

Adapted from the Course Book: *Manufacturing Facilities Design and Material Handling*, F.E. Meyers and M.P. Stephens, 5th Edition, 2013, Purdue University Press (ISBN-10: 1557536503)

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Introduction to Facility Layout Planning

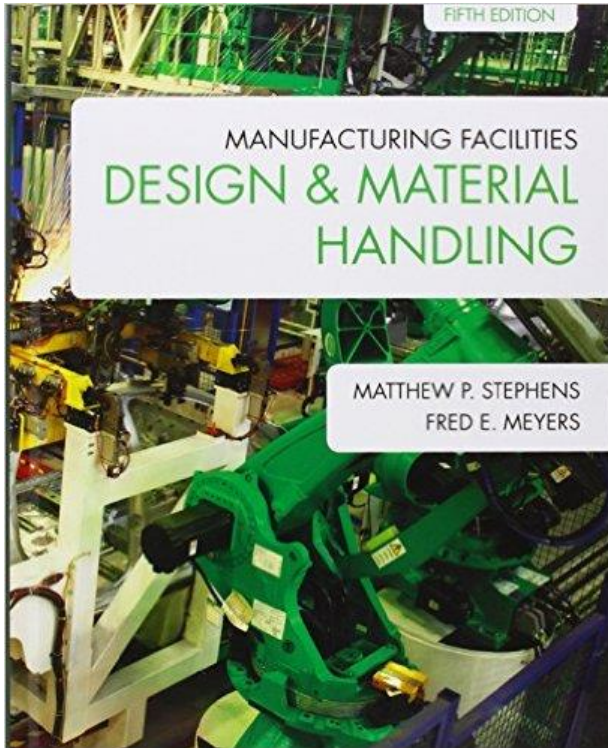
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Introduction to Facility Layout Planning by Dr. Zeki Ayağ, P.Eng.

Course Book



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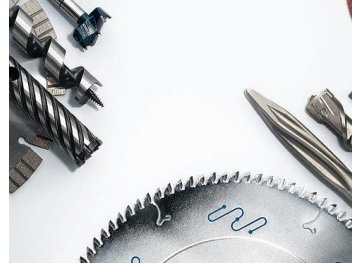
Background at a Glance (1/3)



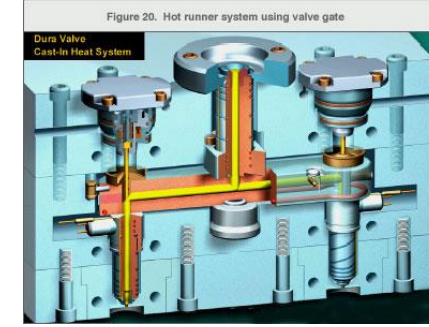
Research & Teaching Assistant
[1989-1993]



Quality Assurance Engineer
[1993-1995]



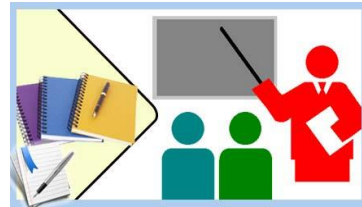
Construction Department Head
[1995-1998]



Engineering Designer (Canada)
[1998-2000]



Full Professor of I.E. [2005-present]
Founding Chairman of I.E. Dept. [2005-2015]
Director of GS of Sci. & Eng. [2014-2017]



Assist.Prof.Dr., IE Department
[2003-2005]



CAD Engineer, P.Eng. (Canada)
[2000-2003]

Career Summary

4-Year *Teaching Assistant Experience*

Almost 10-Year-
National/International Industrial Experience

More than 12-Year
Academic Experience

**More than 25-Year
Academic + Industrial
Experience**

(+ For more information please visit: <http://www.zekiayag.org>)

Background: Selected Achievements (2/3)

- *Registered Professional Engineer (P. Eng.)* (since 2001)
(Society of Professional Engineers in Ontario (PEO), Canada)
- *Best Academician Award of the 2010-2011 Academic Year* at KHU
(Presented by Turkish President Abdullah Gül)
- *Engineering Program Evaluator* for MÜDEK (ABET Equivalent)
(Association of Evaluation and Accreditation of Engineering Programs)
- *Senior Member* (since 2006)
(Society of Institute of Industrial Engineers, IIE)
- *Author, Reviewer and Editorial Board Member* (since 2002)
(International Journal of Production Research, IJPR, indexed by SCI®)
- *14 Journal Articles* with the Number of Citations, 413 (h-index: 10)(Web of Science)
- *82 National and International Conference Papers*



Background: Teaching (since 1989) (3/3)

Courses*

Strategic Management in the 21st Century
(Konkuk University, South Korea)
Factory Design and Plant Layout
Supply Chain Management
Operations Research I
Operations Research II
Systems Simulation
Quality Engineering
Principles of Industrial Engineering
Engineering Problem Solving and Project Management
Multiple-Criteria Decision Making
Production Planning and Control
Strategic Planning
Introduction to System Analysis
Manufacturing Processes
Enterprise Resource Planning
Decision Support and Artificial Intelligence
Management Information Systems
Introduction to Manufacturing Processes
Computer Integrated Manufacturing
Integrated Enterprise Systems
Final Project
Graduate Seminar
Master's Thesis

Seminar through Teaching Staff Mobility (TSP)*

Universidad de La Coruña, Escuela Universitaria Politécnica, Spain
Mondragon University, Faculty of Engineering, Spain
Copenhagen University, College of Engineering, Department of Production Engineering, Denmark
Vilnius Gediminas Technical University, Faculty of Business Management, Lithuania

Courses I assisted as Teaching and Research Assistant

Computer Integrated Manufacturing
Computer Programming using BASIC
Computer Programming using MS-COBOL
Data Processing in Industrial Systems
Facility Planning
Introduction to Industrial Engineering
Introduction to Measurement and Machine Tools
Machine and Cutting Tools
Production Planning and Control
Quality Control
Statistics
System Simulation
Technical Drawing

* All courses given in English

(+ For more information please visit: <http://www.zekiayag.org>)



Content

- Introduction
- Objective of Plant Layout
- Factors Affecting Plant Layout
- Types of Plant Layout
 - Fixed-Position Layout
 - Product-Oriented Layout
 - Process-Oriented Layout
 - Cellular Manufacturing Layout
- Video: Facility Planning Process and Layout



Introduction

Facility Layout:

Arrangement of machines, storage areas, and/or work areas usually within the confines of a physical structure, such as a retail store, an office, a warehouse, or a manufacturing facility.



Objective of Plant Layout



The main objective consists of organizing equipment and working areas in the most efficient way, and at the same time satisfactory and safe for the personnel doing the work.



Factors Affecting Plant Layout

The final solution for a Plant Layout has to take into account a balance among *the characteristics and considerations of all factors* affecting plant layout, in order to get *the maximum* advantages.

The factors affecting plant layout can be grouped into 8 categories:

- *Materials*
- *Machinery*
- *Labor*
- *Material Handling*
- *Waiting Time*
- *Auxiliary Services*
- *The Building*
- *Future Changes*

Types of Plant Layout

The production process normally determines the type of plant layout to be applied to the facility:

- *Fixed-position plant layout*
Product stays and resources move to it.
- *Product-oriented plant layout*
Machinery and Materials are placed following the product path.
- *Process-oriented plant layout*
Machinery is placed according to what they do and materials go to them.
- *Cellular manufacturing layout*
Hybrid Layout that tries to take advantage of different layouts types.

Types of Plant Layout

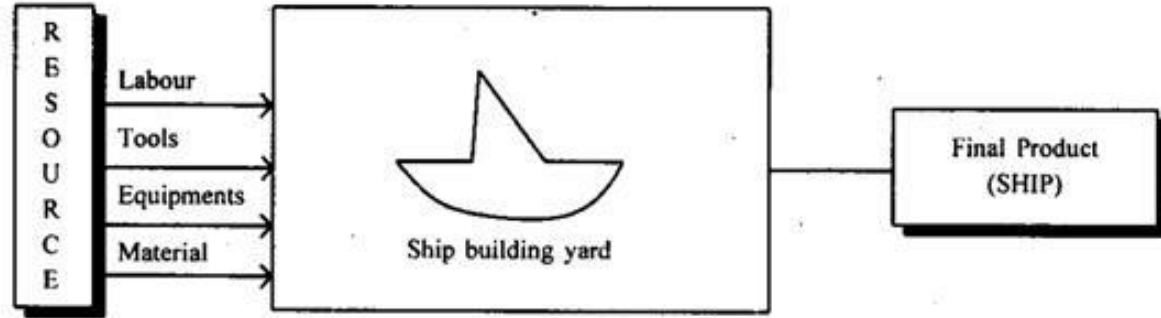
Fixed-Position Layout

Manufacturing and non-manufacturing operations of bulky or fragile products, *e.g., ships and planes.*

Move machines and/or workers to the site; products normally remains in one location for its entire manufacturing period

Types of Plant Layout

Fixed-Position Layout



Types of Plant Layout

Product-Oriented Plant Layout

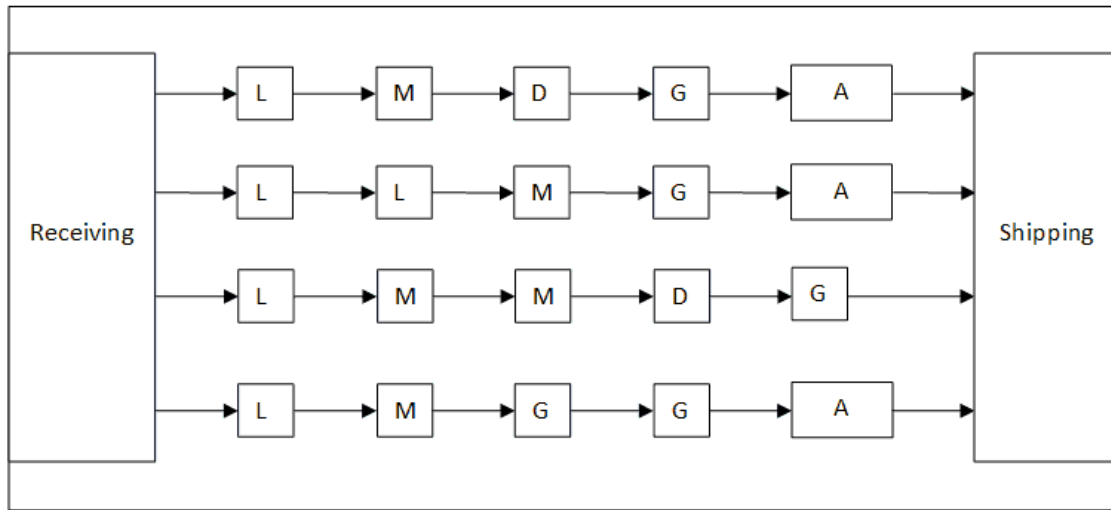
This type of plant layout is useful when the production process is organized in a *continuous* or *repetitive* way.

- Continuous flow: The correct operations flow is reached through the layout design and the equipment and machinery specifications.
- Repetitive flow (assembly line): The correct operations flow will be based in a line balancing exercise, in order to avoid problems generated by bottlenecks.

The plant layout will be based in allocating a machine as close as possible to the next one in line, in the correct sequence to manufacture the product.

Types of Plant Layout

Product-Oriented Plant Layout



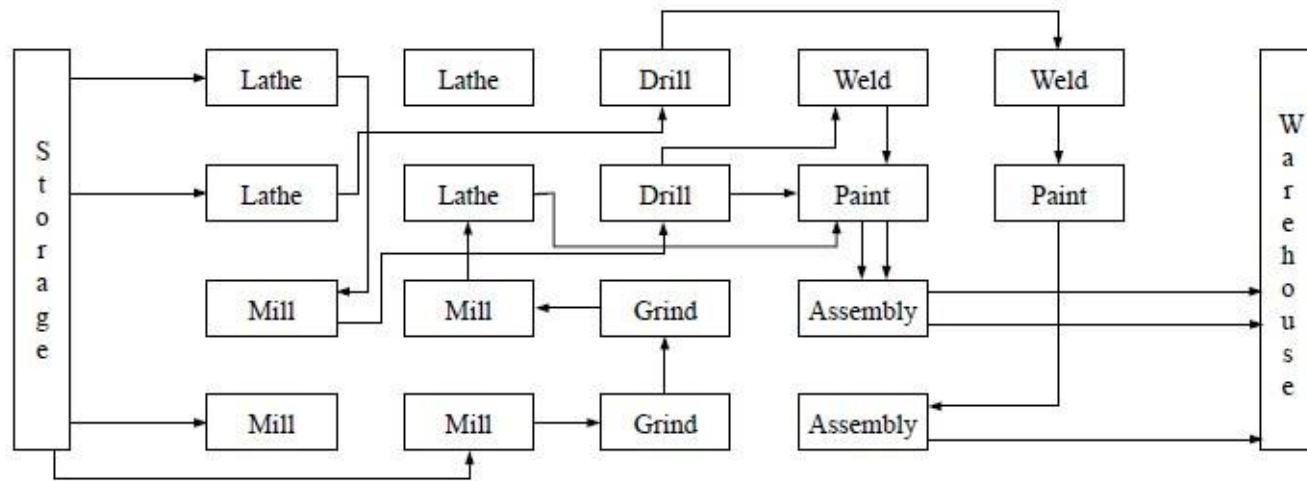
Types of Plant Layout

Process-Oriented Plant Layout

- This type of plant layout is useful when the production process is organized *in batches*.
- Personnel and equipment to perform the same function are allocated *in the same area*.
- *The different items* have to move from one area to another one, according to the sequence of operations previously established.
- The variety of products to produce will lead to *a diversity of flows* through the facility.
- *The variations in the production volumes* from one period to the next one (short periods of time) may lead to modifications in the manufactured quantities as well as the types of products to be produced.

Types of Plant Layout

Process-Oriented Plant Layout



Types of Plant Layout

Cellular Manufacturing Layout

Group of equipment and workers that perform a sequence of operations over multiple units of an item or family of items.

Looks for the advantages of product and process layouts:

Product-oriented layout: *Efficiency*

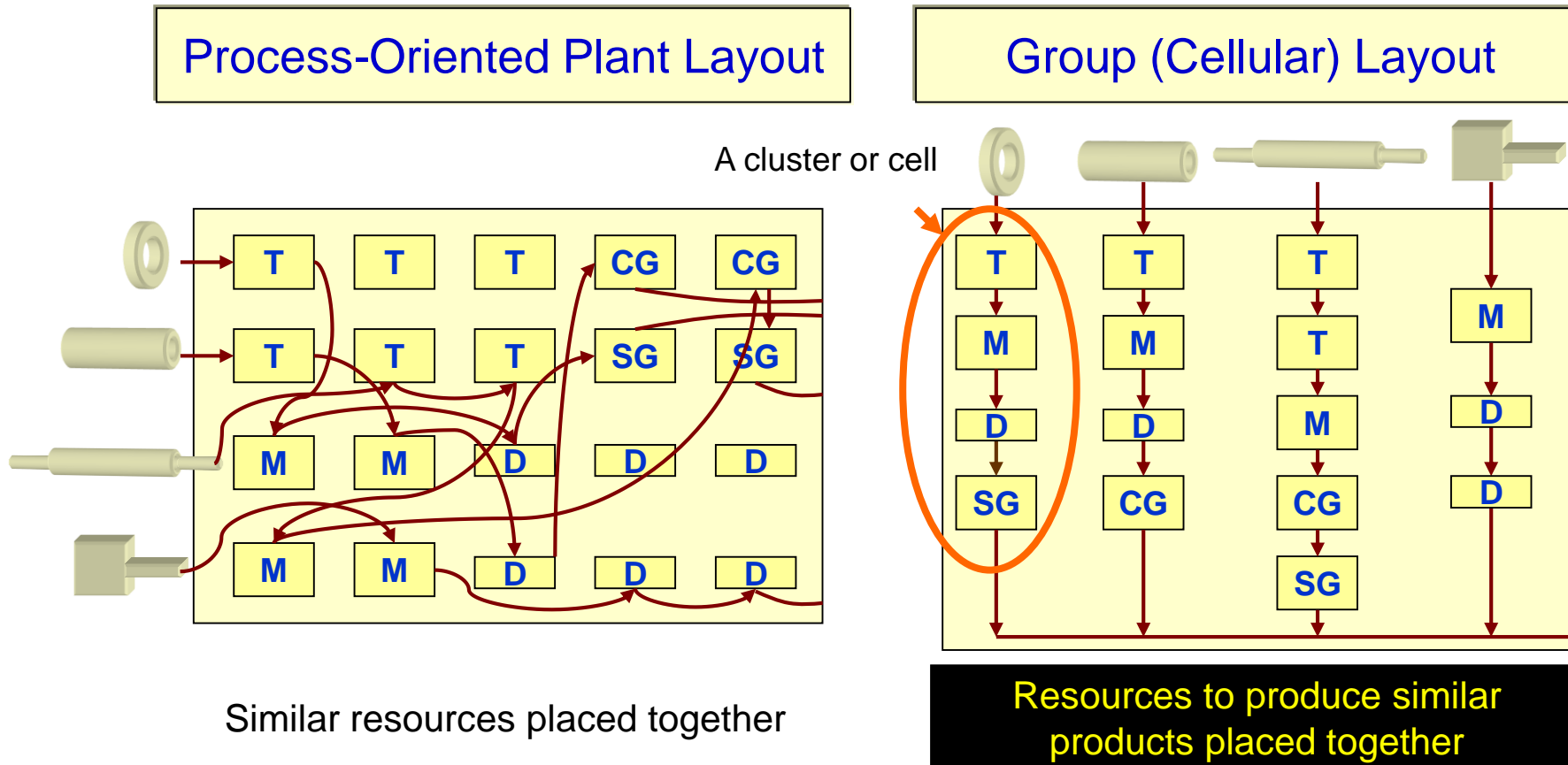
Process-oriented layout: *Flexibility*

Group Technology

Grouping outputs with the same characteristics to families, and assigning groups of machines and workers for the production of each family.

Types of Plant Layout

Cellular Manufacturing Layout vs. Process-Oriented Plant Layout



Video: Facility Planning Process and Layout



Thanks for Listening ...