Introduction to Methods Engineering and Operations Analysis

Sections:

1. Evolution and Scope of Methods Engineering – part 1
2. How to Apply Methods Engineering – part 1
3. Basic Data Collection and Analysis Techniques – part 2
4. Automation and Methods Engineering – part 2
1. Evolution and Scope of Methods Engineering
Methods Engineering

- **Analysis** and **design** of **work methods and systems**, including the tooling, equipment, technologies, workplace layout, plant layout, and work environment

- Other names for methods engineering:
  - Work study
  - Work simplification
  - Methods study
  - Process re-engineering
  - Business process re-engineering
Objectives in Methods Engineering

- Increase **productivity** and **efficiency**
- Reduce cycle **time**
- Reduce product **cost**
- Reduce **labor** content
Other Objectives

- Improve **customer satisfaction**
- Improve product and/or service **quality**
- Reduce **lead times** and improve **work flow**
- Increase **flexibility** of work system
- Improve worker **safety**
- Apply more **ergonomic** work methods
- Enhance the **environment** (both inside and outside the facility)
Operations Analysis

- **Study** of an operation or group of related operations for the purpose of **analyzing** their **efficiency** and **effectiveness** so that **improvements** can be developed.

- Objectives in operations analysis:
  - Increase **productivity**
  - Reduce **time** and **cost**
  - Improve **safety** and **quality**

- Same basic objectives as methods engineering.
Methods Engineering

Can be divided into two areas:

1. Methods analysis
2. Methods design
Methods Analysis

- Concerned with the study of an **existing method or process**
- Objectives:
  - **Eliminate** unnecessary and non-value-adding work elements
  - **Combine** elements and operations
  - **Rearrange** elements into more **logical sequence**
  - **Simplify** remaining elements and operations
Methods Design

Concerned with either of the following situations:

1. **Design** of a **new method or process**
   - Required for new product or service and there is **no existing precedent**
   - Method must be **designed from scratch**, using best existing practice for similar operations

2. **Redesign** of an **existing method or process** based on a preceding methods analysis
2. How to Apply Methods Engineering
Systematic Approach

1. Define the problem and objectives
2. Analyze the problem
3. Formulate alternatives
4. Evaluate alternatives and select the best solution
5. Implement the best method
6. Audit the study

- A systematic approach is more likely to yield operational improvements than an undisciplined approach
Techniques of Methods Engineering

- Data gathering and statistical tools
- Charting and diagramming techniques
- Motion study and work design
- Facility layout planning
- Work measurement techniques
- New approaches
Charting & Diagramming Techniques

- Network diagrams
- Traditional industrial engineering charting techniques
  - Operation charts
  - Process charts
  - Flow diagrams
- Block diagrams
- Process maps
Motion Study and Work Design

- Concerned with **basic motions** of a human worker **while performing** a given task
- Examples of basic motion elements:
  - Reach
  - Grasp
  - Move
  - Release
- Guidelines for work design include “principles of motion economy”
Facility Layout Planning

- **Facility layout** refers to:
  - **Size** and **shape** of a facility
  - **Arrangement** of the different departments and equipment within the facility

- Problem area includes:
  - Design of a **new facility**
  - **Installing** new equipment, **retiring** old equipment
  - **Expanding** (or contracting) an existing facility
Four basic work measurement techniques:
1. Direct time study
2. Predetermined motion time systems (PMTS)
3. Standard data systems
4. Work sampling

PMTS and work sampling can be used in methods engineering to make improvements in the work methods.
New Approaches

- Lean production
  - Based on the Toyota production system
  - Embraced by U.S. companies due to its success at Toyota
- Six Sigma and other quality-focused programs
  - Widely adopted in industry for improving quality of work processes
Selecting Among Alternative Proposals

- Need for a **systematic procedure** to decide among alternative proposals
  - To begin, **list** the technical features and functional specifications for the application
    - **Must features**
    - **Desirable features**
  - **Criteria matrix to evaluate alternatives**
    - **Drop** candidates that do **not satisfy** “**must features”**
    - Develop **scores** for **desirable features**
## Evaluation of Robots for Welding

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<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
<th>Model D</th>
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