10.1108/01443570310458465
2. Kaganski, S., & Paavel, M. (2015). Performance Measurement and KPI Evaluation for Engineering Design Team in SME. International Journal of Engineering Innovation & Research.
3. Bourne, M., Mills, J., Wilcox, M., Neely, A., & Platts, K. (2000). Designing, implementing and updating performance measurement systems. International Journal of Operations and Production Management. https://doi.org/10.1108/01443570010330739
4. Bourne, M., Neely, A., Mills, J., & Platts, K. (2003). Implementing performance measurement systems: a literature review. International Journal of Business Performance Management. https://doi.org/10.1504/IJBPM.2003.002097
5. Konsta, K., & Plomaritou, E. (2012). Key Performance Indicators (KPIs) and Shipping Companies Performance Evaluation: The Case of Greek Tanker Shipping Companies. International Journal of Business and Management. https://doi.org/10.5539/ijbm.v7n10p142
6. Lavy, S., Garcia, J. A., Scinto, P., & Dixit, M. K. (2014). Key performance indicators for facility performance assessment: simulation of core indicators. Construction Management and Economics. https://doi.org/10.1080/01446193.2014.970208
7. Syakima, N., Yusoff, M., Sapri, M., Sipan, I., & Muhibudin, M. (2017). the Development of the Key Performance Indicators for School Classroom Facilities. International Journal of Real Estate Studies.
8. Koumparoulis, D. N. (2013). Key Performance Indicators (KPI): A Commentary. International Journal of Management Sciences, 1(1), 30–30. Retrieved from http://www.rassweb.com

9. Nurcahyo, R., Wibowo, A. D., & Putra, R. F. E. (2015). Key performance indicators development for government agency. International Journal of Technology. https://doi.org/10.14716/ijtech.v6i5.1840

10. Peter, K. A., & Zakariya, B. H. (2014). Appraising effectiveness of key performance indicators used by nigerian construction firms. International Journal of Education and Research.

11. Zakaria, Z., Yaacob, M. A., Yaacob, Z., Noordin, N., Sawal, M. Z. H. M., & Zakaria, Z. (2011). Key performance indicators (KPIs) in the public sector: A study in Malaysia. Asian Social Science. https://doi.org/10.5539/ass.v7n7p102

12. Parmenter, D. (2007). Key Performance Indicators (KPI): Developing, Implementing, and Using Winning KPIs. Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki. https://doi.org/978-0470545157

13. Mohamed Abd EL-Mongy, A., El-deen Hamouda, A., Nounou, N., & A. Wahdan, A.-M. (2013). Design of Prediction System for Key Performance Indicators in Balanced Scorecard. International Journal of Computer Applications, 72(8), 10–14. https://doi.org/10.5120/12512-6016

14. Ikediashi, D. I., Mendie, A., Achuenu, E., & Oladokun, M. G. (2012). Key Performance Indicators of Design and Build Projects in Nigeria. Journal of Human Ecology. https://doi.org/10.1080/09709274.2012.11906447

15. Luxhoj, J. T. (1996). A review of: " Performance Management: A Business Process Benchmarking Approach " Edited by Asbjorn Rolstadas Chapman & Hall, 1995, 399 pp., ISBN 0 412 60560 0, $49.95 (Hardback) . IIE Transactions. https://doi.org/10.1080/07408179608966302.

16. E. Julianto, W. A. Siswanto, and M. Effendy, "Characteristics of Temperature changes and Stress of Float Glass," Int. J. Emerg. Trends Eng. Res., vol. 7, no. 9, pp. 228–233, 2019.

17. A. D. Anggono, N. Ernawan, and T. W. B. Riyadi, "Analysis of mechanical and metallographic properties on the joining between aluminum and brass by using the brazing method," Int. J. Emerg. Trends Eng. Res., vol. 8, no. 2, pp. 440–446, 2020.