Standard Data Systems

Sections:

1. Using a Standard Data System
2. Developing a Standard Data System
3. Work Element Classification in Standard Data Systems
4. Analysis of Machine-Controlled Element Times
5. SDS Advantages and Disadvantages

Standard Data System Defined

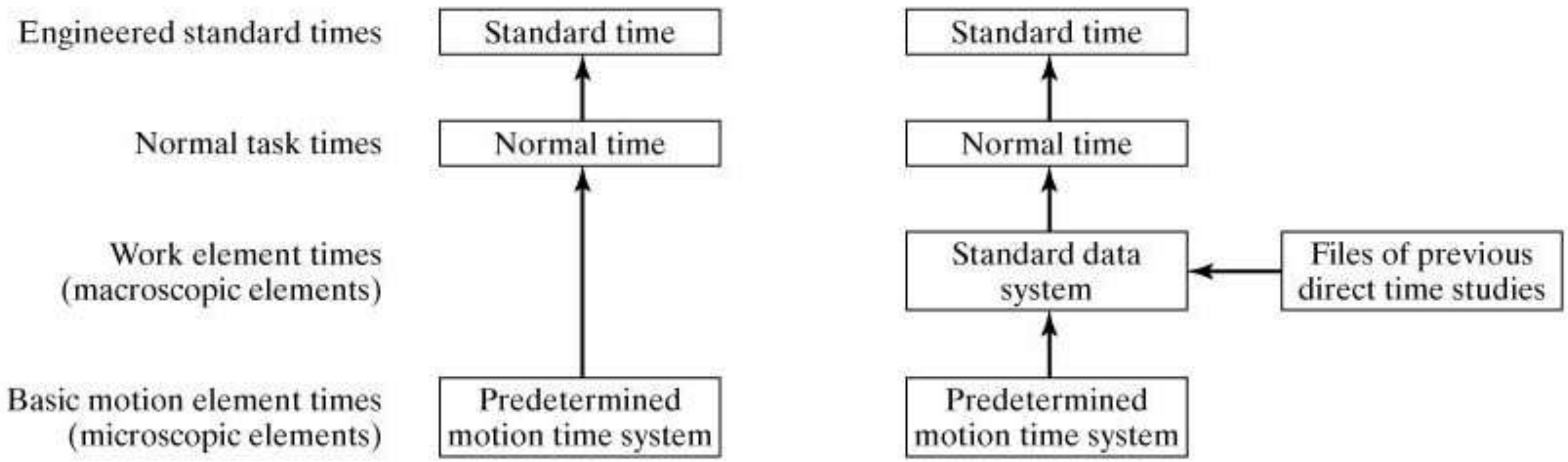
A SDS is a database of normal time values, usually organized by work elements, that can be used to establish time standards for tasks composed of work elements similar to those in the database

- Normal times in the database are usually compiled from previous direct time studies
- Using a standard data system, time standards can be established before the job is running

When a SDS is Most Suitable

- Similarity in tasks
  - With many similar tasks, it is more efficient to use a SDS than direct time study
- Batch production
  - Best suited to medium production quantities
- Large number of standards to be set
  - More productive than direct time study
- Need to set standards before production
  - Direct time study requires observation of actual task to set standard, SDS does not

PMTS and SDS Compared



Operation of a predetermined motion time system

Development and operation of a standard data system

Using a Standard Data System

1. Analyze the new task and divide into work elements
2. Access database to determine normal times for the work elements
   - Distinguish setup time from production cycle time
3. Add element normal times to obtain the task normal times for setup and production cycle
4. Compute standard times for setup and production cycle by adding appropriate allowances

SDS Database

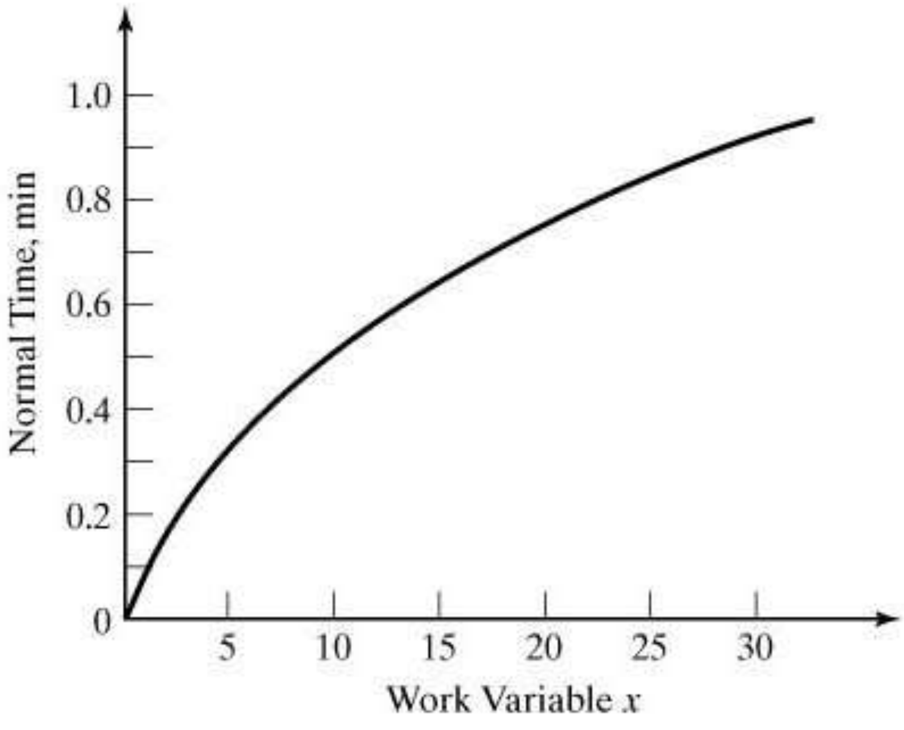
A catalog of normal times, organized to allow the analyst to access the values corresponding to work elements performed under various work variables

- *Work variables* - factors that affect the normal time of the element
  - Examples:
    - Work unit characteristics (e.g., size, weight)
    - Task parameters (e.g., distances moved)
    - Working conditions (e.g., illumination)

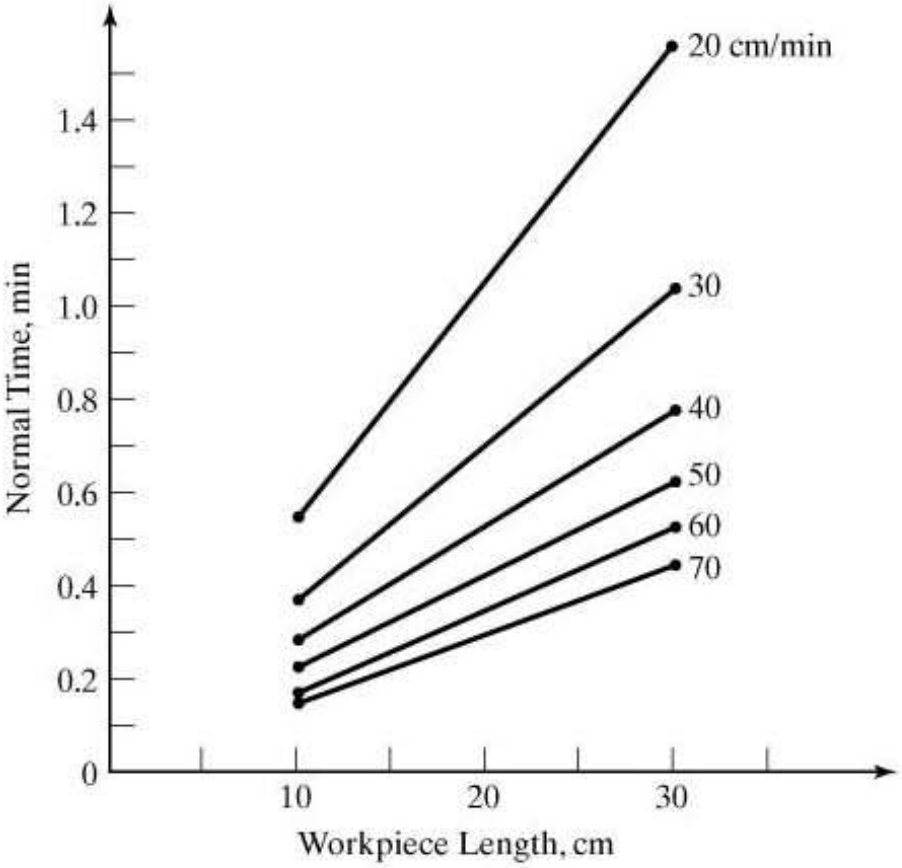
The SDS Database

- Various formats can be used in the SDS database:
  - Charts
  - Tables
  - Mathematical formulas
  - Worksheets
  - Computerized database and retrieval system

Charts: One Work Variable



Charts: Two Work Variables



Developing a SDS

1. Define objectives of the system
2. Define the coverage of the system
   - What is the family of tasks that will be included in the system?
3. Obtain work element normal time data
4. Classify work elements
5. Analyze data to determine element normal times
6. Develop database to predict normal times
7. Prepare documentation

Classification of Work Elements

- Setup versus production elements
- Constant versus variable elements
- Worker-paced versus machine elements
- Regular versus irregular elements
- Internal versus external elements

Setup versus Production

- Setup elements - associated with activities required to change over from one batch to the next
  - Performed once per batch
- Production elements - associated with the processing of work units within a given batch
  - Performed once per work unit
- Batch time

$$T_b = T_{su} + Q\,T_c$$

where T_b = batch time, T_{su} = setup time, Q = quantity, and T_c = cycle time

Constant and Variable Elements

- Constant elements - same time value in all time studies and tasks
  - Examples:
    - Replace cutting tool in tool post
    - Dial telephone number of customer
- Variable elements - same basic motion elements but normal times vary due to differences in work units
  - Examples:
    - Load workpiece into machine
    - Keypunch address

Operator-Paced vs. Machine Elements

- Operator-paced elements - manual elements
  - Can be setup or production cycle elements
  - Can be constant or variable
- Machine-controlled elements - machine time depends on machine operating parameters
  - Once parameters are set, the machine time can be determined with great accuracy
  - Characterized by little or no random variations

Other Work Element Differences

- Regular elements - performed once every cycle
- Irregular elements - performed less frequently than once per cycle
  - Must be prorated in regular cycle
- External elements - manual elements performed in series with machine elements
- Internal elements - manual elements performed at same time machine is running

Work Cycle Standard Data

A SDS that uses normal times for the entire task rather than dividing the task into work elements and determining element normal times

- When appropriate:
  - Work elements of task are highly variable
  - Elements are difficult to separate or identify
  - Task consists of many elements
  - Many elements are similar
  - Time standard will not be used for wage incentive purposes

Work Cycle Standard Data

- Examples:
  - Checkout of customers at supermarket counter
    - Simpler to determine time per customer than to break the time into elements
  - Prepare legal document for client
    - Start with standard document form (e.g., will) and edit for specific needs of client
  - Proofreading a document
    - Time estimate based on the number of pages to proofread

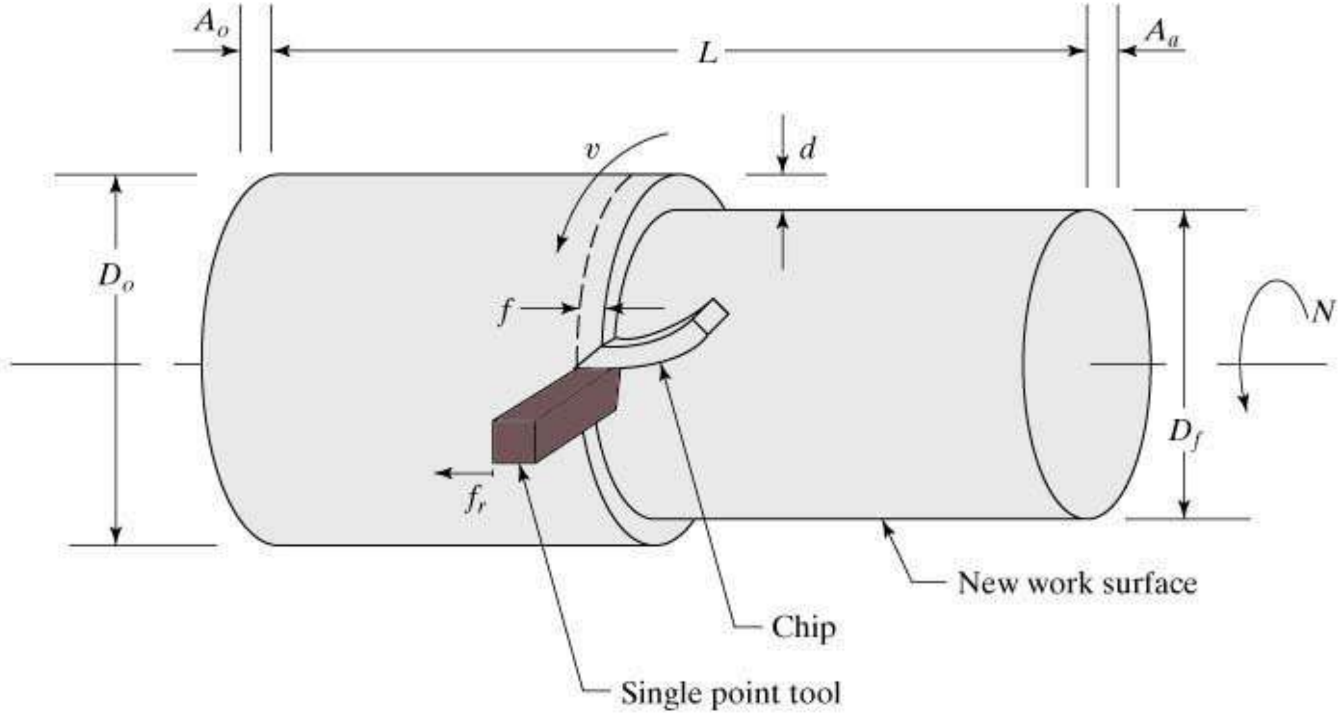
Machine-Controlled Elements

- Examples:
  - Power feed motion of a machine tool
    - Once activated by worker, machine time depends on feed and speed settings and dimensions of workpiece
  - Semiautomatic cycle of a machine
    - Machine cycle operates under computer numerical control (CNC)
  - Fully automated cycle
    - Operator periodically attends machine

Machine Times for Machining

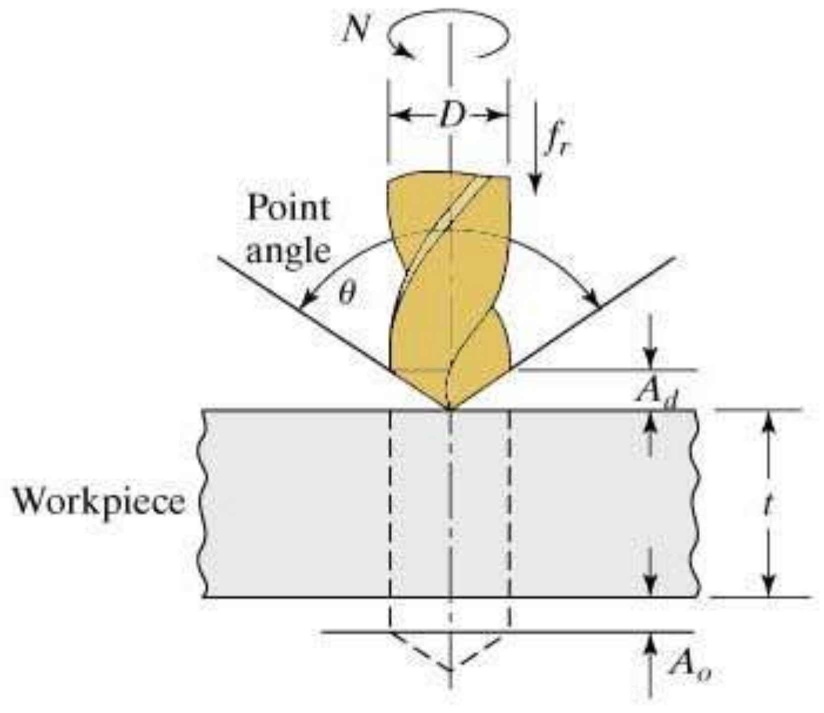
- Machining - family of processes in which excess material is removed from a starting workpiece by a sharp cutting tool so the remaining part has the desired geometry
  - Common machining operations:
    - Turning
    - Drilling
    - Milling
- Machining times can be calculated or measured with great accuracy, given the machine settings (feeds and speeds) and part dimensions

Turning Operation

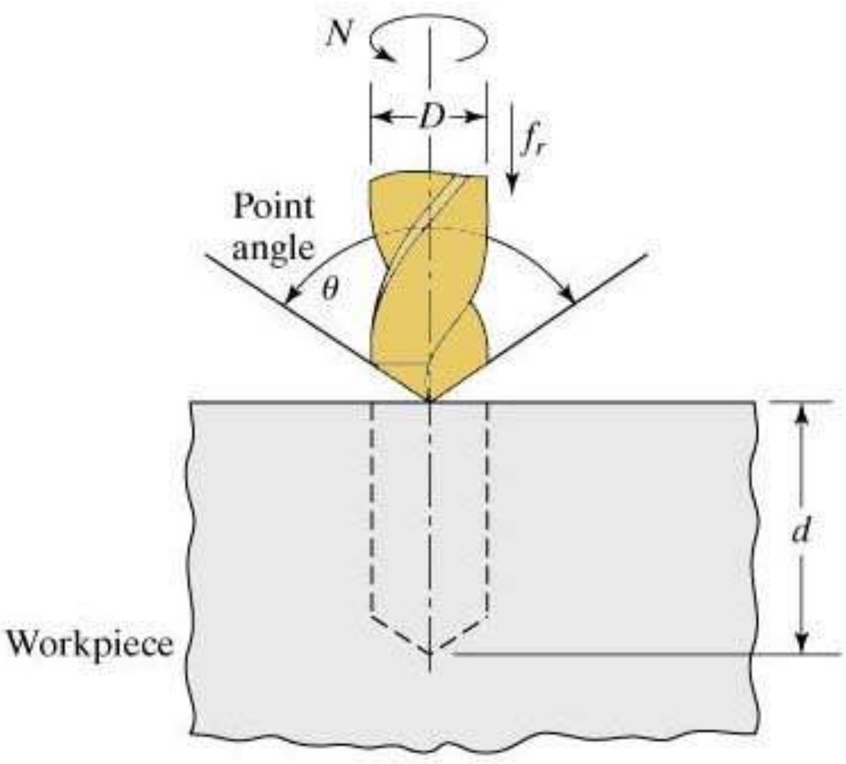


Key: D_o = staring diameter, D_f = final diameter, L = length, v = cutting speed, f = feed, d = depth of cut, f_r = feed rate, N = rotational speed, A = approach allowance, and A_o = overtravel allowance.

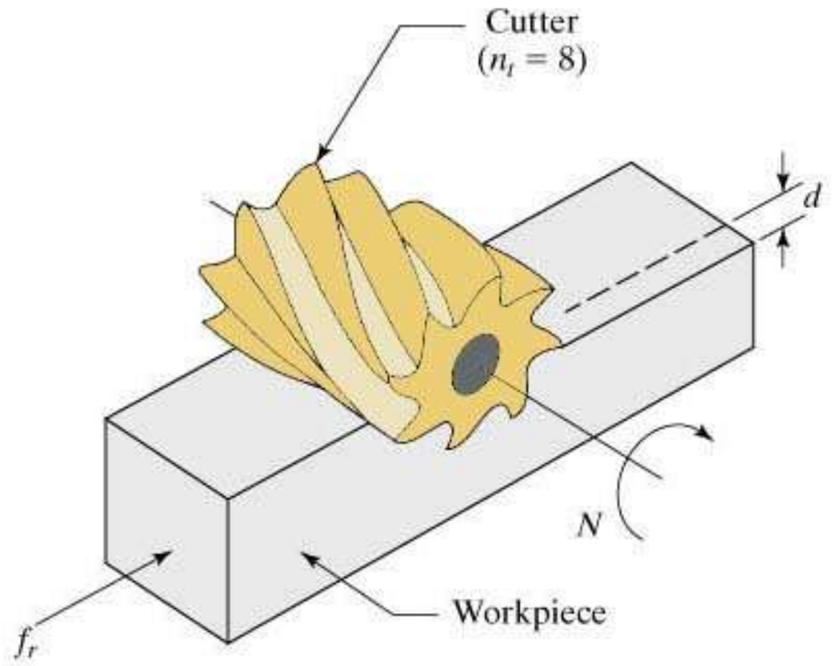
Drilling Operation: Through Hole



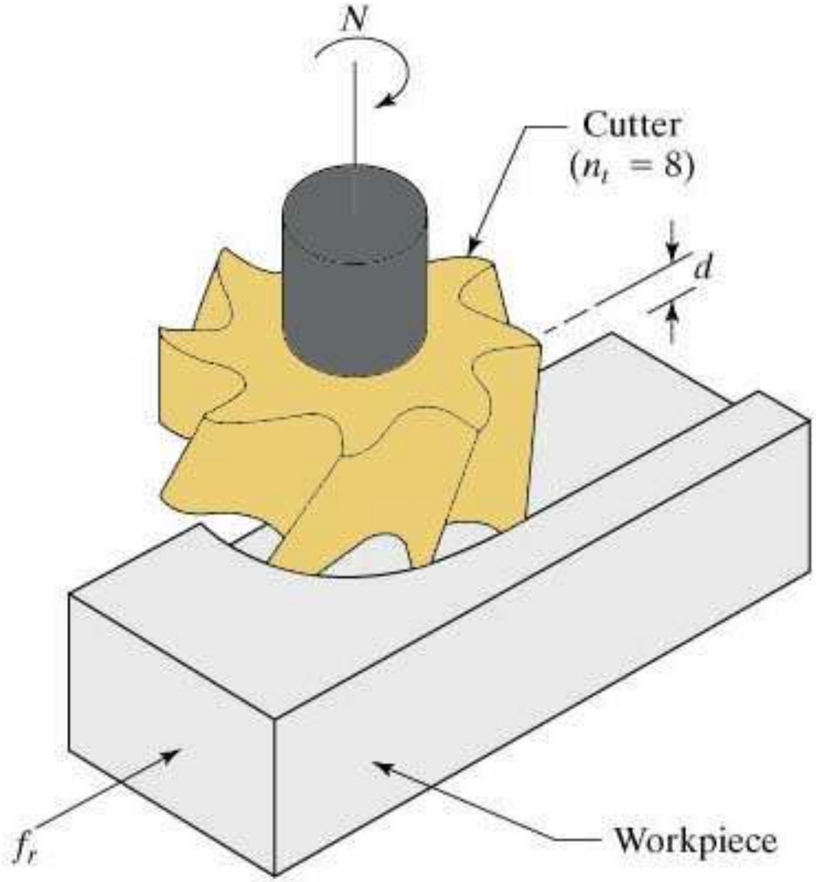
Drilling Operation: Blind Hole



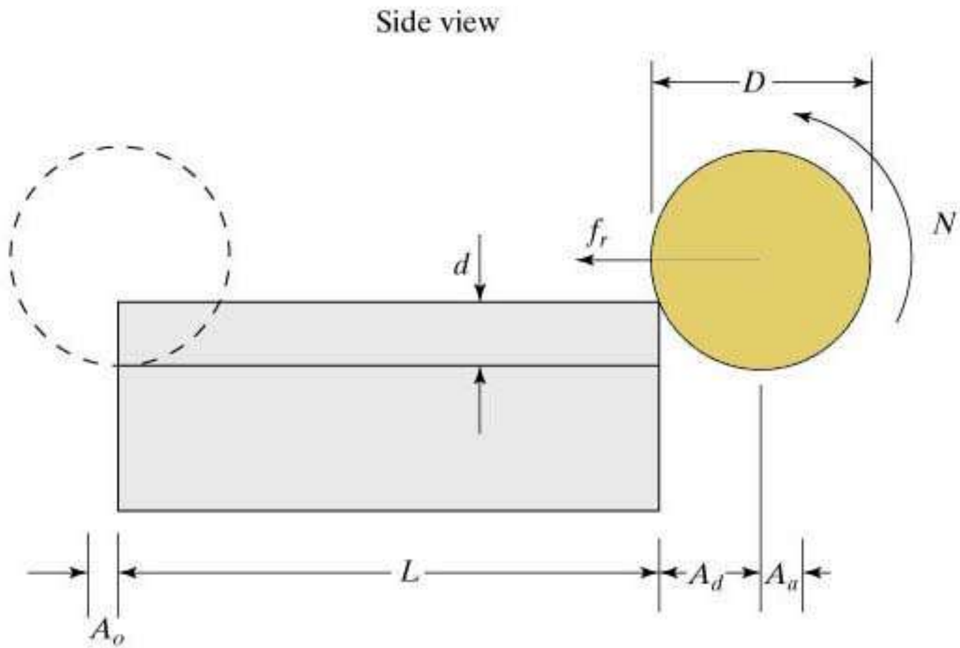
Milling Operation: Peripheral Milling



Milling Operation: Face Milling

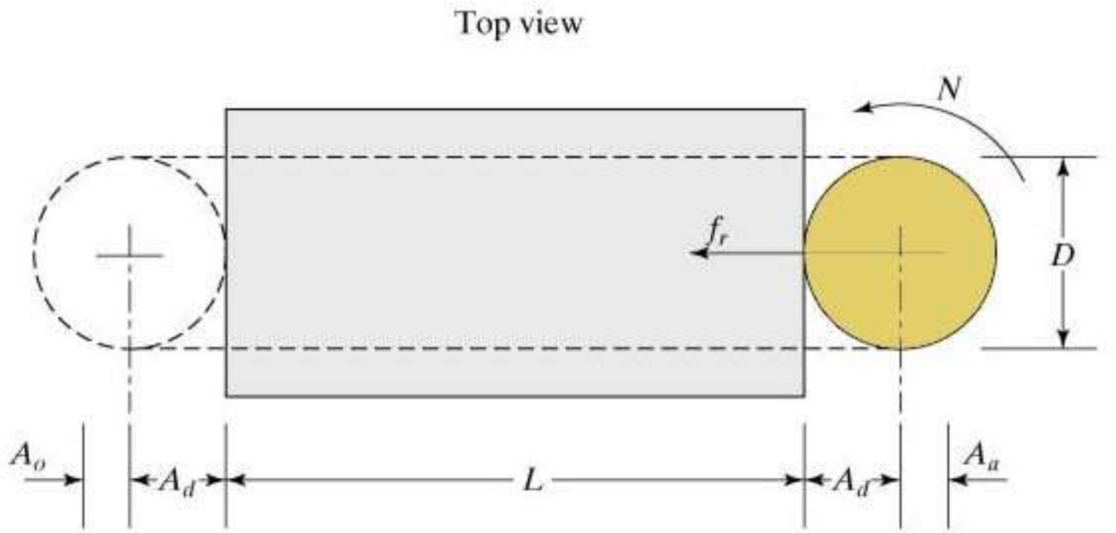


Peripheral Milling: Approach Distance



Key: D = cutter diameter, N = cutter rotational speed, f_r = feed rate,
L = workpiece length, d = depth of cut, A_d = distance to reach full depth,
A_a = approach allowance, and A_o = overtravel allowance.

Face Milling: Approach and Overtravel



Key: D = cutter diameter, N = cutter rotational speed, f_r = feed rate, L = workpiece length,
A_d = allowance distance to reach full diameter (equal to overtravel distance),
A_a = approach allowance, and A_o = overtravel allowance.

Calculation of Machining Times

- Basic approach to calculate machining times:
  - Determine the length of the cut

    L = mm or inch

    - Add allowances for approach and overtravel if applicable
  - Divide by feed rate, which is the travel speed of the cutting tool in the direction of the length

    f_r = mm/min or inch/min
- Thus, machining time $T_m = L/f_r$

SDS Advantages

- Increased productivity in setting standards
  - Associated costs savings
- Capability to set standards before production
- Avoids need for performance rating
  - Controversial step in direct time study
- Consistency in the standards
  - Based on averaging of much DTS data
- Inputs to other information systems
  - Product cost estimating, computer-assisted process planning, MRP

SDS Disadvantages and Limitations

- High investment cost
  - Developing a SDS requires considerable time and cost
- Source of data
  - Large file of previous DTS data must exist
- Methods descriptions
  - Documentation still required
- Risk of improper applications
  - Attempting to set standard for tasks not covered by SDS