



DEWI HARDININGTYAS, ST, MT, MBA



#7 ***WORK MEASUREMENT***

ANALISA DAN PENGUKURAN KERJA



JOB DESIGN :

METHODS STUDY + WORK MEASUREMENT

WORK STUDY, ANALYSIS, DESIGN, or
METHODS ENGINEERING

METHODS
STUDY

WORK
MEASUREMENT

Resulting in more effective use of Manpower, Material, Machine, and Working environment

Making possible improved Planning and Control, Manning and as a basis for Sound Incentives Schemes

HIGH PRODUCTIVITY

- **METHODS STUDY** : the part of methods engineering normally involving an examination and analysis of an operation or a work cycle broken down into its constituent parts to improve the operation, eliminate unnecessary steps, and/or establish and record in detail a proposed method of performance

- **WORK MEASUREMENT** : A process for measuring the required time for performing a given task, by a given method, by a trained worker, working in a normal pace.

WORK MEASUREMENT

WHY USE IT?

- Schedule work and allocate capacity
- Motivate and measure work performance
- Evaluate performance
- Provide benchmarks



HOW IT WORKS ?

- Establish the standard job method
- Break down the job into elements
- Study the job
- Rate the worker's performance
- Compute the average time
- Compute the normal time
- Compute the standard time



LANGKAH – LANGKAH PENGUKURAN [WAKTU] KERJA

1

Catat semua informasi yang berkaitan dengan operasi kerja



2

Bagi operasi kedalam elemen-elemen kegiatan



3

Amati, ukur dan catat waktu dari elemen-elemen kegiatan kerja



4

Test dan evaluasi kenormalan, keseragaman dan kecukupan data



Perhitungan Waktu & Output Baku



7

Penetapan Waktu Longgar



6

Rating Performance & Perhitungan Waktu Normal

5

1. Collect information & equipment preparation

- *Equipment used :*
 - Stop-watch
 - Camera
 - Time-study form
 - Board
 - Pocket calculator
- *Layout, environment, machines*
- *Communication with foreman and workers*



2. Breakdown operations to elements

- Purpose : easy to measure & line balancing
- Separate handling time (**non-productive time**) with operation time (**productive time**)
- Separate **constant element** with **variable element**.
- Every element must have an easily identifiable starting and ending point (**breakpoints**)
- **Continuities** between elements
- Elements times: 0.04min (short), 0.25min (reasonable)
- **Relative frequency** must be included



3. Work Measurement Methods

ESTIMASI

Biasa dilakukan oleh seorang estimator yang berpengalaman. Dilakukan sekedar untuk bisa menetapkan estimasi waktu penjadwalan kerja yang dikaitkan dengan biaya (budget) sebuah aktivitas yang harus segera diputuskan. Tidak direkomendasikan untuk menetapkan waktu, output maupun upah standar.

PAST PERFORMANCE

Lebih baik dari estimasi. Ditetapkan berdasarkan data historis (pengalaman) kegiatan yang pernah dilaksanakan (baik yang persis sama maupun mendekati).



3. Work Measurement Methods

DIRECT MEASUREMENT

Cara terbaik untuk menetapkan waktu standar maupun untuk menetapkan kondisi kerja yang tidak produktif. Penetapan berdasarkan fakta obyektif yang terjadi, diukur langsung dengan alat pencatat waktu (stop-watch), dan tidak sekedar diestimasikan.

INDIRECT MEASUREMENT

Mengukur waktu kerja dengan melakukan dokumentasi (video) terlebih dahulu atas pekerjaan tersebut. Kemudian menghitung waktu standar-nya dengan analisa gerakan kerja. Terkadang kurang merepresentasikan *performance* dari operator.



METODE PENGUKURAN [WAKTU] KERJA

PENGUKURAN [WAKTU] KERJA



DIRECT



INDIRECT



STOP-WATCH



STANDARD DATA

WORK SAMPLING

PMTS



4. Tes Kenormalan, Tes Keseragaman, Tes Kecukupan Data

- TES KENORMALAN** → data pengamatan seharusnya berjumlah cukup besar (banyak) dan berdistribusi normal.
- TES KESERAGAMAN** → data harus homogen dan diperoleh dari populasi yang sama.
- TES KECUKUPAN** → data yang dikumpulkan telah cukup secara obyektif, dengan konsep statistik (derajat ketelitian dan tingkat keyakinan/kepercayaan yang diinginkan).



Konsep Operator Bekerja Normal

Operator dianggap bekerja normal, bilamana :

1. Memiliki pengetahuan, ketrampilan, dan pengalaman pekerjaan yang cukup.
2. Bekerja tanpa menunjukkan usaha-usaha (tempo kerja yang terlalu berlebihan atau bersikap tidak wajar).
3. Menguasai cara / metode kerja yang ditetapkan secara standar, dan
4. Menunjukkan kesungguh-sungguhan (serius) dalam melaksanakan pekerjaannya.

5. Performance Rating & Normal Time

- Analyst judges the performance or pace of the worker **relative (subjective)** to the definition of standard performance used by the organization.
- **Standard (normal) performance $PR = 100\%$**
 - Slower pace than standard $PR < 100\%$
 - Faster pace than standard $PR > 100\%$
- **Methods :**
 - Speed Rating
 - Westinghouse Rating System

Normal time :
 $T_n = T_{obs} (PR)$



SPEED RATING

- Single factor, example speed.
- Benchmark with experienced operator.
- Selection of an operator who gives performances between 85 and 115.
- Use of the average value of three or more independent studies.



WESTINGHOUSE RATING SYSTEM

Skill	Effort	
+ 0.15 A ₁ - Superskill +0.13 A ₂ +0.11 B ₁ - Excellent +0.08 B ₂ +0.06 C ₁ - Good +0.03 C ₂ 0.00 D - Average	+ 0.13 A ₁ - Excessive + 0.12 A ₂ + 0.10 B ₁ - Excellent + 0.08 B ₂ + 0.05 C ₁ - Good + 0.02 C ₂ 0.00 D - Average	- 0.04 E ₁ - Fair - 0.08 E ₂ - 0.12 F ₁ - Poor - 0.17 F ₂
Conditions	Consistency	
+ 0.06 A - Ideal + 0.04 B - Excellent + 0.02 C - Good 0.00 D - Average - 0.03 E - Fair - 0.07 F - Poor	+ 0.04 A - Perfect + 0.03 B - Excellent + 0.01 C - Good 0.00 D - Average - 0.02 E - Fair - 0.04 F - Poor	

6. Determine Allowance

Allowance

Constant

Special

Personal Needs

Fatigue

Avoidable
Delays

Unavoidable
Delays



7. Standard Time and Output

- The function of the allowance factor is to inflate the value of standard time in order to account for the various reasons why the worker loses time during the shift
- A PFD (personal time, fatigue, delays) allowance is added to the normal time to compute the standard time.

$$T_{std} = T_n(1 + A_{pfd})$$

$$O_{std} = 1 / T_{std}$$



WORK MEASUREMENT PROBLEMS

- Observers are not always competent.
- Those conducting the study are not always proficient in the job being observed.
- The actions observed are not always reflective of the group as whole.

WORK MEASUREMENT PROBLEMS

**Workers may not cooperate,
because :**

- 1. They may resent the study if it is being used to determine the pay scale.**
- 2. Workers may change the rate at which they work.**
- 3. Pressure may increase mistakes made.**
- 4. Workers may alter normal work methods to disrupt the study.**

**“Knowing exactly what you want to do,
and then seeing that they do it the best
and cheapest way.”**

- Frederick W. Taylor-

Thank you