Chapter 17
Further Practical Study of the Kanban System

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CONTENTS

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- If the assembly line stops frequently, parts withdrawal will be made according to a *constant-quantity and inconstant-cycle* system.

- If production in a subsequent process is not necessarily smoothed, and the preceding process is producing in small lots, how to make the production order?

- Look at a gear-grinding line as an example.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- At the starting point of the line, production kanban posts are equipped for every part to be processed.

  - White
  - Green
  - Yellow

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

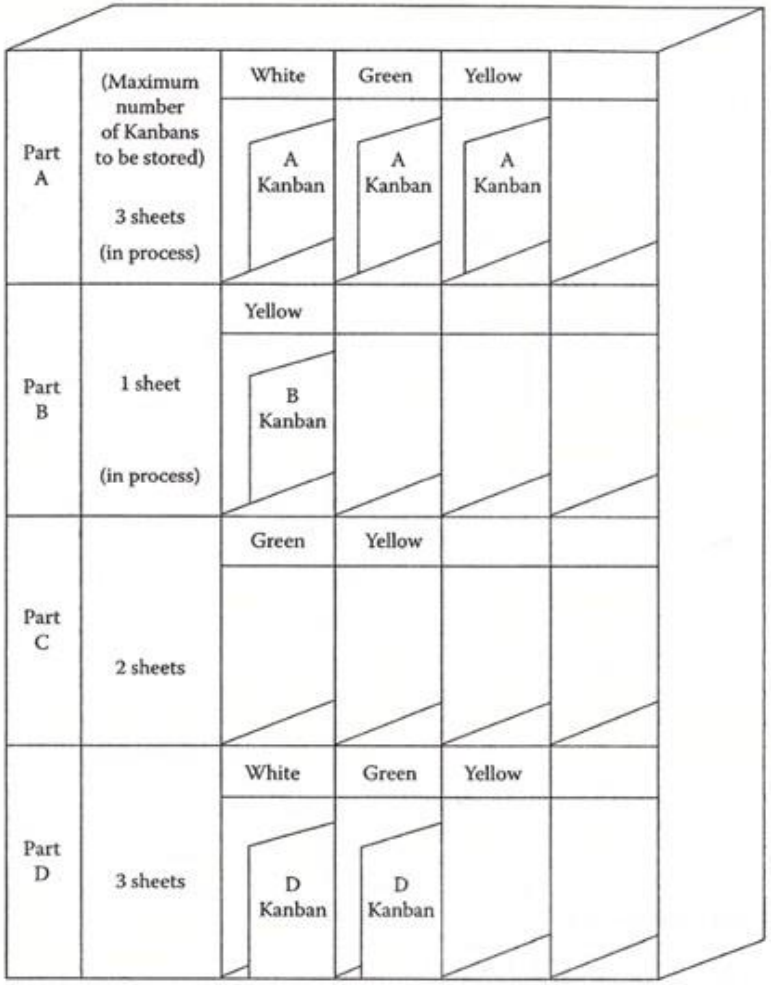


FIGURE 17.1
Production-ordering kanban post.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- When kanbans are stocked in the white or green frames, production of these parts need not be started yet.

- If the kanban is put into a yellow frame, production should begin.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- Lead time of the production kanban.

  - The interval between the time when the production-ordering kanbans were detached at the process and the time when the same process can replenish these parts to the storage.

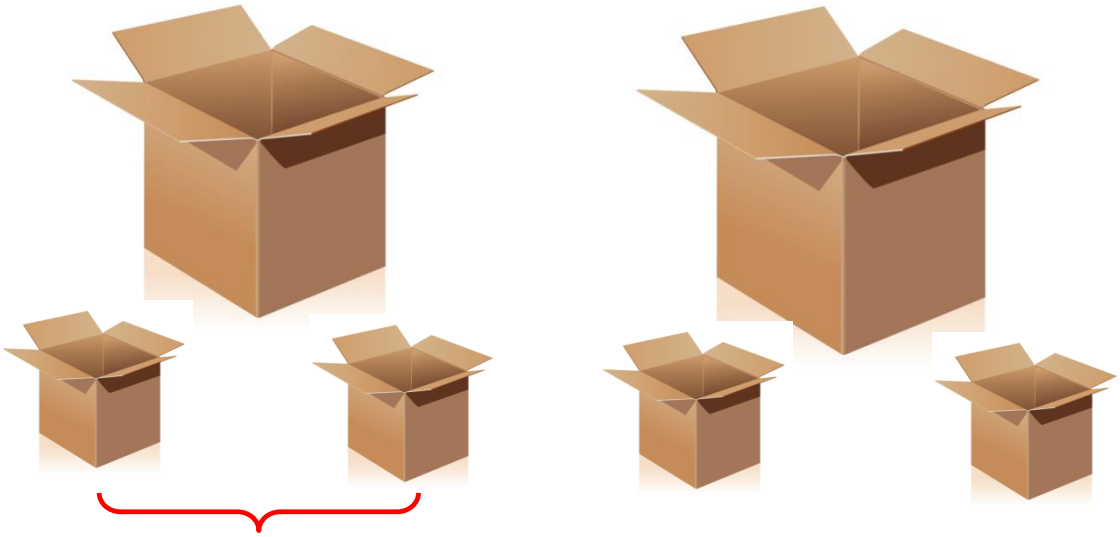
- The sum of the lot sizes specified in production kanbans is equivalent to the parts usage quantity of the subsequent process during the lead time of the production kanban.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- In a two-bin system, two large boxes of inventory are used.
- When one box of inventory goes out of stock, the inventory of the other box will be used.
- The empty box will trigger an order for one box.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- If we reduce the capacity of each box to half and increase the number of boxes in the subsequent process to four.



Correspond to the two production kanbans to be kept as maximum in the production kanban post of the preceding process.

17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- In general, an acceptable number of kanbans stocked in the production-ordering post is determined by the daily average figure derived from the monthly production quantity.

- This number depends on the turnover time.

- At Toyota, this number usually ranges from one to three kanbans.

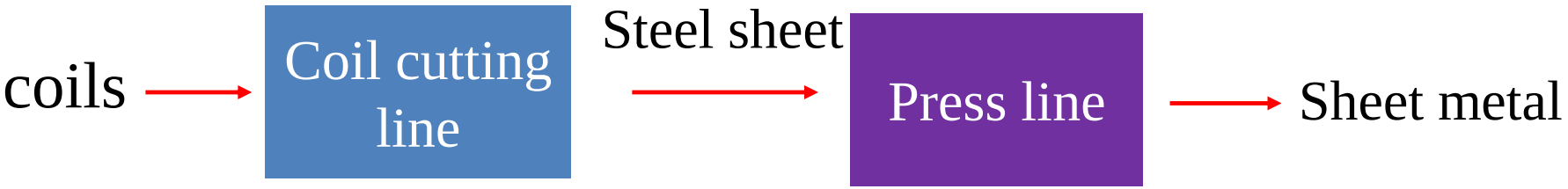
17.1 MAXIMUM NUMBER OF PRODUCTION KANBANS TO BE STORED

- The progress on each process can be detected by the kanban system.
- If kanbans are not smoothly stocked, production is delayed in the subsequent process.
- If kanbans are stocked earlier than scheduled, the subsequent process is proceeding too fast.

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- Look at an example.

- A cutting line for coils and a press line



17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- For lot production, a signal Kanban is used.

Material-Requisition Kanban

Preceding Process	Store 25 → Press #10		Subsequent Process
Back No.	MA36	Item Name	Steel Board
Material Size	40 × 3' × 5'	Container Capacity	100
Lot Size	500	No. of Container	5

Triangular Kanban

Lot Size 500	Part Name Left Door	Reorder Point 200
Pallet No. 5	Part No. 5DS-11	Pallet No. 2
	Store 15-03	
	Machine for Use Press #10	

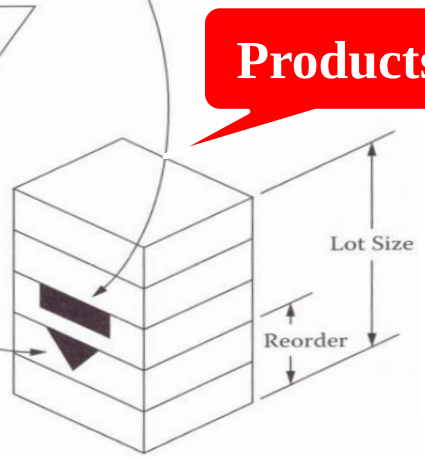
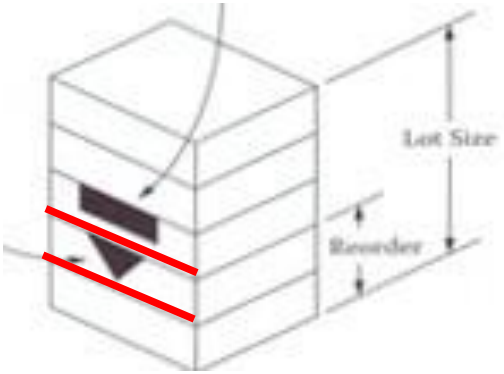


FIGURE 3.6
Signal kanban.

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- When the pallets have been used down to the material requisition kanban, this kanban is removed.

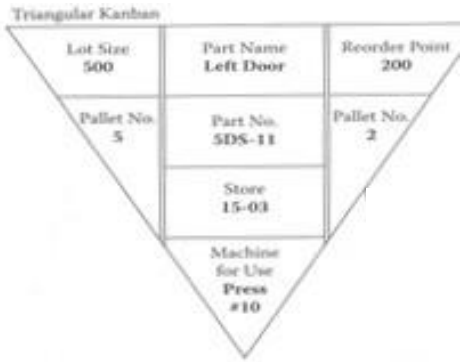
- When the pallets have been used down to the triangular kanban, this kanban is removed.



17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- The removed triangular kanban will be hung on a kanban post on the way to the press line.

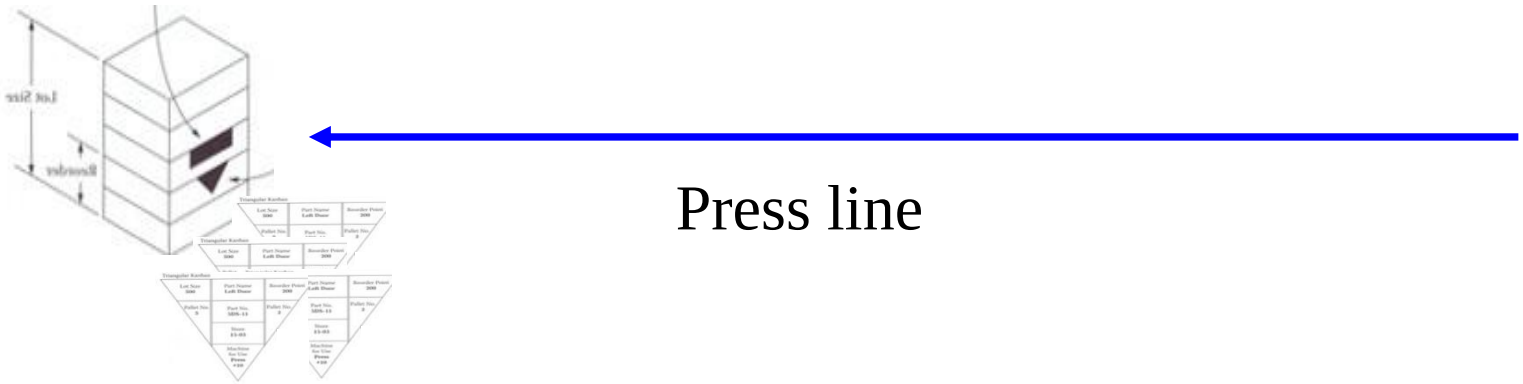
- Triangular kanbans are collected from the post twice a day (9 a.m. and 4 p.m.) and hung on a production-ordering post at the start of the press line.



17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- Why we need to collect the kanbans and move them to the starting point of the line in group?

- Because the line is too long, it is not efficient to move each kanban individually.



17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- A roulette is used for processing press parts that have relatively small consumption quantities.

  - Some parts' usage quantities are smaller than the pallet size.

- If the pallet size cannot be reduced, we need to use the roulette.

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- Suppose a pallet contains 60 pieces of a particular part and the consumption of the part per shift is 10.

  - One pallets can contain the part for 6 shifts.

- The necessary quantity for one shift is only one-sixth of the entire pallet.

Standard pallet quantity = 1/6 = 0.17 ≈ 0.2

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

- Therefore, a triangular kanban is put in area five of the roulette.

- For this part, production should not be started immediately even when the triangular kanban is put in its hangar.

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

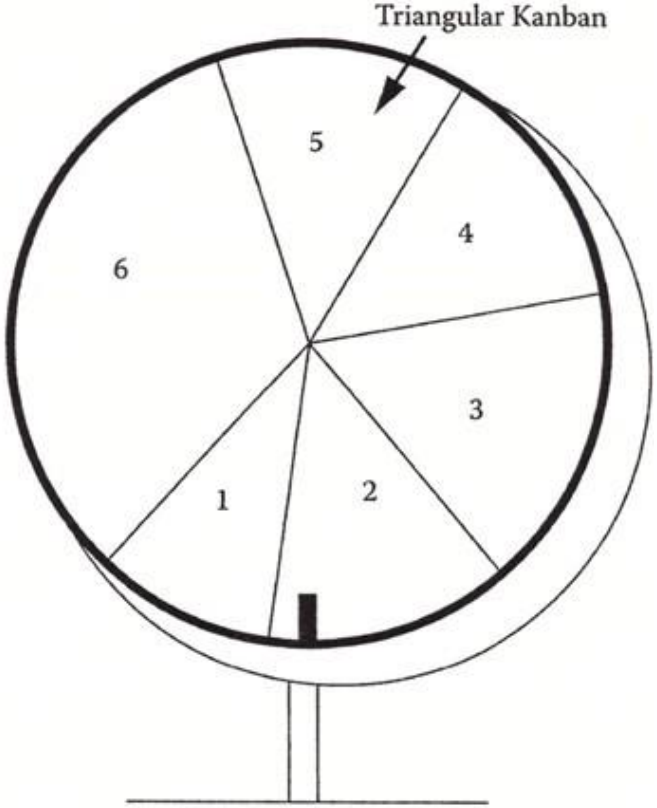


FIGURE 17.3
Roulette. (The roulette is rotated clockwise one block for each shift. In this example, when block 5 gets to the place now occupied by block 2, a triangular kanban is put into the production ordering post.)

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

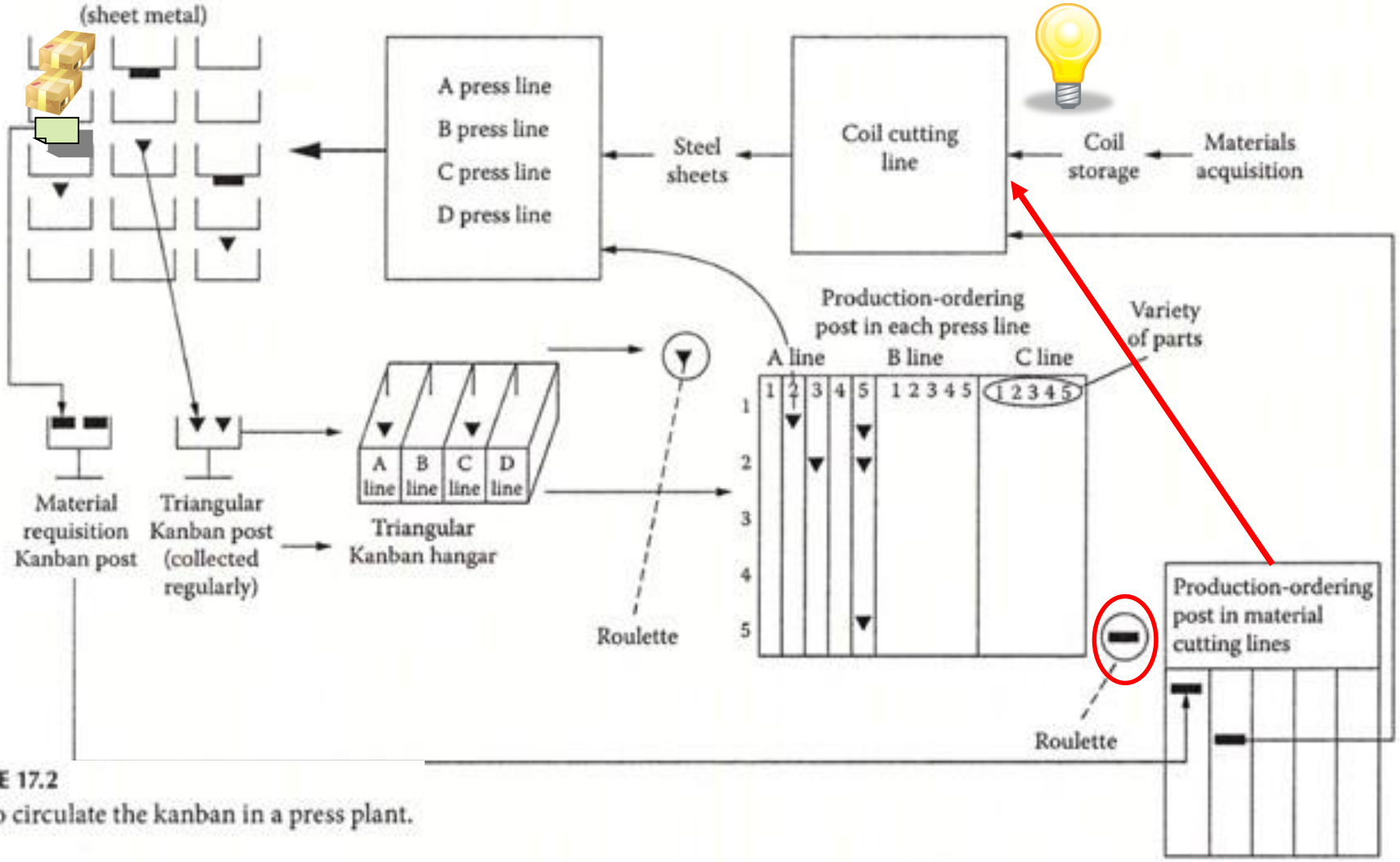


FIGURE 17.2
How to circulate the kanban in a press plant.

17.2 TRIANGULAR KANBAN AND MATERIAL REQUISITION KANBAN ON A PRESS LINE

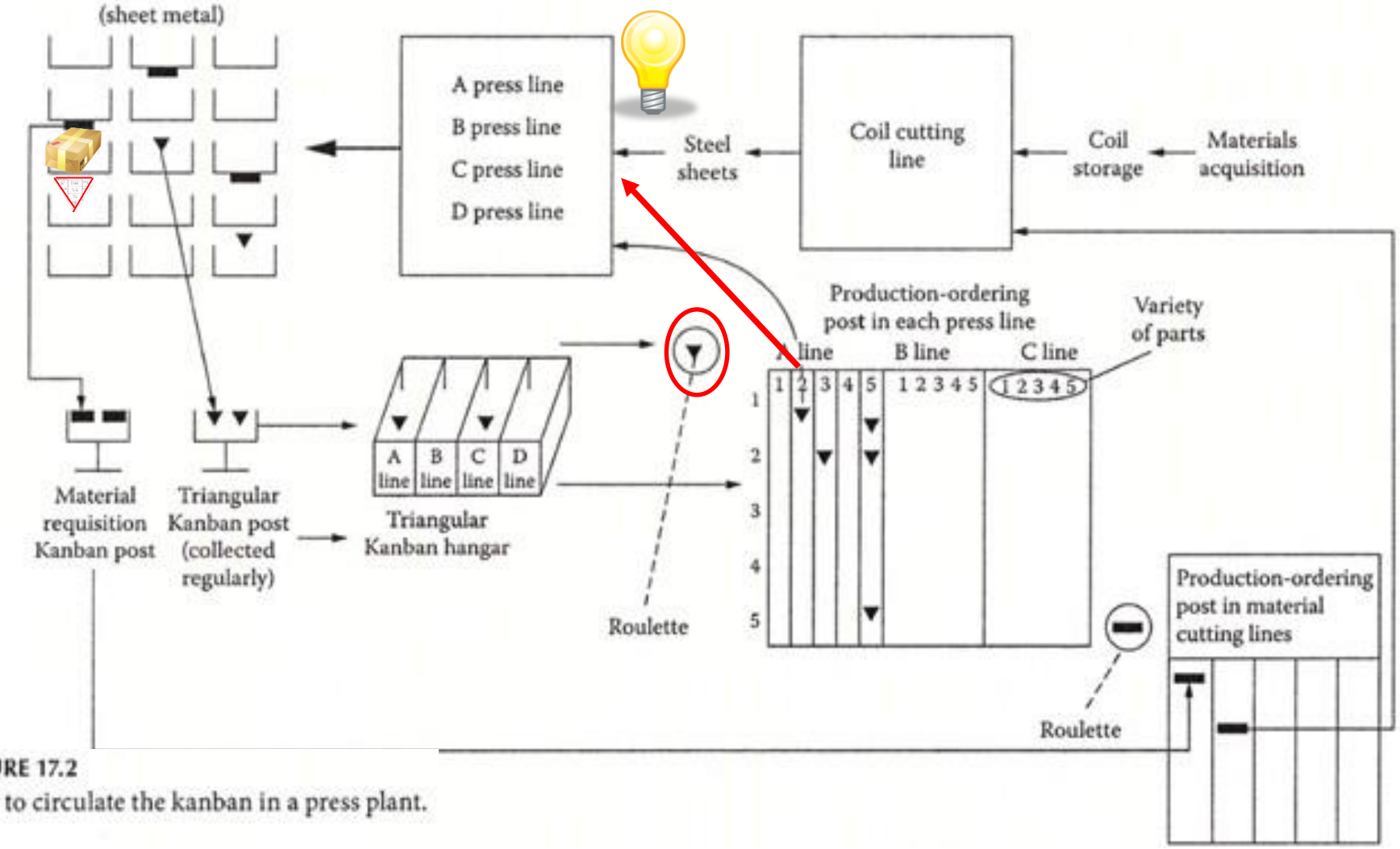


FIGURE 17.2
How to circulate the kanban in a press plant.

17.3 CONTROL OF TOOLS AND JIGS THROUGH THE KANBAN SYSTEM

- Machining tools, such as various cutting bits or drills, have to be replaced regularly.

- To control tool replenishment under the kanban system, toolboxes containing replenishment tools are kept beside the line.

  - A tool setter
  - A tool order kanban (a type of triangular kanban)

17.3 CONTROL OF TOOLS AND JIGS THROUGH THE KANBAN SYSTEM

FIGURE 17.4
Tool-order kanban.

Tool-order Kanban	
Item name code	T-3905
Reorder point	6 units
Lot-size (order-quantity)	10 units

- The reorder point is examined monthly by reviewing consumption quantities over the previous two months.

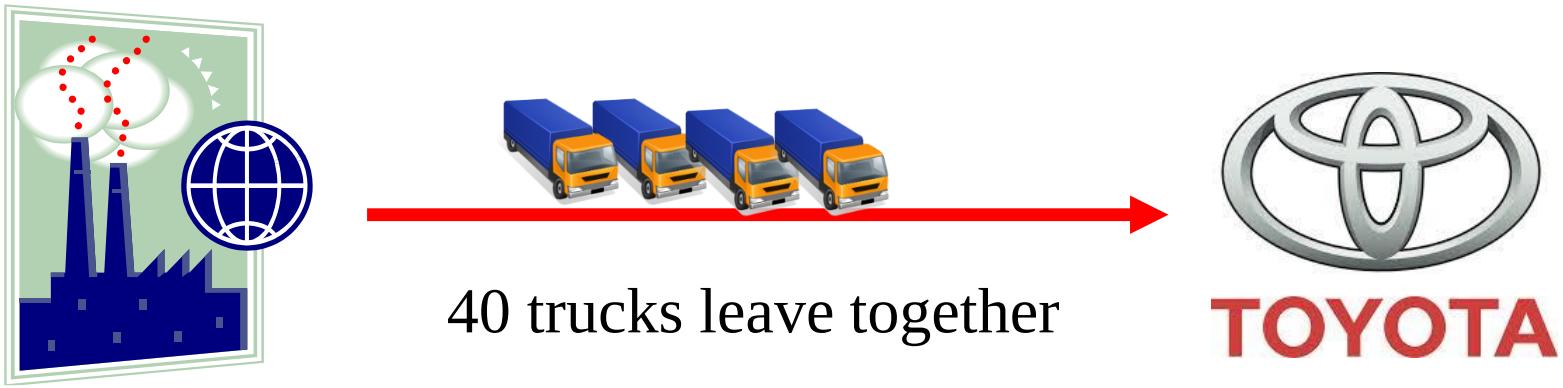
17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- There has been growing criticism of JIT, accusing it of being the cause of physical distribution problems.
  - Increased transportation cost
  - A shortage of drivers
  - Traffic congestion
  - Exhaust gases and pollution

17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- Suppose that a supplier delivers parts to Toyota 20 times per day with the kanban system.

- If the total quantity of parts is equal to 40 truckloads and all deliveries are done once in the morning, 40 trucks are required every morning.



17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- If two trucks deliver the parts 20 times per day,
  - Transportation cost remains.
  - Less drivers are required.
  - Traffic congestion is relieved.
  - Volume of exhaust gas remains.

17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- The application of JIT delivery system requires several conditions.

- The first condition is smoothing.
  - Calculate the average daily sales volume for each month.
  - Produce the average daily sales volume every day.
  - Suppliers use frequent small lot deliveries every day.

17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- The second condition is that trucks must always be fully loaded.

- Use the mixed loading method of various small lot items to achieve full loading efficiency for each truck.

- Toyota develops standardized polyethylene containers of various sizes.

17.4 JIT DELIVERY SYSTEM CAN EASE TRAFFIC CONGESTION AND THE LABOR SHORTAGE

- The third condition is that there must be leeway in the scheduled times that trucks arrive at their destinations.

- If truckers use a schedule without any flexibility

  - Truckers may wait on the highway to use up excess time.

  - Truckers may drive aimlessly around the destination to kill time.