TABLE 10.3 Micromotion Analysis Checklist for Possible Improvements

Therblig	Questions and Suggestions
Transport empty (TE)	Minimize number of parts in the product to reduce frequency of TE and TL.
	Minimize reach distance required.
	Use parts bins that have easy access.
	Can abrupt changes in direction of movement of body member be eliminated or minimized?
	Locate parts and tools used most frequently near their respective points of use.
	Minimize requirements for hand-eye coordination during reach.
	Can right and left hands be used simultaneously to accomplish two transport empty motions?
Grasp (G)	Use parts bins that have easy access.
	Use workholders that have fast release mechanism. For example, screw type vises are time consuming to operate, while pneumatic clamps are fast-acting.
	Locate parts and tools in known locations to save time in searching.
	Can right and left hands be used simultaneously to accomplish two grasp motions?
	Avoid transfer of objects from one hand to the other.
	Design parts that do not tangle.
Transport loaded (TL)	Can parts be slid across work surface rather than carried above work surface? This usually saves time.
	Can abrupt changes in direction of movement of body member be eliminated or minimized?
	Design parts and tools to be as lightweight as possible to save move time.
	Minimize number of parts in the product to reduce frequency of TE and TL.
	Minimize move distance required.
	Locate parts and tools used most frequently near their respective points of use.
	Minimize requirements for hand-eye coordination during movement.
	Can right and left hands be used simultaneously to accomplish two transport loaded motions?
Hold (H)	This is considered an ineffective therblig. Can it be eliminated?
	Can a workholding device (e.g., fixture, jig, vise, clamp) be used instead of holding by hand?
	Can friction, an adhesive, or a mechanical stop be used instead of holding by hand?
	If holding by hand cannot be eliminated, can an armrest be provided?
Release load (RL)	Is it possible to release the object by dropping it (e.g., into a chute)?
	Is the delivery point (e.g., bin, workholder) designed for ease of release of the object?
	Minimize requirements for hand-eye coordination during release.
Preposition (PP)	This is considered an ineffective therblig. Can it be eliminated?
	Can symmetry of prepositioning be increased? For example, it is easier to preposition a round shaft relative to a round hole than a square shaft relative to a square hole because of increased symmetry of the fit.
	Can a guide be designed to facilitate prepositioning?
	Can an armrest be used to steady the hand during prepositioning?
	Design parts and tools to be as lightweight as possible to save prepositioning time.
	Make sure object is grasped properly to facilitate prepositioning.
Position (P)	This is considered an ineffective therblig. Can it be eliminated?
	Can symmetry of positioning be increased? For example, it is easier to position a round shaft relative to a round hole than a square shaft relative to a square hole because of increased symmetry of the fit.
	Can a guide be designed to facilitate positioning?
	Can an armrest be used to steady the hand during positioning?
	Can tools be suspended from overhead to avoid positioning?
	Design parts and tools to be as lightweight as possible to save positioning time.
	Make sure object is grasped properly to facilitate positioning.
Use (U)	Can a more efficient hand tool be designed to reduce the time of the use motion?
	Can a portable power tool be devised to reduce the time of the use motion?

Therblig	Questions and Suggestions
	The part should be held in a workholder during the use motion.
	Can a jig be designed to guide the use of the tool? A ***jig*** is a special workholder that has a mechanism for guiding the tool.
	Can a mechanized or automated operation be used to eliminate the need for the use motion?
Assemble (A)	Can a hand tool be designed to reduce the time required for the assembly motion?
	Can a portable power tool be devised to reduce the time of the assembly motion?
	The base part or existing subassembly should be positioned in a workholder during the assembly motion.
	Can the product be designed with fewer components to minimize assembly time?
	Design the product for automated assembly to eliminate the need for manual assembly.
Disassemble (DA)	Can a hand tool be designed to reduce the time required for the disassembly motion?
	Can a portable power tool be devised to reduce the time required for the disassembly motion?
	The base part or existing subassembly should be positioned in a workholder during the disassembly motion.
Search (Sh)	This is considered an ineffective therblig. Can it be eliminated?
	Make sure lighting is adequate to facilitate searching.
	Can parts be fed from magazines or chutes to avoid searching?
	Locate tools in known positions in the workplace to facilitate searching; for example, suspend tools from overhead.
	Can different parts be made with different colors to facilitate searching?
Select (St)	This is considered an ineffective therblig. Can it be eliminated?
	Use parts bins that have easy access.
	Make sure lighting is adequate to facilitate selecting.
	Can parts be fed from magazines or chutes for one-at-a-time selection?
	Can different parts be made with different colors to facilitate searching?
Plan (Pn)	This is considered an ineffective therblig. Can it be eliminated?
	Remove the need for the worker to decide on a course of action that causes hesitation in the work cycle.
Inspect (I)	Make sure lighting is adequate to facilitate the inspection procedure.
	Minimize the number of characteristics to inspect. Only the key characteristics of the part should be inspected. Time should not be wasted inspecting unimportant characteristics.
	Can the object be inspected using gauges instead of actually measuring the characteristics of interest? Gauging takes less time than measuring.
	Can inspection be combined with another operation so it is not performed separately?
	Can inspection be automated (e.g., machine vision) to eliminate the need for a worker to accomplish it (e.g., visually)?
	Can multiple but separate inspection steps be combined into one inspection?
Unavoidable delay (UD)	This is considered an ineffective therblig. Can it be eliminated?
	Eliminate the reason for the delay. For example, can the machine speed be increased to reduce the machine cycle time?
	Can external work elements be made into internal work elements to fill up the delay time with useful work activities?
Avoidable delay (AD)	This is considered an ineffective therblig. Can it be eliminated?
	Eliminate the reason for the delay.
	Provide incentives for the worker to minimize delay time.
Rest (R)	Reduce metabolic load on worker through the use of machines and tools to minimize need for rest breaks.
	Improvements in methods and motions through analysis of previous therbligs should reduce need for rest breaks.