Mould Temperature Control system

(M T C)

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Topics MTC system

1. Purpose of development
2. Hardware and installation
3. Software and algorithm
4. Result of automatic temperature control
5. Current installation and operation

Purpose of development

Stable and high quality production

Process automation

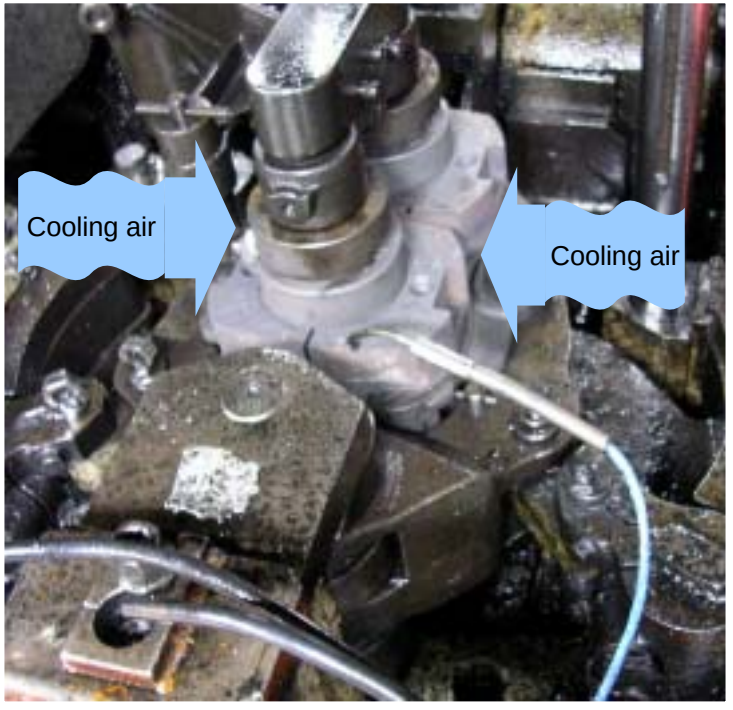
Light weight production

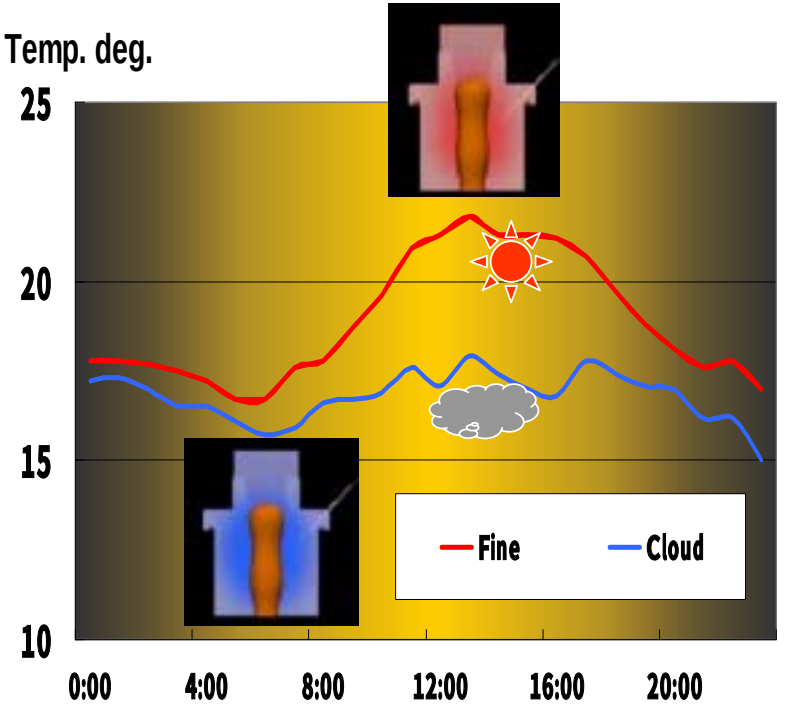
by eliminating temperature deviation

from blank mould.

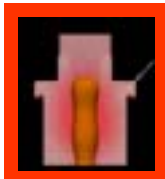
Why we need automatic control ?

Temperature of cooling air changes from night and day or by weather of the day. It is not possible to keep constant blank temperature by fixed cooling time.





Typical defects by blank temperature



High blank temperature

Glass distribution

Thick bottom

Thin shoulder

Low blank temperature

Glass distribution

Thin bottom

Thick shoulder

Temperature variation with manually control

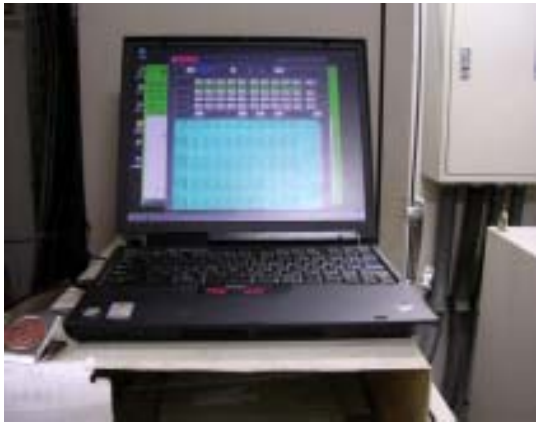
With manual control ±10 deg.

With MTC control ±2 deg. is possible

MTC hardware

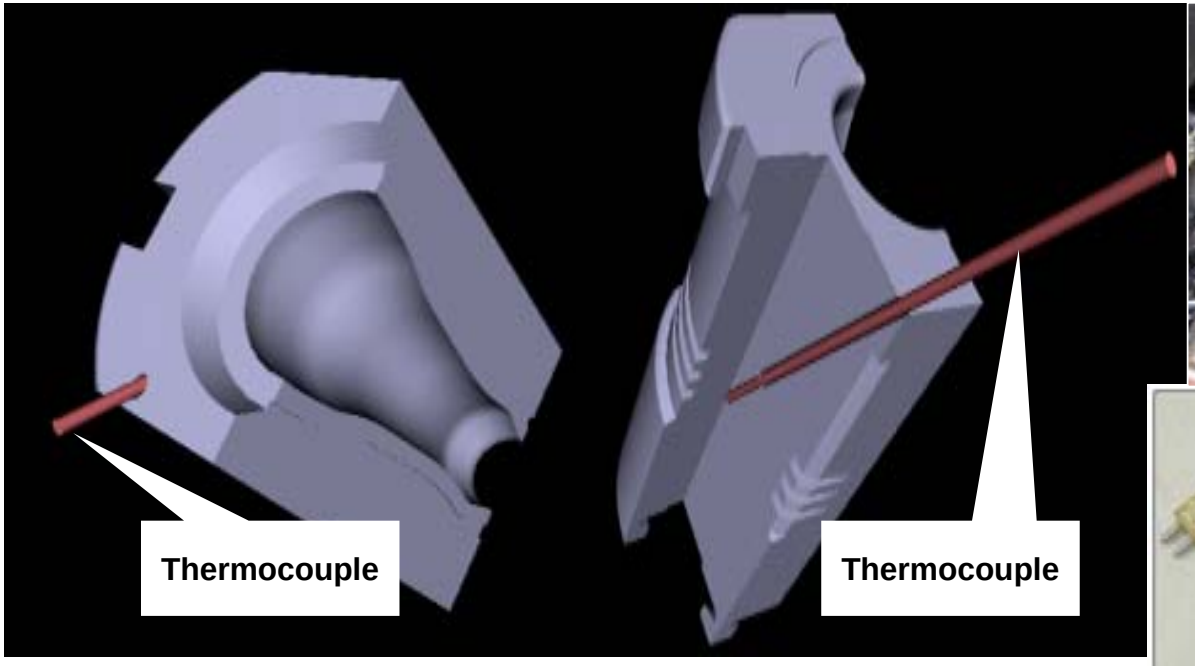
Control panel

Operation terminal



Indicator

Thermocouple insertion



Thermocouple measures blank temperature at all time during production.

MTC control system

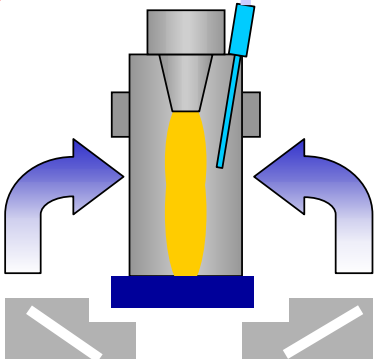
Operation terminal

Serial communication

Serial communication

Indicating panel
438 deg.

difference
8 deg.

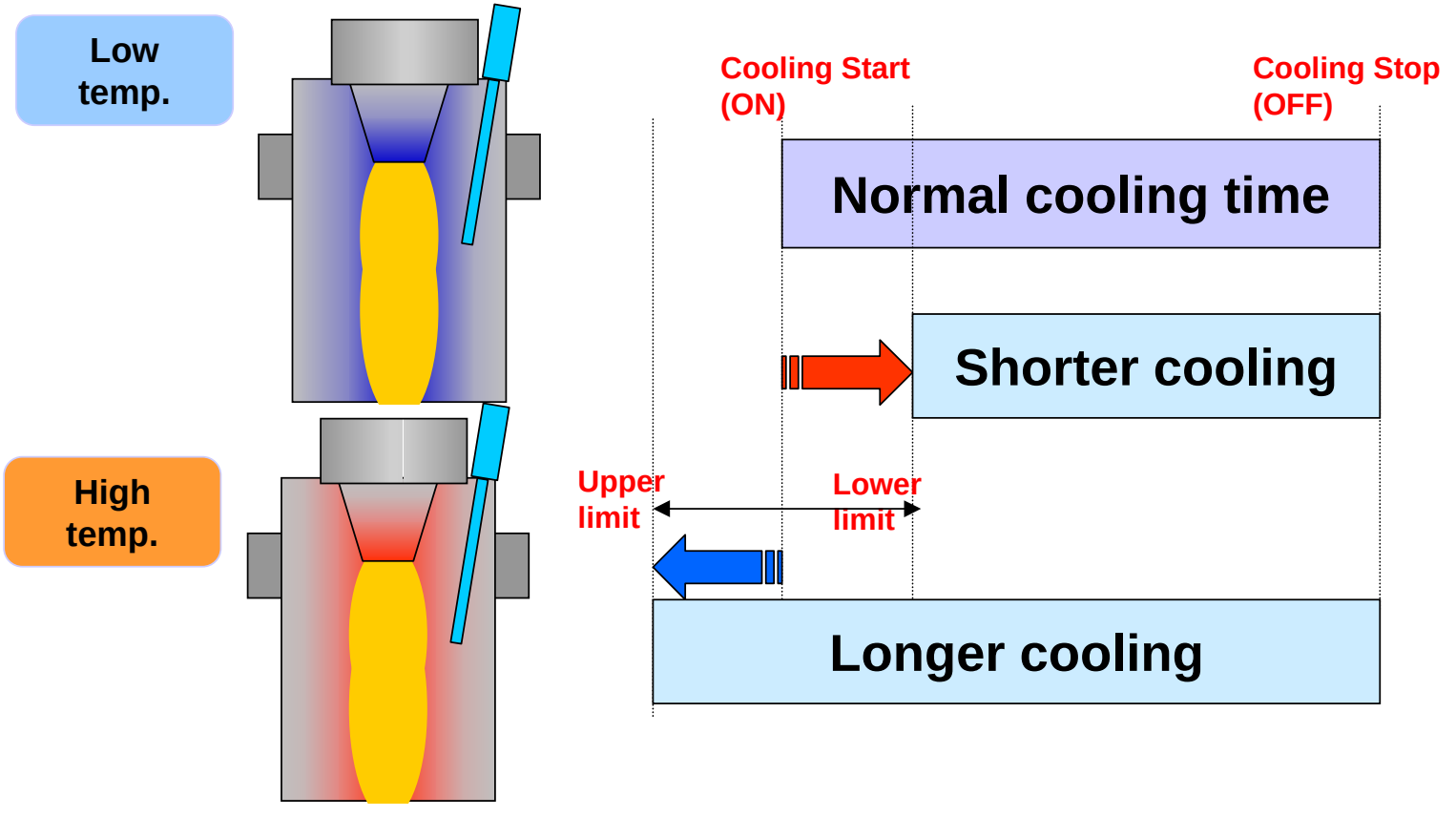


ET solenoid output of Cooling event

MTC controller modifies cooling time

Modified solenoid output for cooling damper

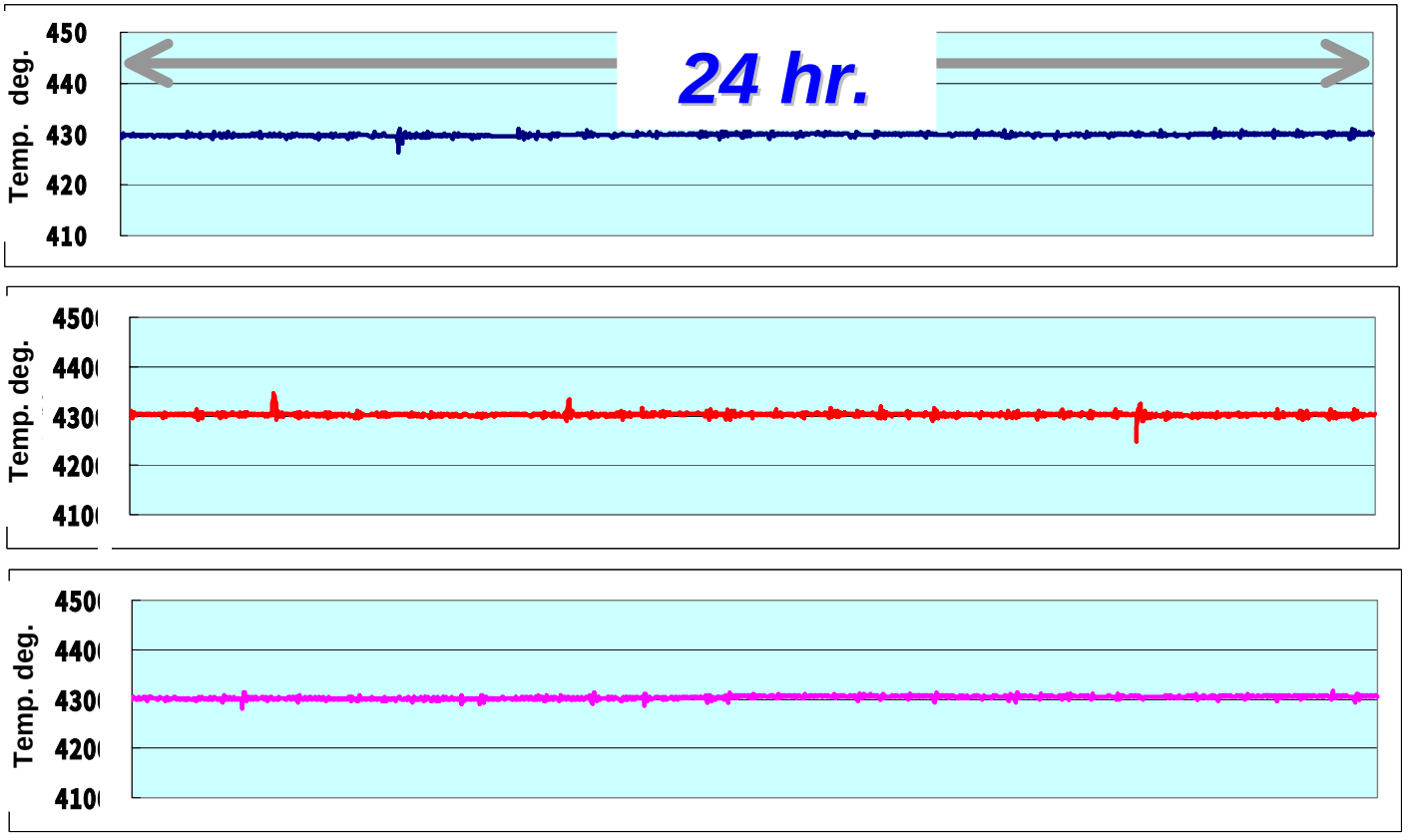
Control algorithm



To maintain constant blank temperature, MTC modifies cooling time comparing measured temperature and set point.

Results of automatic temperature control

Temperature is kept within 430 +/- 2 degree C



Benefits of MTC system

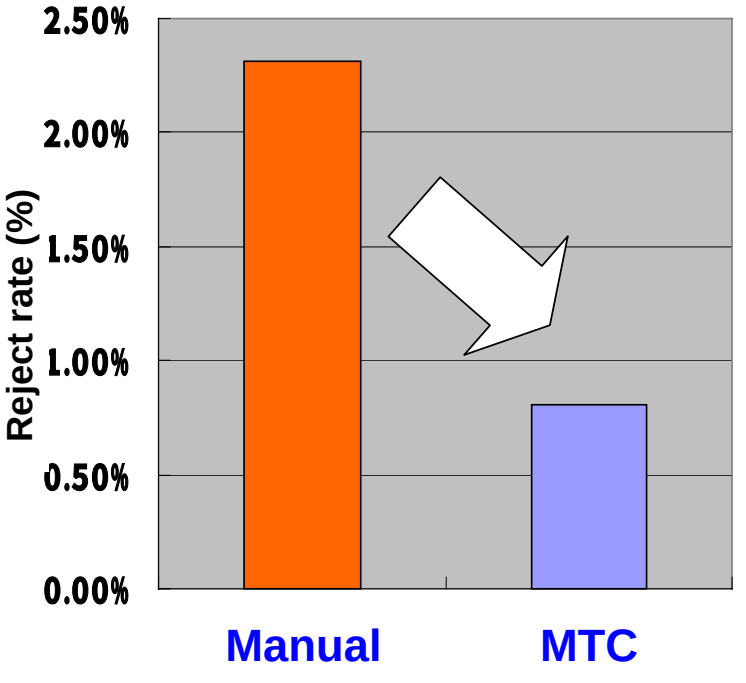
- Good glass distribution
- Increase in percent pack
- Decrease of appearance defects
- Decrease in dimensional defect
- Faster pick-up time after job change
- Reduction in forming work

Benefits of MTC system

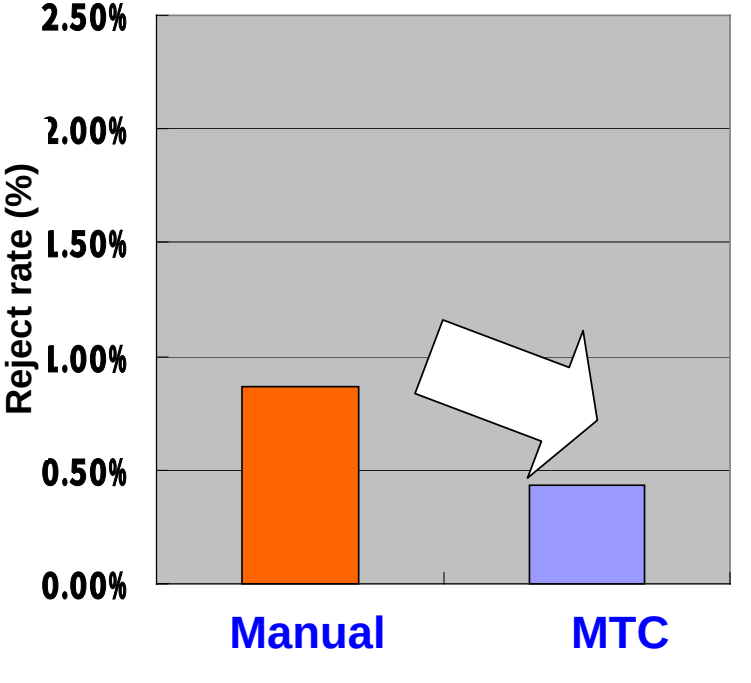
Decrease of wall thickness reject

900 ml, 305g, L = 0.69, Light weight bottle NNPB, design thickness 1.7mm

Manual vs MTC (UCP)



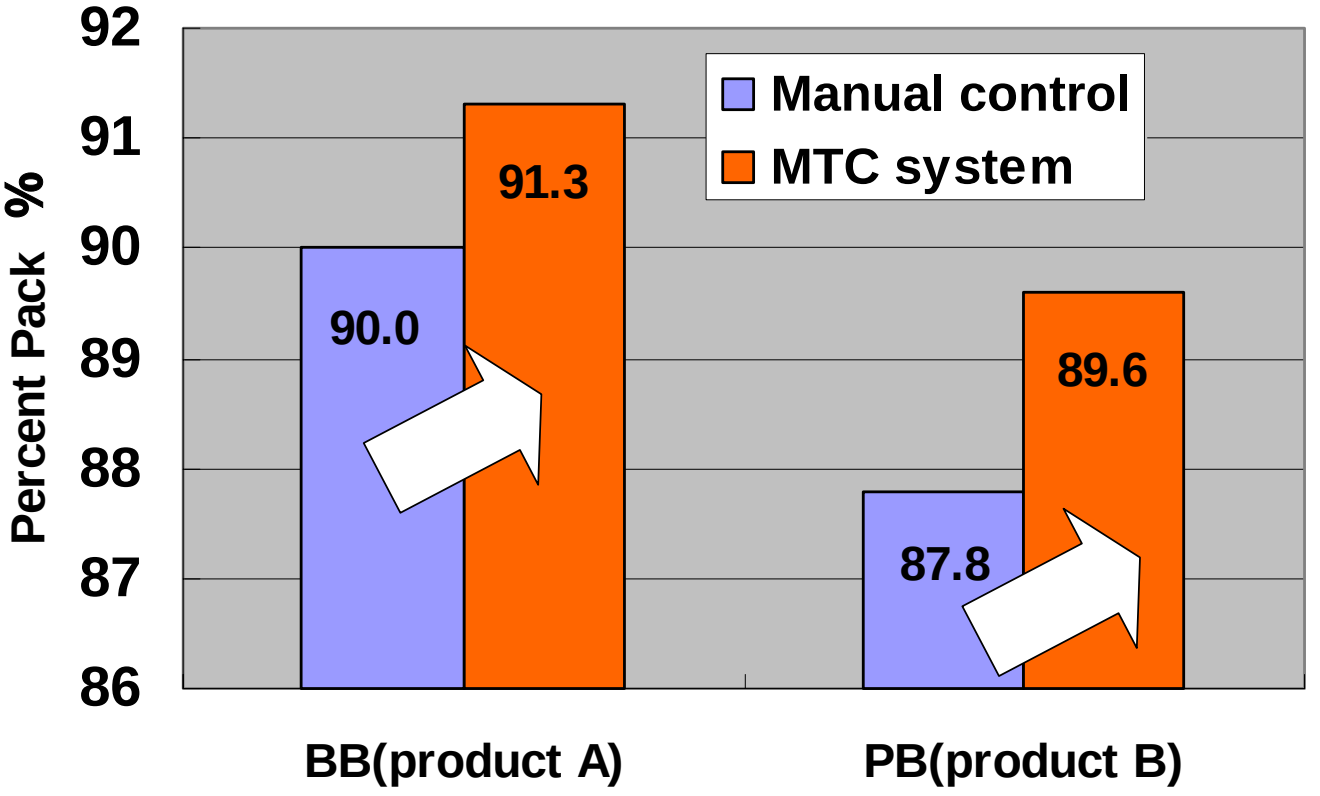
Manual vs MTC (LCP)



n = 32000 bottles (Manual, Auto)

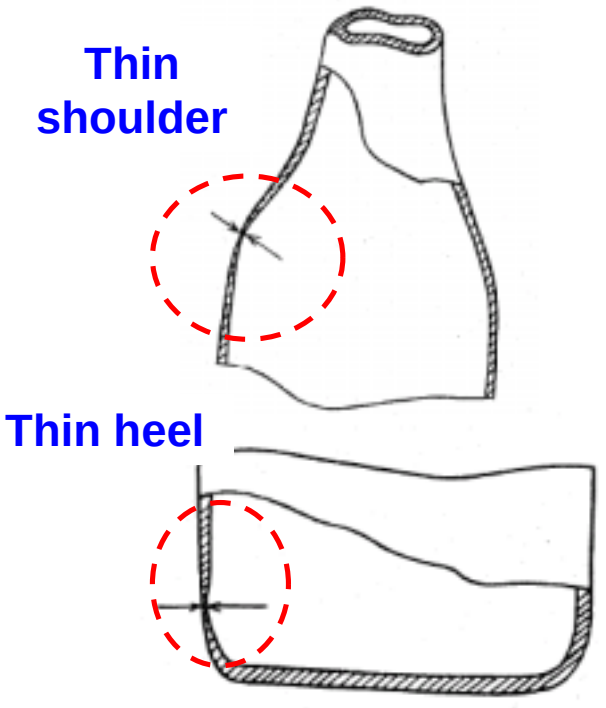
Benefits of MTC system

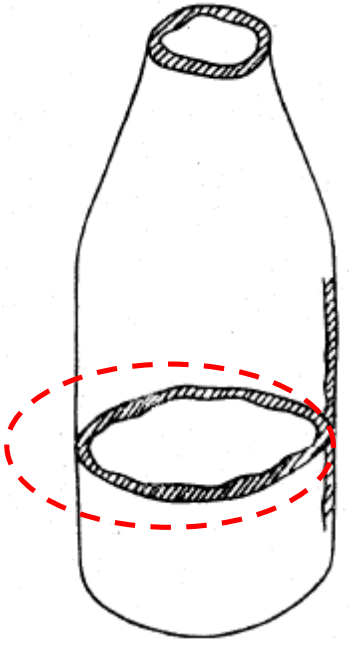
Increase of percent pack



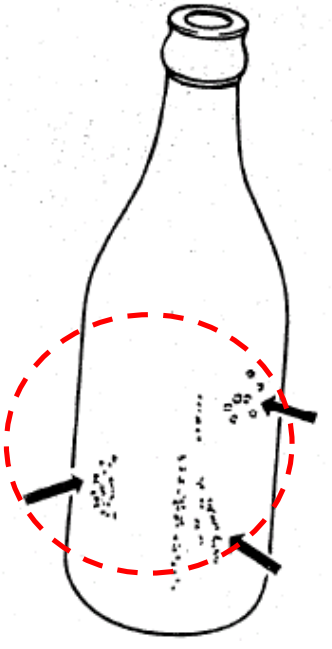
Reduction of forming defects by stable temperature

Thin wall, laps,uneven distribution,cold mold





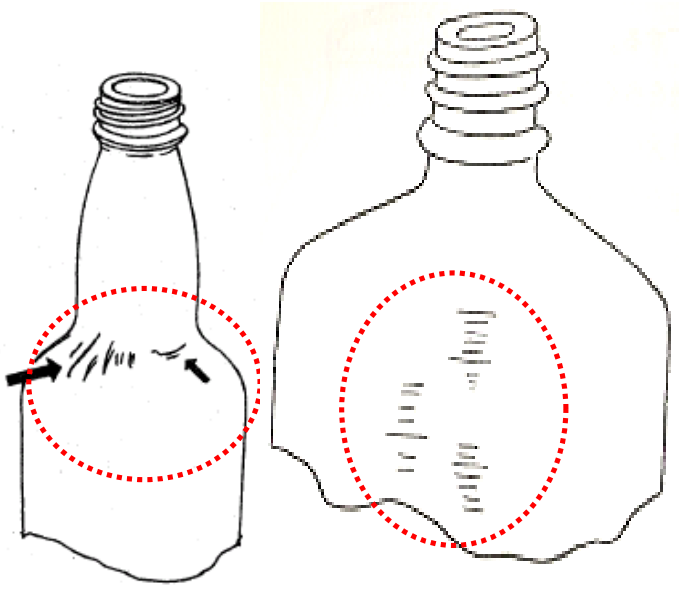
Uneven distribution



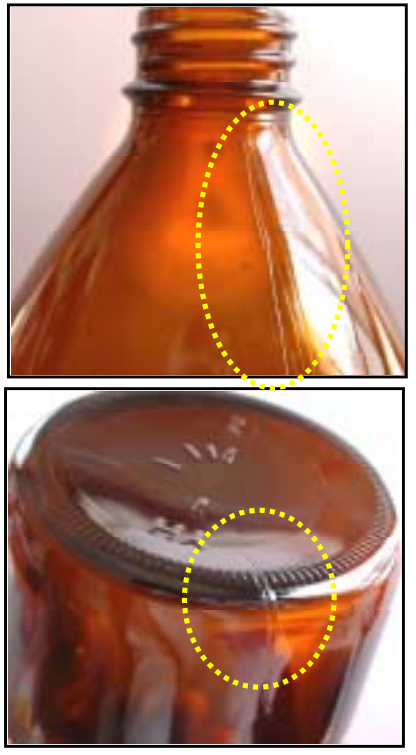
Cold mold

Reduction of forming defects by stable temperature

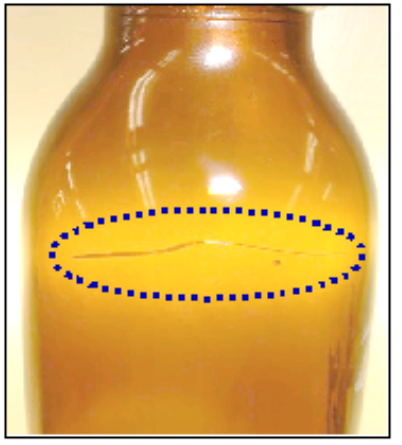
Streaks and laps decrease by stable blank temp.



Lap or wash board



Press lap

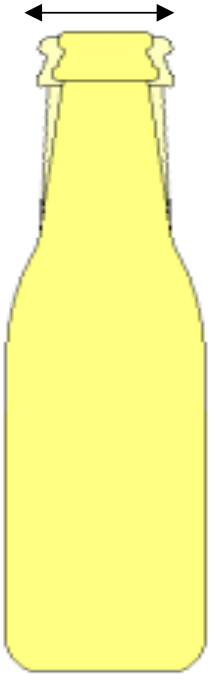


Body tear

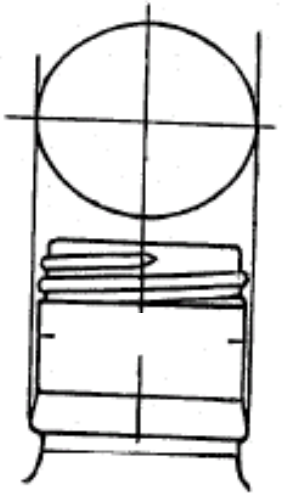
Reduction of forming defects by stable temperature

Swung baffle, cocked finish, out of round finish decrease by stable blank temperature

Swung baffle



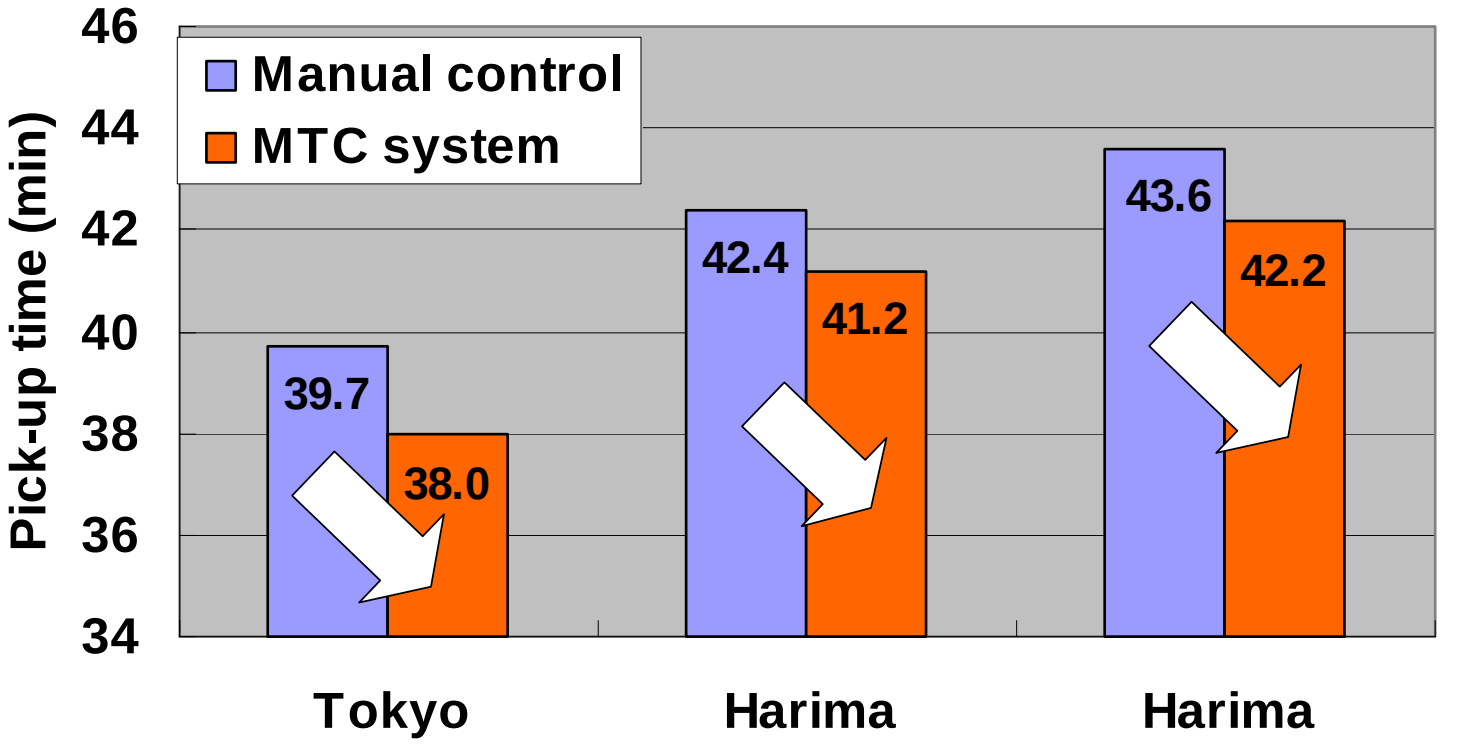
Cocked finish



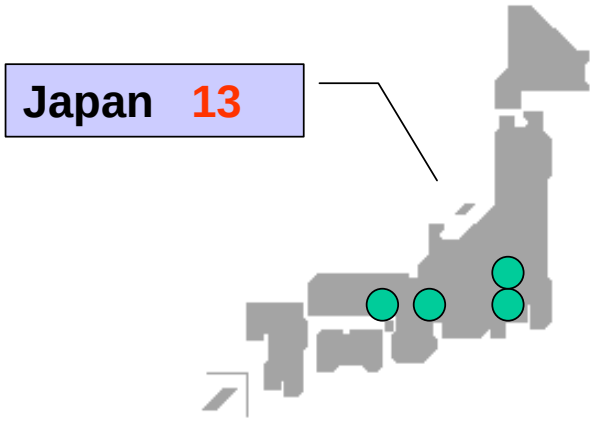
Out of round finish

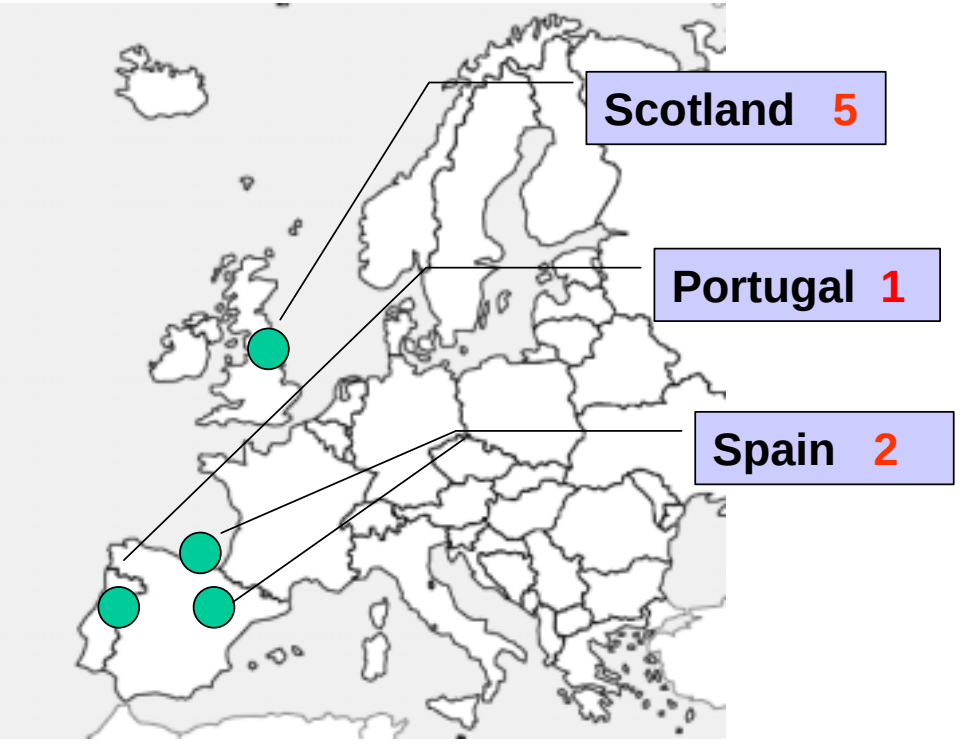
Benefits of MTC system

Faster pick up time after job change



MTC installation in Europe,Japan





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