In Search of Lost Time

Given that its name is something of a tongue twister and sounds unusually extravagant, nonetheless, the Process Chart & Analysis Sheet is one of the most important basic tools for introducing and visualising standardised working processes and, in turn, the basic requirement for lean production.

Reiner Schloz, Nishiyama, Bernd Würsching

The men were concentrating on the task. After all, it was a matter of seconds. Their gaze wandered here and there: stopwatch, workplace, stopwatch. Nothing stood in the way of their search for lost time. No hand movement, no step, no glance, no judder of the machine. Record the time, make notes, with brief discussions in between. On the racecourse, striving to beat the record, it could scarcely be otherwise. Here, in the Production Department of the Japanese car component supplier—KSK—the competitive conditions were equally harsh: the aim was to achieve a new "fastest lap time".

In conjunction with the Japan seminar held by Porsche Consulting, colleagues of the Benteler Group had a tough nut to crack in the KSK workshops. Armed with the necessary information and after spending an hour on site observing and taking measurements, the production experts from Germany had to put forward proposals for optimising a Chaku-Chaku line on which an aluminium gearbox component was being produced. The objective was to improve the working procedures to such an extent that, in future, the required quantities could be manufactured by two operators instead of three, as was currently the case.

This is a popular exercise among masters of Kaizen. As a matter of course, anyone who gets their teeth into the rules and procedures of a Chaku-Chaku line has to grapple with the basic principles of lean production and the opportunities for steady improvements in small stages. The aim is the standardisation and visualisation of working procedures. This is achieved by using the Process Chart & Analysis Sheet utility, which provides a graphic representation of the perfect lean interaction of man and machine—a typical characteristic of a Chaku-Chaku line.

A Chaku-Chaku line (Japanese for "loaded, loaded") makes it possible to control different production processes in parallel and to convert the waiting times of operators into shorter walking distances and quality inspections. While a component is in production, the various ▸

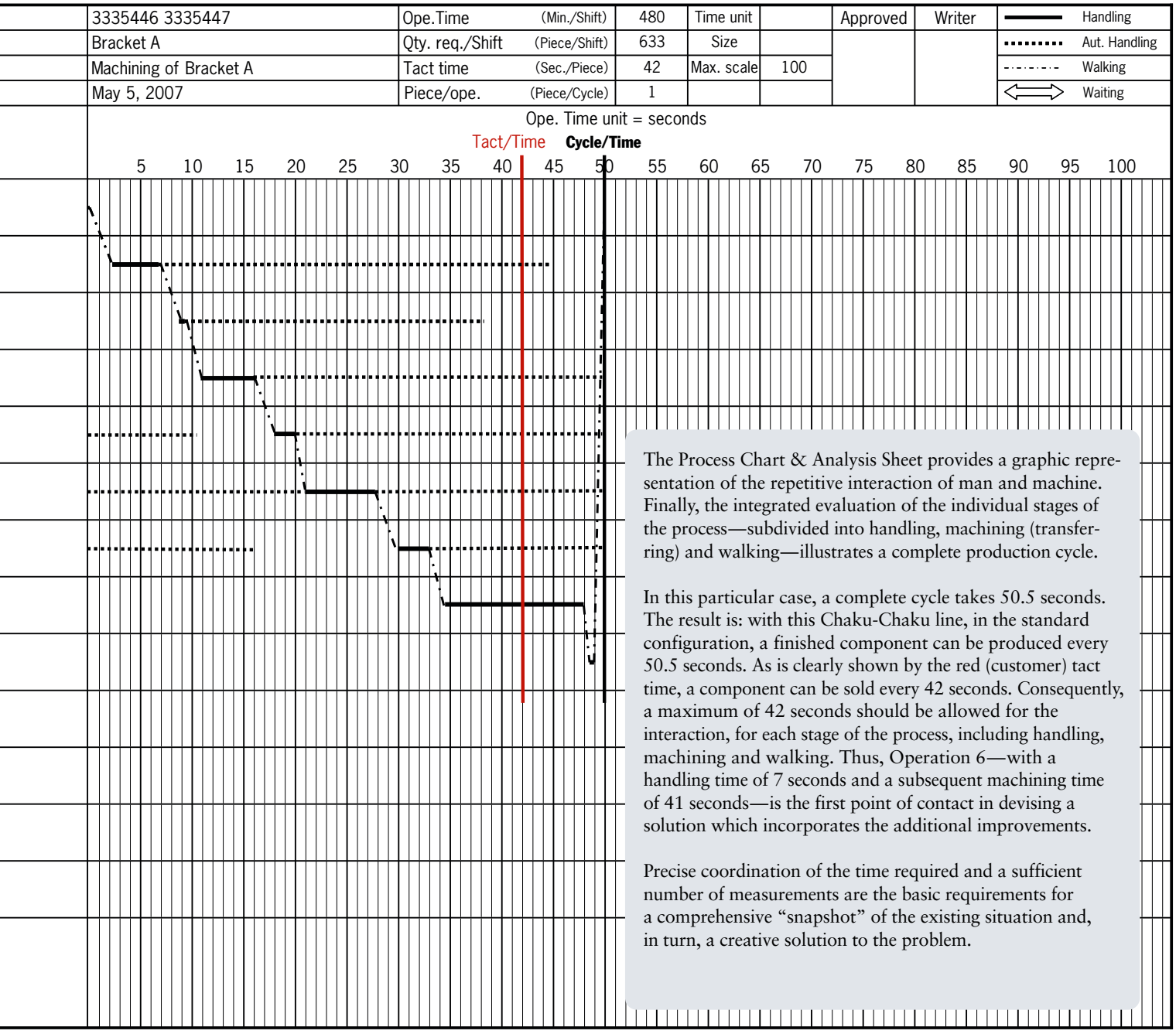
Man and machine in one line: work expressed in time (right) and in stages of the process (right, folded out)

machines used for machining, finishing or quality assurance in the production cycle are loaded and unloaded. The operator is responsible for transport, quality control and process control. During the production cycle, the basic principle of the Chaku-Chaku line is that "the machine has to wait, not the operator". The Process Chart & Analysis Sheet defines the production standard. In this way, problems and deviations can be quickly identified by the operator as well as by the observer. On a typical production line, the individual processes (lathing, drilling, milling or washing) are arranged in a logical sequence. The course of the production line runs in an anticlockwise direction—ideal for a right-handed operator.

A Chaku-Chaku line is more suitable for machining than a conventional general-purpose machine.

More expensive technologies demand a heavy workload on machinery, they are less flexible for variations in production volume and they cost more to maintain. With the simple Chaku-Chaku line, the required quantities can also be achieved by deploying operators in a more flexible manner. ▸

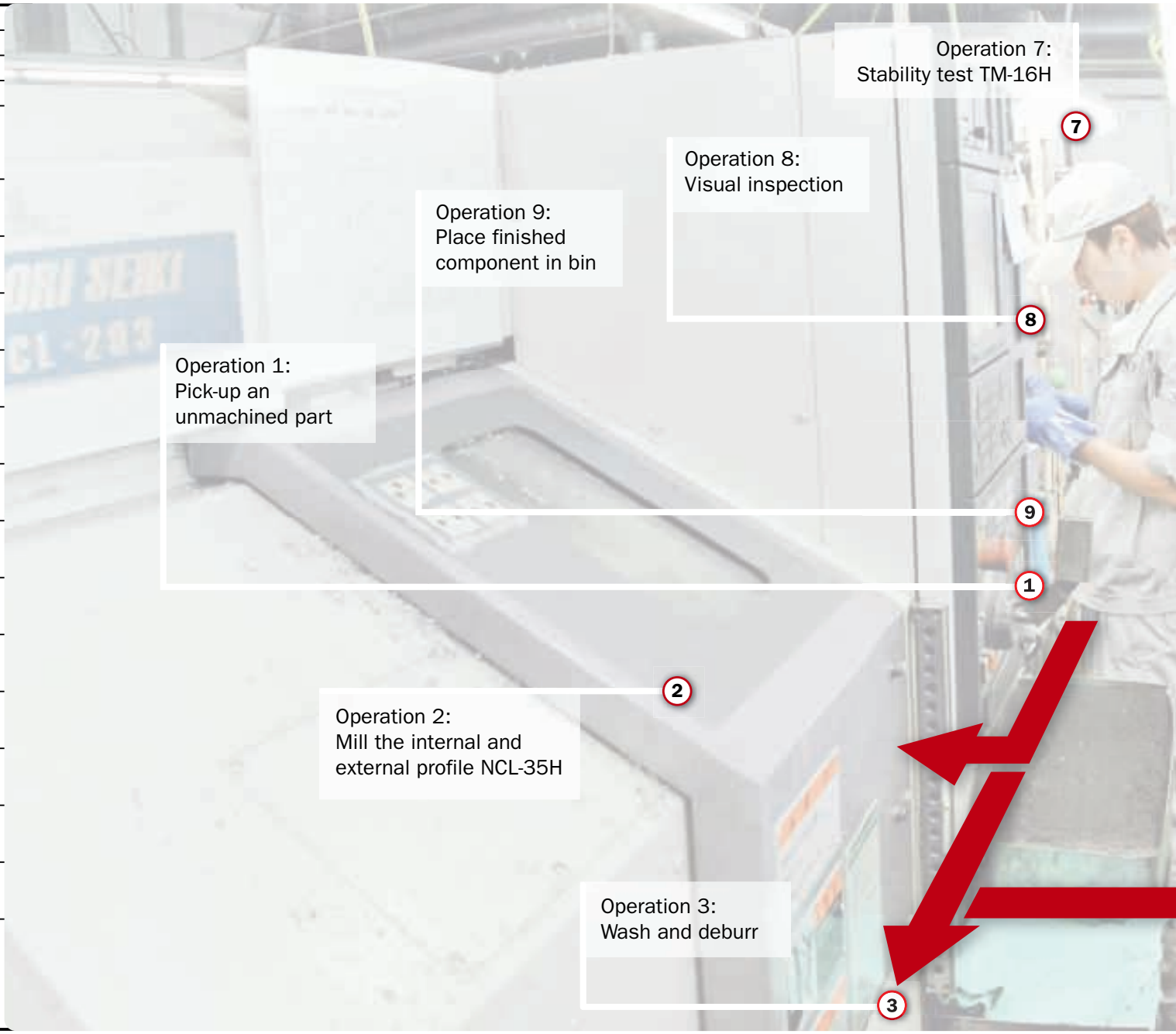
Process Chart & Analysis Sheet				Part Number	
				Part Name	
				Process	
0	0 : Regular operation 1 : Set-up change			Date	
Step #	Operation & order	Time; seconds			
		Hand-ling	Trans-ferring	Wal-king	Total
1	Pick-up a casted part	0,5		2,0	2,5
2	Cutting & setting by NCL-35H of inner & outer diameter	4,5	38,0	2,0	9
3	Intermediated washing, deburring on chukking face	0,5	29,0	1,5	11
4	Cutting & setting by NCL-36H of inner & outer diameter	5,0	34,0	2,0	18
5	Final washing by ABU-16H and setting	2,0	40,0	1,0	21
6	Leak-testing by LT-7H and setting	7,0	41,0	2,0	30
7	Waggle-checking by TM-16H	3,0	33,0	1,5	34,5
8	Visual appearance checking	14,0		0,5	49
9	Put a completed part into a container box	0,5		1,0	50,5
10	**Total**	**37,0**		**13,5**	**50,5**

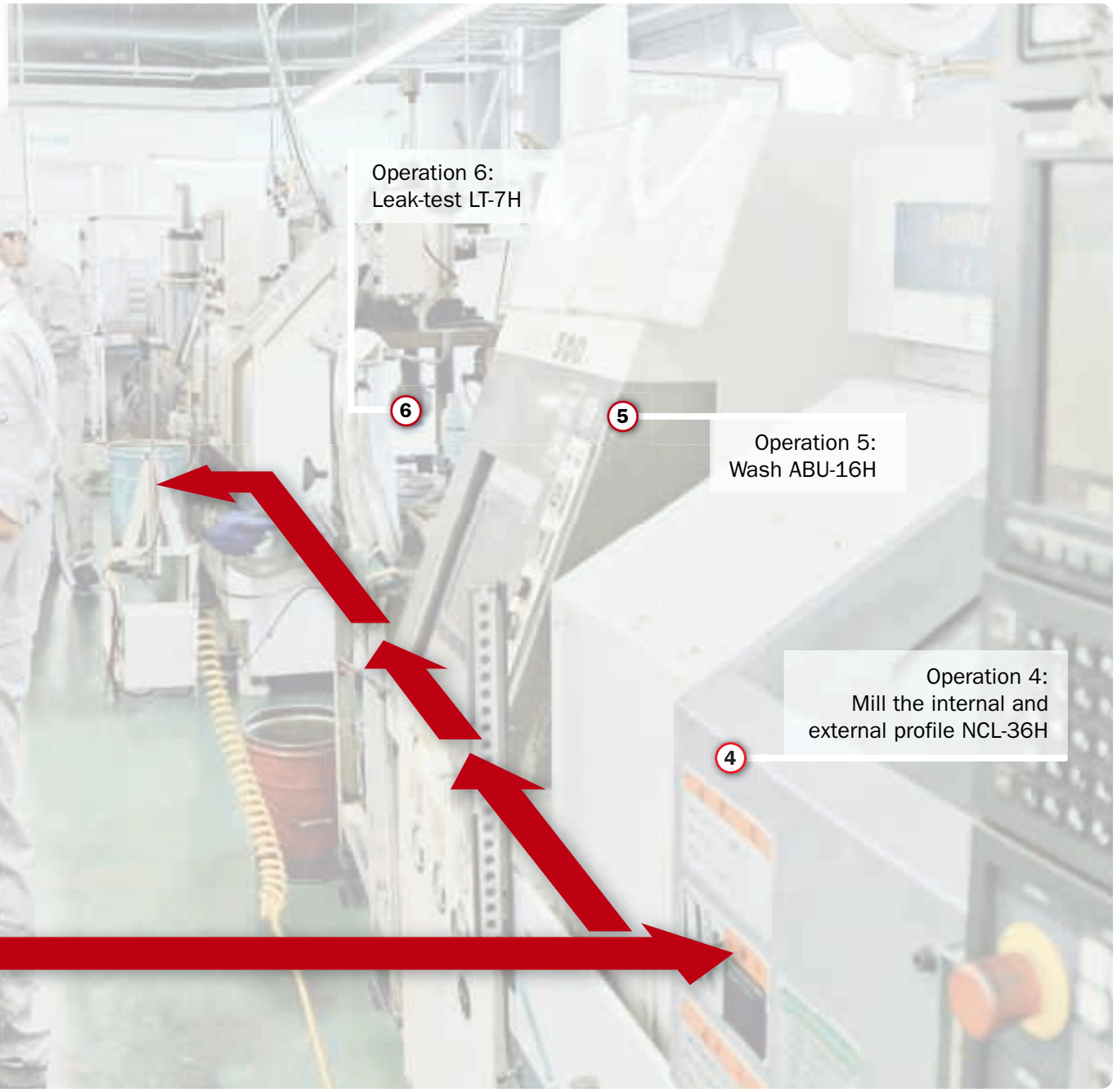


The Process Chart & Analysis Sheet provides a graphic representation of the repetitive interaction of man and machine. Finally, the integrated evaluation of the individual stages of the process—subdivided into handling, machining (transferring) and walking—illustrates a complete production cycle.

In this particular case, a complete cycle takes 50.5 seconds. The result is: with this Chaku-Chaku line, in the standard configuration, a finished component can be produced every 50.5 seconds. As is clearly shown by the red (customer) tact time, a component can be sold every 42 seconds. Consequently, a maximum of 42 seconds should be allowed for the interaction, for each stage of the process, including handling, machining and walking. Thus, Operation 6—with a handling time of 7 seconds and a subsequent machining time of 41 seconds—is the first point of contact in devising a solution which incorporates the additional improvements.

Precise coordination of the time required and a sufficient number of measurements are the basic requirements for a comprehensive “snapshot” of the existing situation and, in turn, a creative solution to the problem.


Operation 7:
Stability test TM-16H
7
Operation 8:
Visual inspection
8
Operation 9:
Place finished
component in bin
9
Operation 1:
Pick-up an
unmachined part
1
2
Operation 2:
Mill the internal and
external profile NCL-35H
Operation 3:
Wash and deburr
3


Operation 6:
Leak-test LT-7H
6
5
Operation 5:
Wash ABU-16H
Operation 4:
Mill the internal and
external profile NCL-36H
4

Seconds cycle: Using a stopwatch on the line

In order to be able to identify the existing situation, all the relevant data and facts are entered onto the Process Chart & Analysis Sheet. This starts with the architecture of the line. In the case of KSK, this signifies nine process stages. Three machines lathed and washed the component, the operator was responsible for quality control and loading and unloading the machine, pushing the Nagara Switch, walking distances and waiting times.

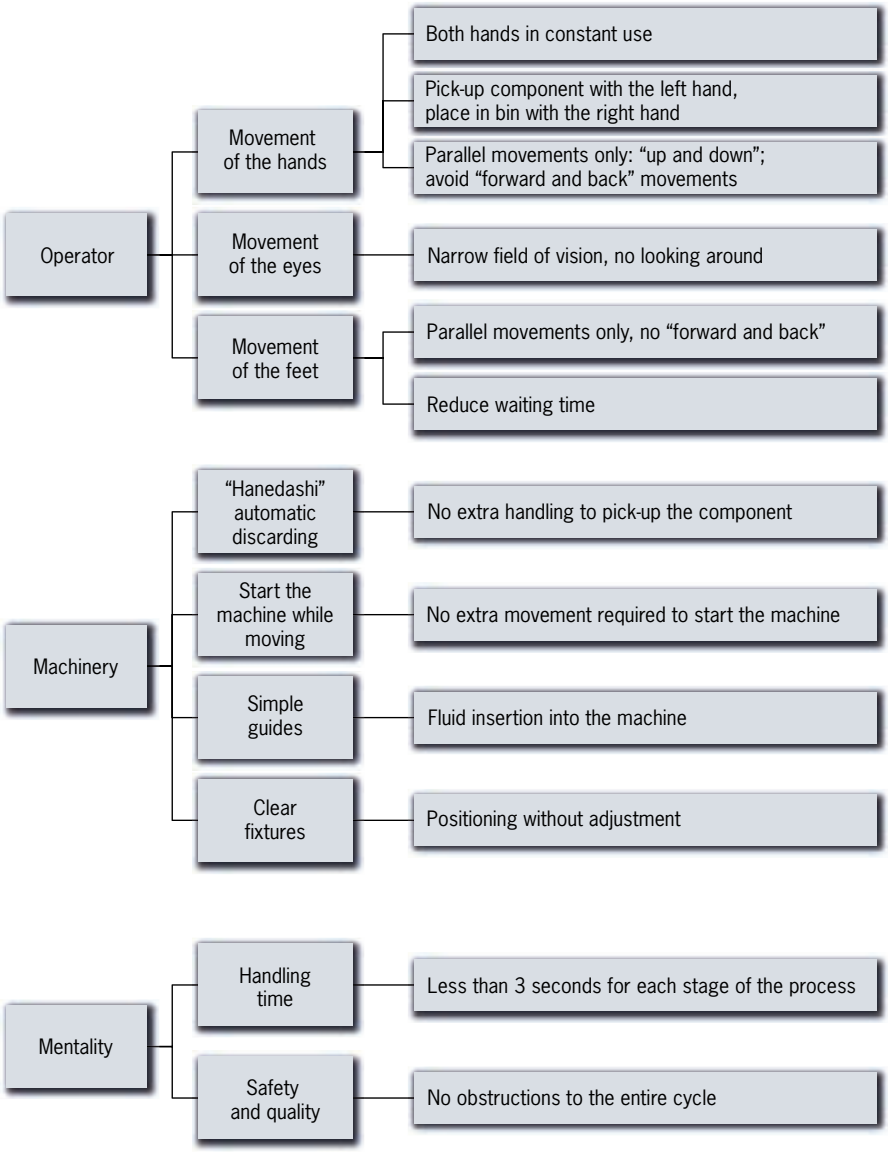
In the Process Chart & Analysis Sheet, all the stages are then itemised in the sequence of the production cycle. The visitors from Germany measured each process several times, using a stopwatch, and entered the times in the table. In this way, the production sequence can be visualised in cycles of seconds, subdivided into the categories of walking time, machining time, handling time and waiting time.

Now, it might be thought that a production expert would have no difficulty in making noticeable improvements to the cycle times by accelerating the individual stages (by speeding up the time taken to open and close the machine, for example). However, it is not quite that simple. Bernd Würsching, of Porsche Consulting, says: "It is often the case with these exercises that there is too much emphasis on the technicalities, overlooking the fact that the time saved at a particular stage does not necessarily affect the complete cycle. It is always important to consider the entire production process for the component." The interaction of man and machine is directed towards the customer cycle: based on the requirement, how many seconds should elapse during which a finished component is produced every time?

Thus, with KSK too, after evaluation of the Process Chart & Analysis Sheet, much discussion took place and many calculations were made. Finally, however, the proposals by the German visitors were implemented by the Japanese overnight, the production cycles were comprehensively modified, machines were repositioned and new job instructions were issued—with the desired result. In future, the required quantities can be achieved with two instead of three operators. "The fundamental criteria for such results," says Bernd Würsching, emphasising the importance of this exercise, "are standardised working procedures. Only if something consistently operates in the same way is it possible to make comparisons and introduce improvements."

Based on the principles of lean management, this rule applies well beyond the production process and, in essence, in all areas of the company, right up to managerial level. In the final analysis, in one way or another everyone is searching for lost time every day. ◂

Rules governing the structure of a Chaku-Chaku line*



The structure of a Chaku-Chaku line is based on simple principles. For many years, Porsche Consulting has been conducting a lively exchange with experts from Keihin Seimitsu Kogyo Ltd. concerning the structure and operation of Chaku-Chaku lines. Regardless of the product and the machines deployed for the purpose, it is essential that these rules should be followed from the initial design stage of such a line. The Process Chart & Analysis Sheet can be deployed in the early process definition phase in order to verify the viability and quality of the line. **Source: Keihin Seimitsu Kogyo Ltd.*