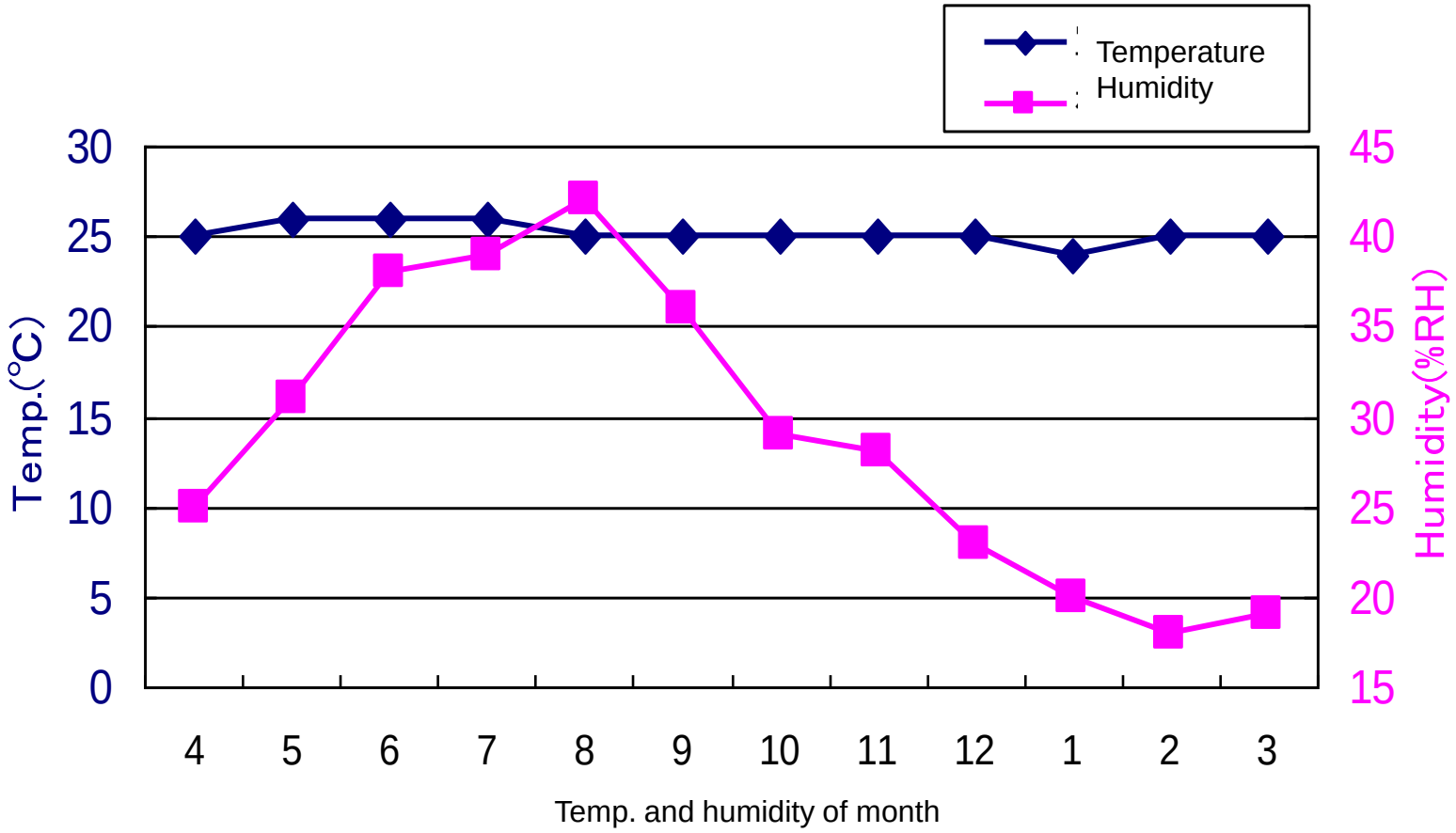
Humidification for SMT process

"The Fog Engineers"
IKEUCHI EUROPE B.V.

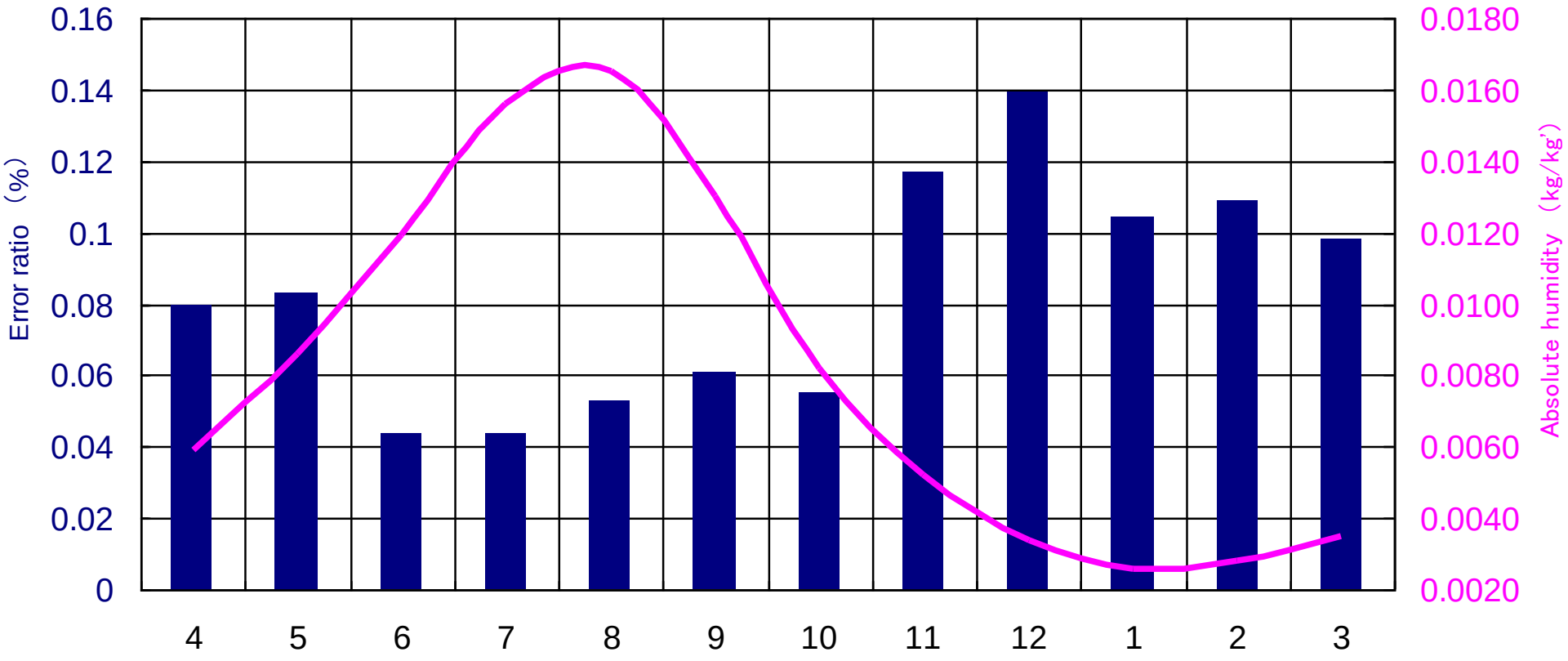
Humidity and temperature in factory

1) Temperature in side of factory is controlled uniformly and not effected outside air conditions.
2) Humidity is effected by outside air conditions and factory humidity become low especially in winter.
3) In dry season, SMT process has many problems such as ESD, pick up error, soldering defect, etc.



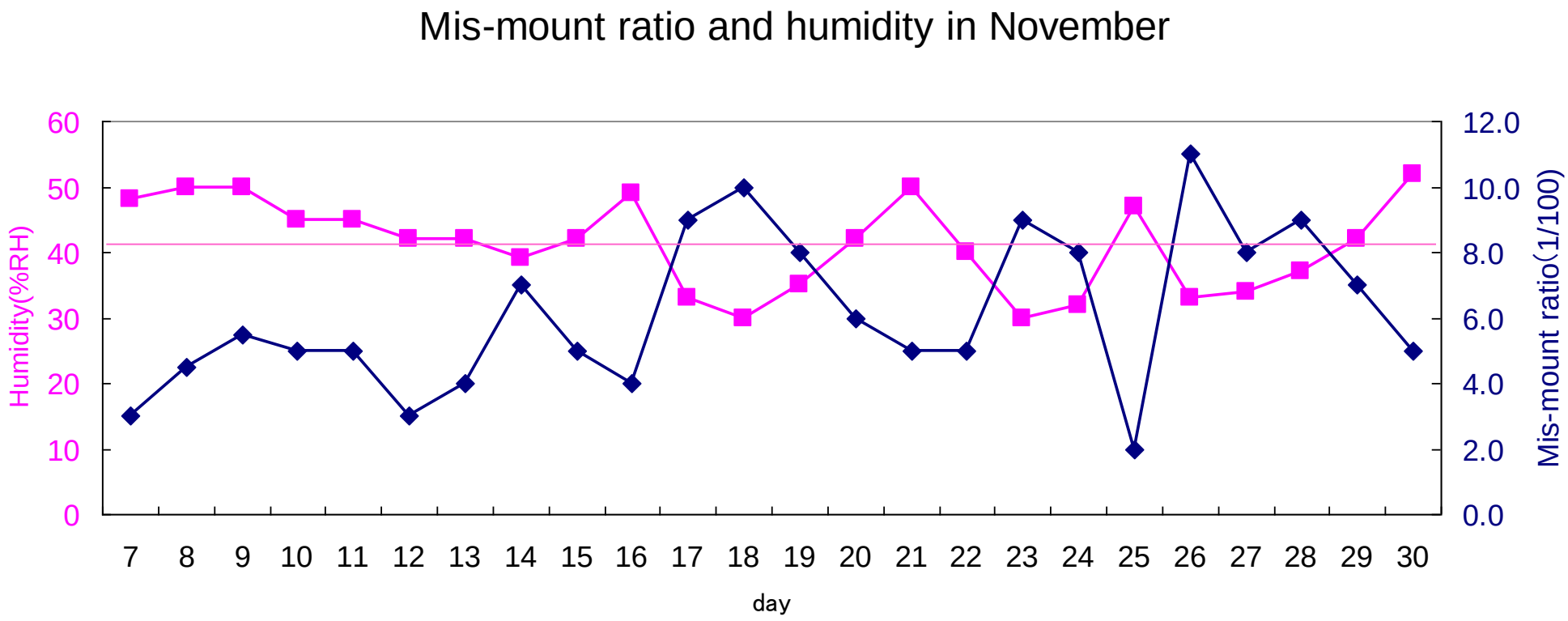
Temp. and humidity of month

Pick up error ratio of high-speed mounter

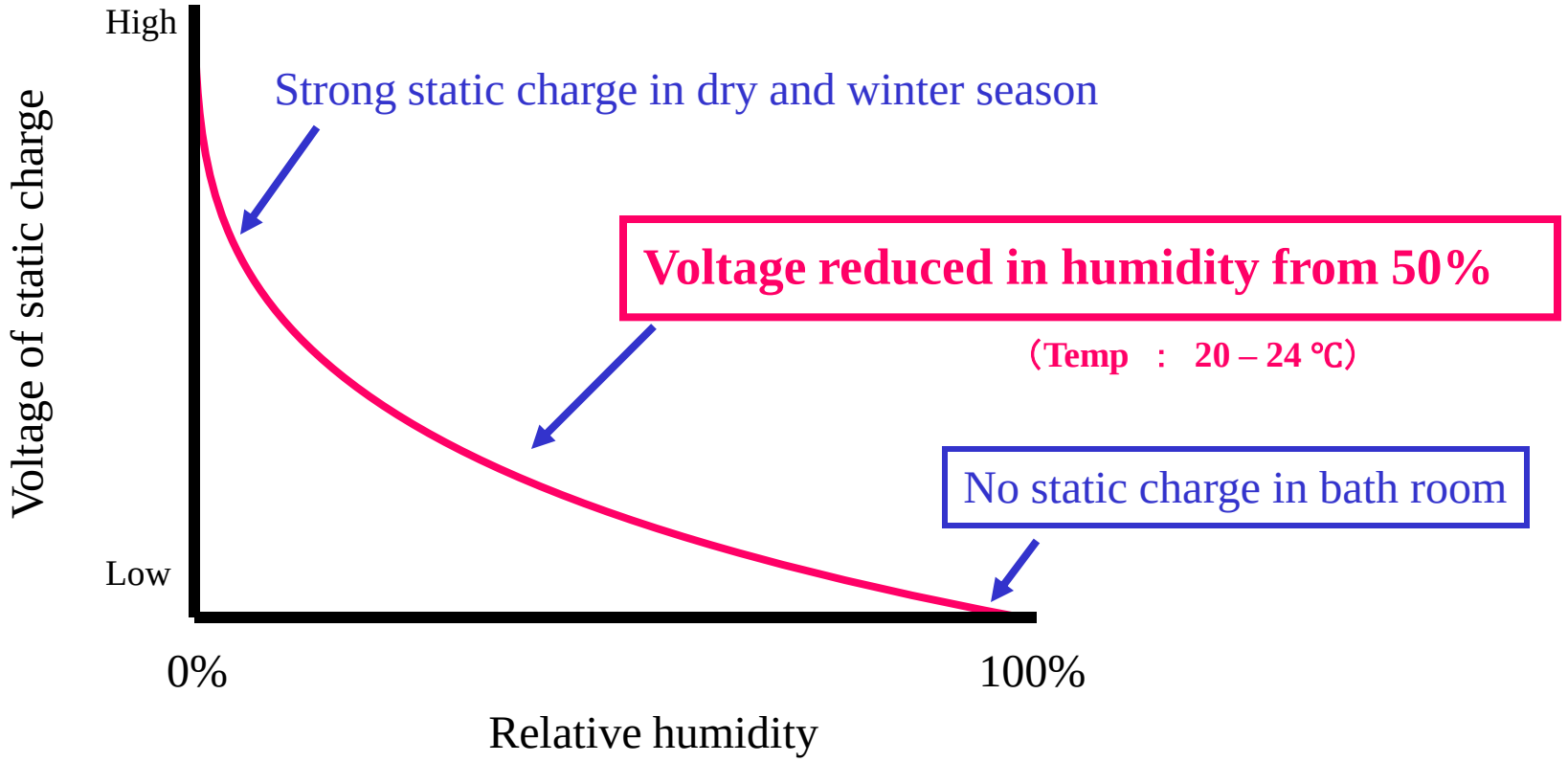


Relation between error and absolute humidity

Mis-mount ratio and humidity

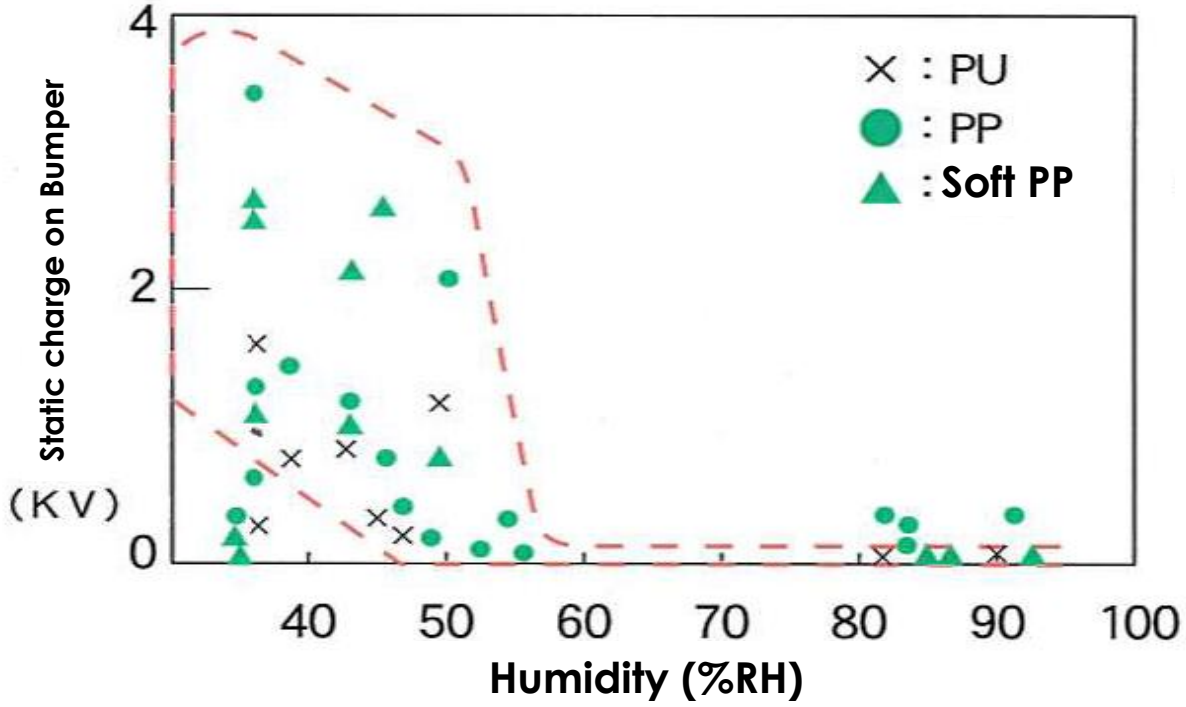


Relation between relative humidity and static charge

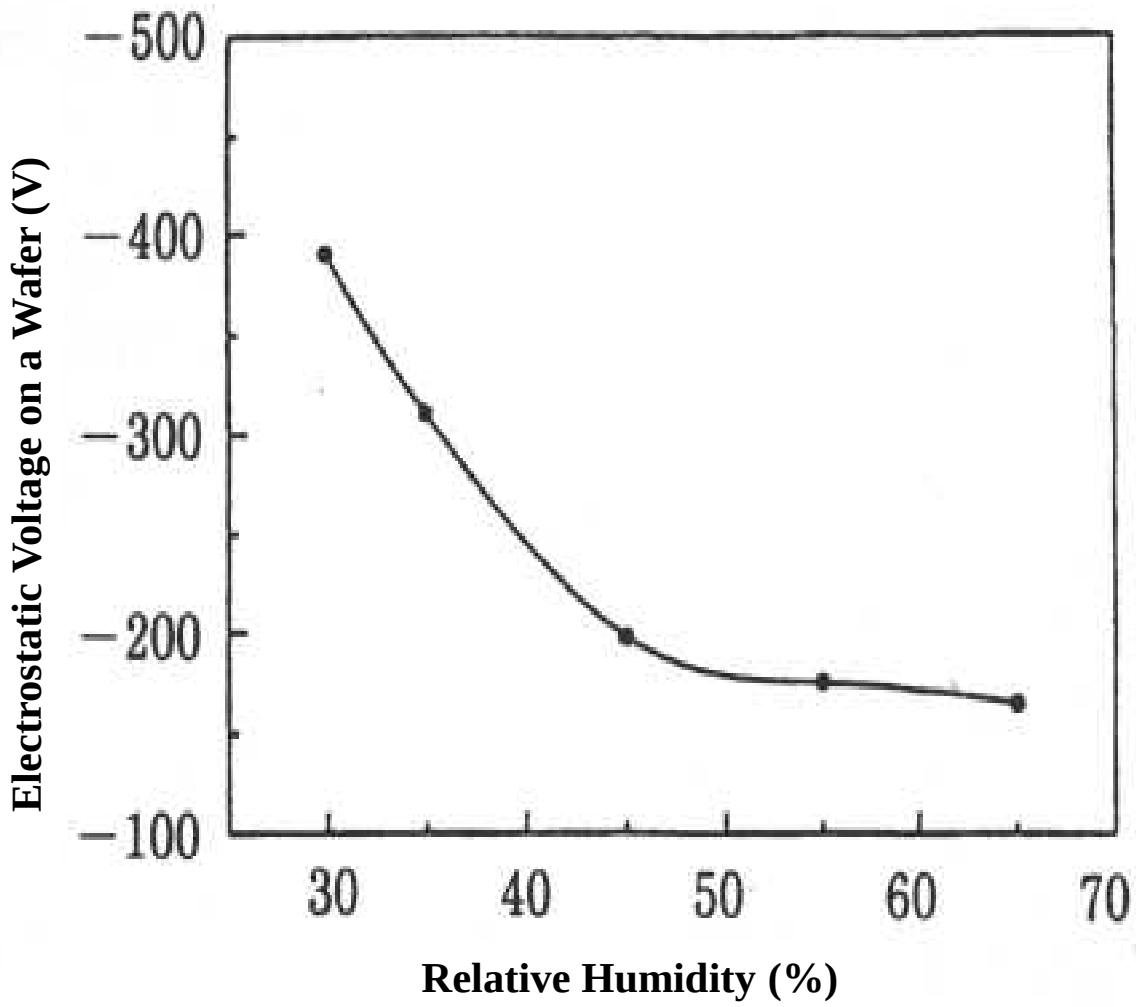


Static charge on automotive bumper painting line

Relation on humidity and electro static on Bumper



Static charge on wafer



Static charge generated by each action

Action	Generated static charge（V） in each humidity		
	10%	40%	55%
Work on carpet	35,000	15,000	7,500
Work on plastic floor	12,000	5,000	3,000
Take out ceramic DIP from plastic tube	2,000	700	400
Take out ceramic DIP from plastic tray	11,500	4,000	2,000
Remove package sheet of PCB	26,000	20,000	7,000

Relation of static charge and humidity on operator (human body)

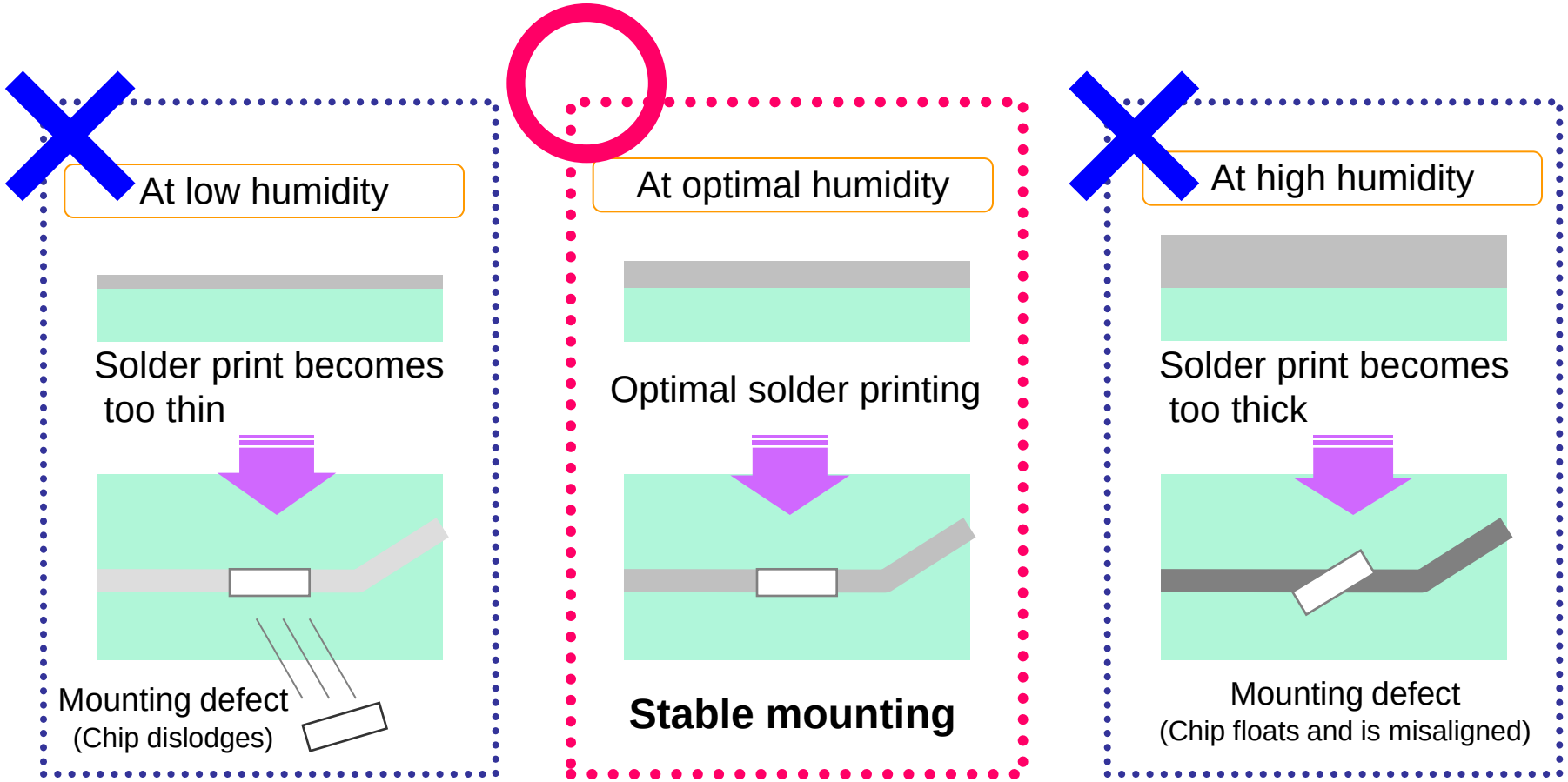
Operator	Charge on Human Bodies (V)	
	Before installation	After installation
	24C, 32%RH	23C, 53%RH
A	350	0
B	200	0
C	500	0
D	300	0
E	850	100
F	250	0
G	400	50
H	150	0
I	450	0
J	300	0
K	600	0
L	500	50
M	900	50
N	700	50
Average	460	20

Effects:

- Reduction of electrostatic destruction at the inspection process
- Controlled humidity throughout the year reduced in-process failure caused by particles.

Measurement equipment:
Richmond T1300

Improve circuit printing quality



Purpose of humidification

- Reduce static charge voltage and prevent ESD problem.
- Prevent pick up failure especially of small size tip such as 1005, 0603 and 0402 that get big effect of static charge.
- For quality control of circuit printing.
- Humidity suppress dust in the room and reduce dust sticking problem in soldering process and assembling process.

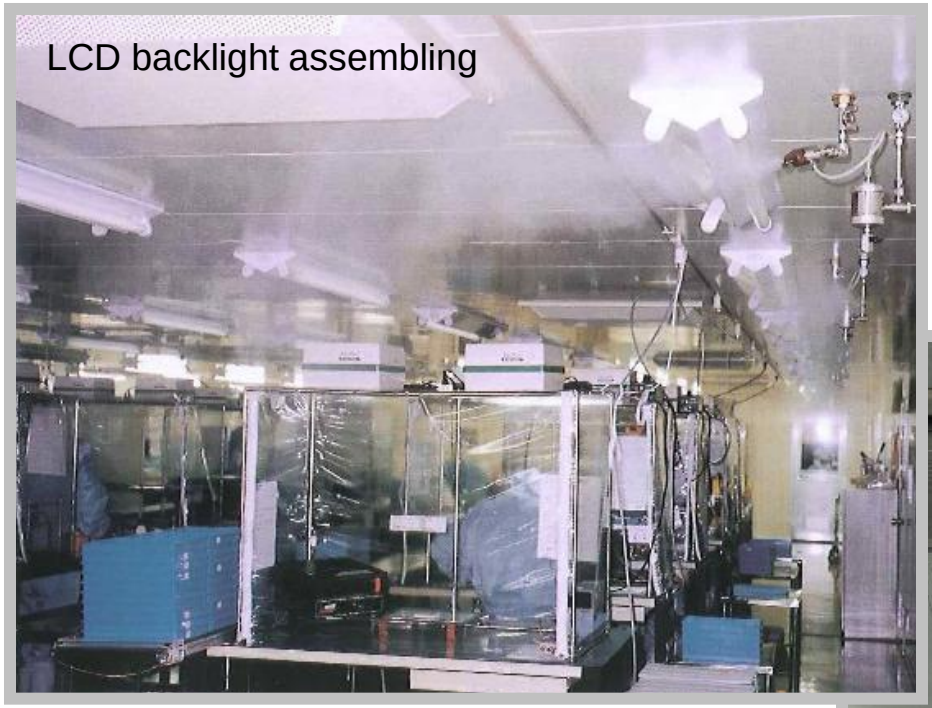
Now a days, control humidity in SMT line is considered one of indispensable method to prevent static charge problems and keep high level quality control.

Installation in SMT process

DVD laser pick up SMT process

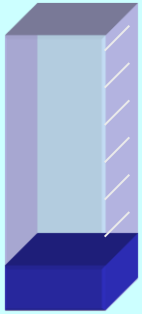
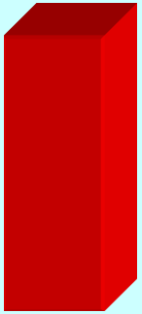
Installation in SMT process

Installation in electronics parts production



Energy saving effect

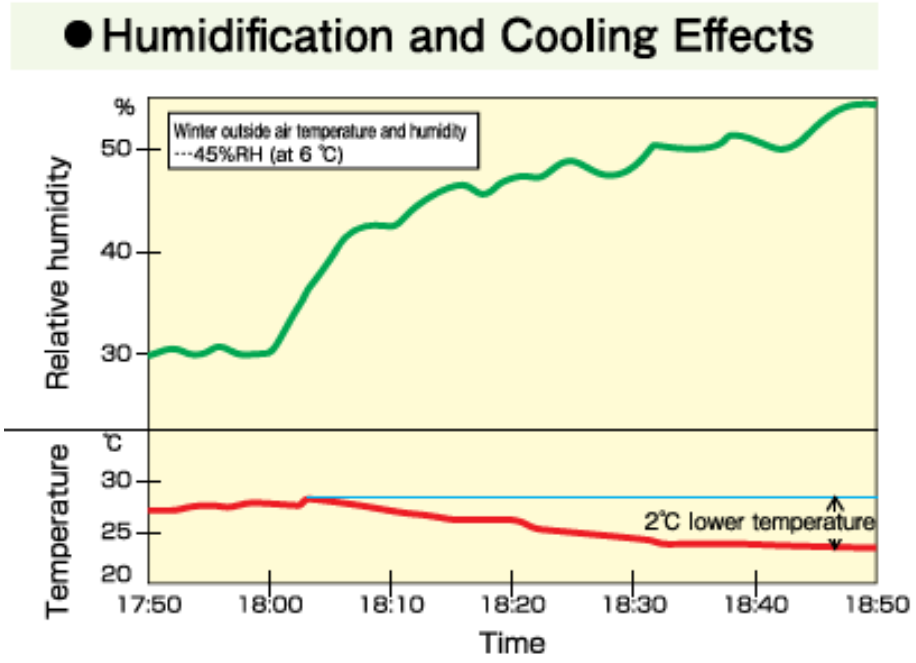
Steam humidification is also common solution for SMT line is but this system consumes large energy to vapor water and it takes about 8 – 6 times higher energy cost than AKIMist.
Besides on this matter, steam system needs regular maintenance with high cost.

	AKIMist® "E"	**Steam Humidifier** (Electrode vapor)
Energy cost		
For example (Amount of humidification: 100kg/h)	Approx. 10kw	Approx. 75kw
Annual electricity	Approx. EUR 3,000-	Approx. EUR 22,500-

Cooling effect of humidification

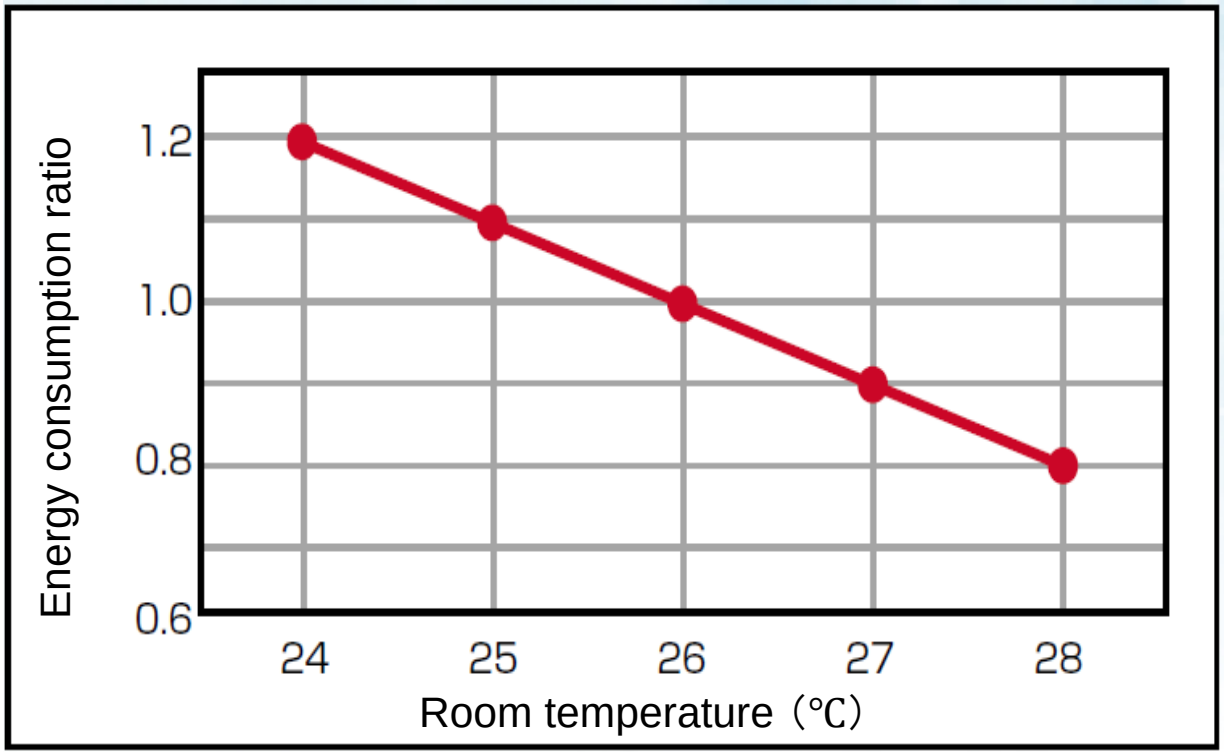
SMT factory is consuming large energy for air cooling not only in summer but also in winter season and this shares the one of biggest ratio of energy cost of the plant.

AKIMist® "E" sprays water direct into the room and it's adiabatic cooling effect is 625W / water 1kg. Generally speaking, it can cool down room temperature about 2degreeC and this cooling effect leads about 20% of energy saving of air cooler.



Cooling effect of humidification

In case the room temperature is cool down 2℃, it leads about 20% of cooling energy saving of air conditioner.



Air conditioner energy saving ratio at each room temperature (26℃ standard)

Reference: The Energy Conservation Center, Japan

Cooling effect of humidification

Estimated cooling energy saving by AKIMist Dry Fog humidification system.

	Company A	Company B
Process	IC Packaging	SMT
Room volume [m^3]	30 x 13 x 2.8=1100	45 x 24 x 3.5=3700
Humidification [L/hr]	41.0	98.5
Energy for cooling [kw h]	40.0	82.5
Operation time	Whole year	Whole year
Annual cooling energy (kw)	120,000	247,500
Annual Energy cost	EUR 16,800.00	EUR 34,650.00
Annual cost saving	EUR 3,360.00	EUR 6,930.00

kW h=0.14EUR

Energy loss of steam humidifier in SMT process

SMT room often needs cooling even in winter and this is one of the biggest energy cost in the plant. Steam humidifier often loss energy of air conditioner.

1. Cooling coil and steam (heat) make confliction in the air conditioner and spend large cost for air cooler.

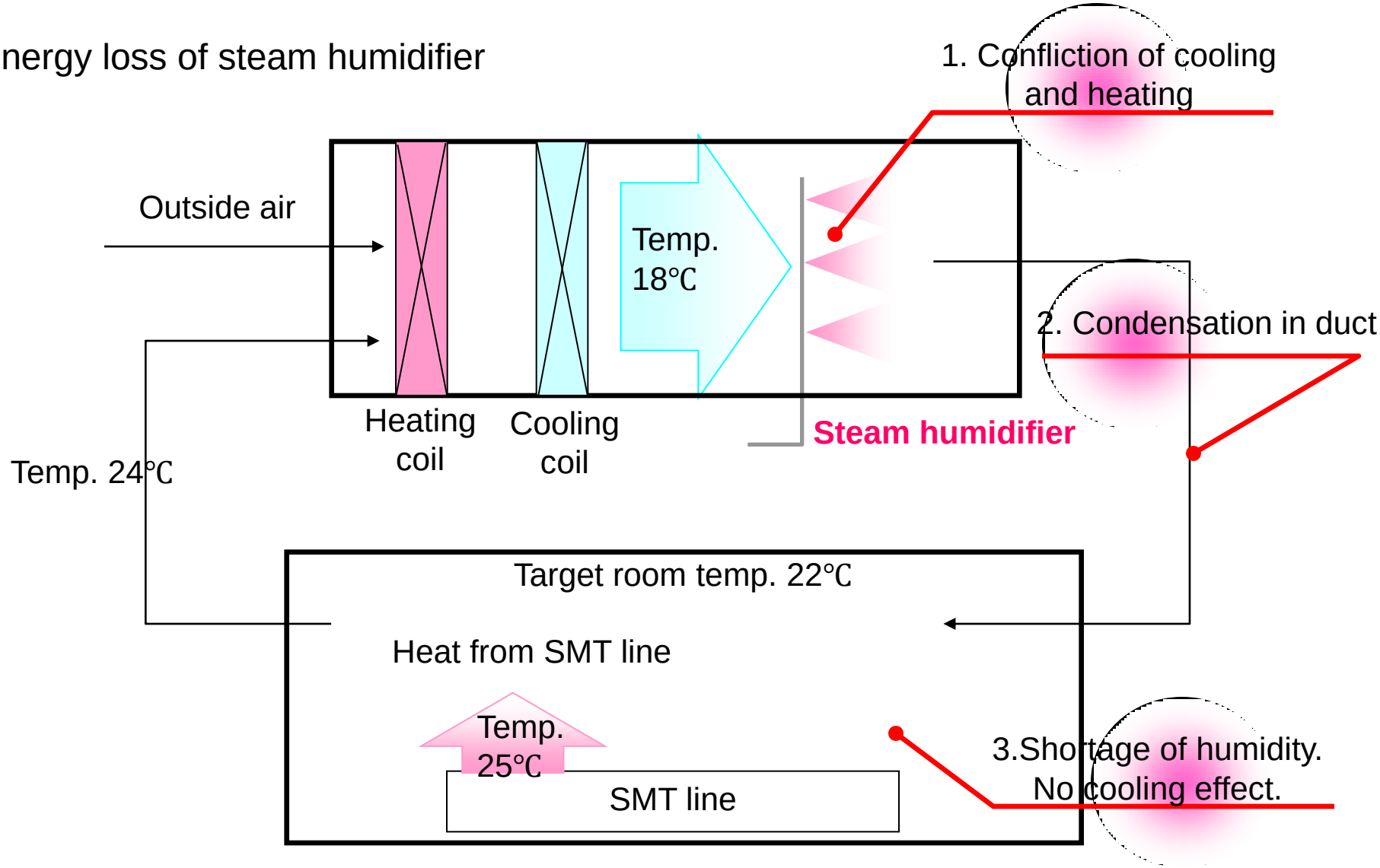
2. The temperature in air duct should control cooler to against heat of steam. Steam makes condensation in the duct.

3. Because of condensation, not enough humidity supplied to production room so, the humidifier is controlled to produce more steam. The temperature in duct become high again and air cooler need to generate furthermore low temperature air.

4. As the result, the cost for steam and also air cooling becomes huge.

Energy loss of steam humidifier in SMT process

1. Energy loss of steam humidifier



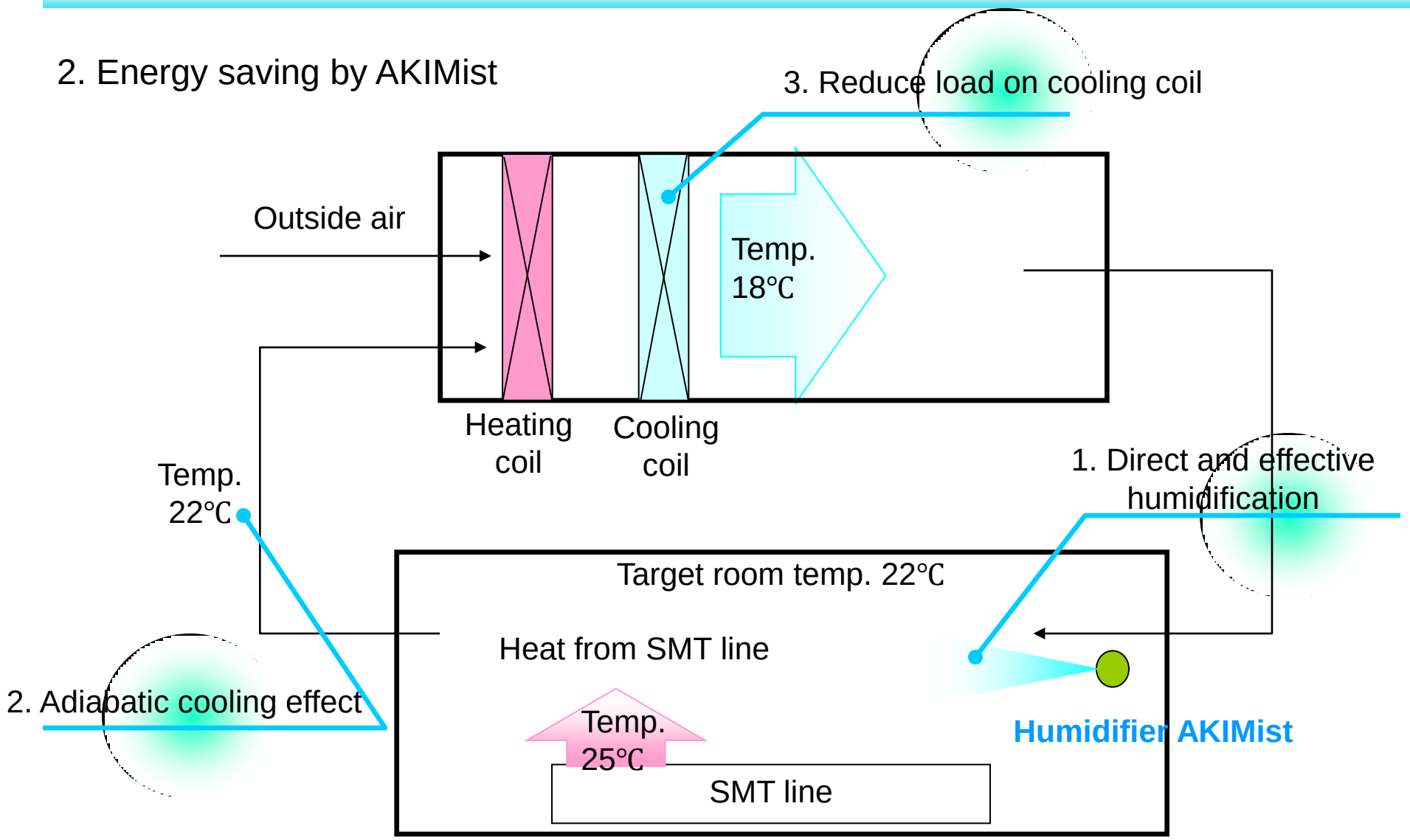
Energy saving of AKIMist® in SMT process

1. AKIMist can be sprayed directly on to SMT production line.
   It makes quick and effective humidification.

2. AKIMist sprays water and it's adiabatic cooling effect reduce room temperature about 2℃.

3. This cooling effect reduce load of cooling. This means it can reduce about 20% air cooling energy.

Energy saving of AKIMist® in SMT process



Advantage of AKIMist®: Dry Fog

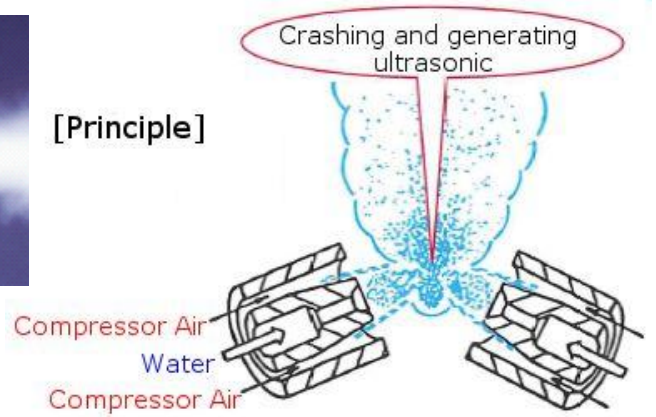
How Dry Fog is Produced.

AKIJet® is composed by two spray nozzles and both of them atomize fog.

This couple of flow hit each other and shear droplets.

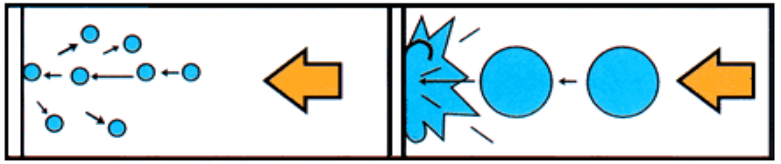
Simultaneously they generate ultrasonic of 3.3~4MHz to further atomize droplets and homogenize size.

[Principle]



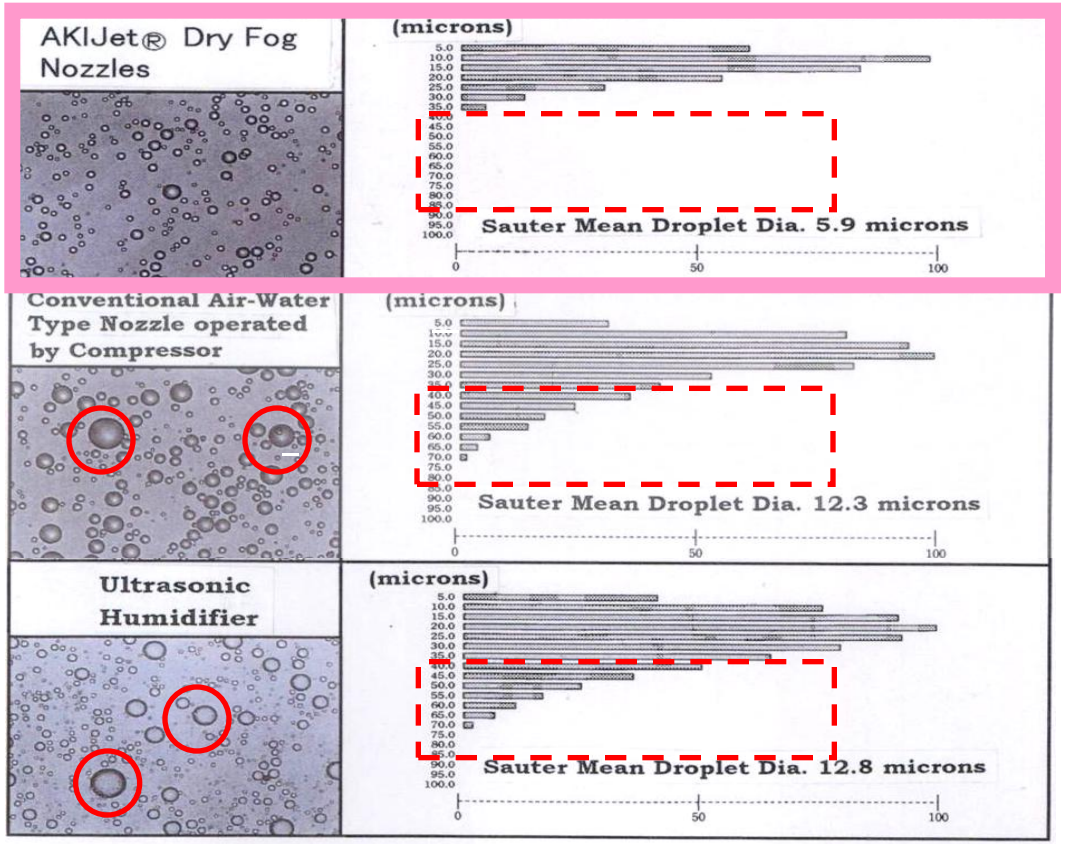
Why doesn't Dry Fog wet the object?

As shown below, small droplets rebound from an object, but large droplets get burst and wet the object. This is just like how soap bubbles do.



Advantage of AKIMist®: Dry Fog

The finest mist with droplet sizes distributed in a very tight range.

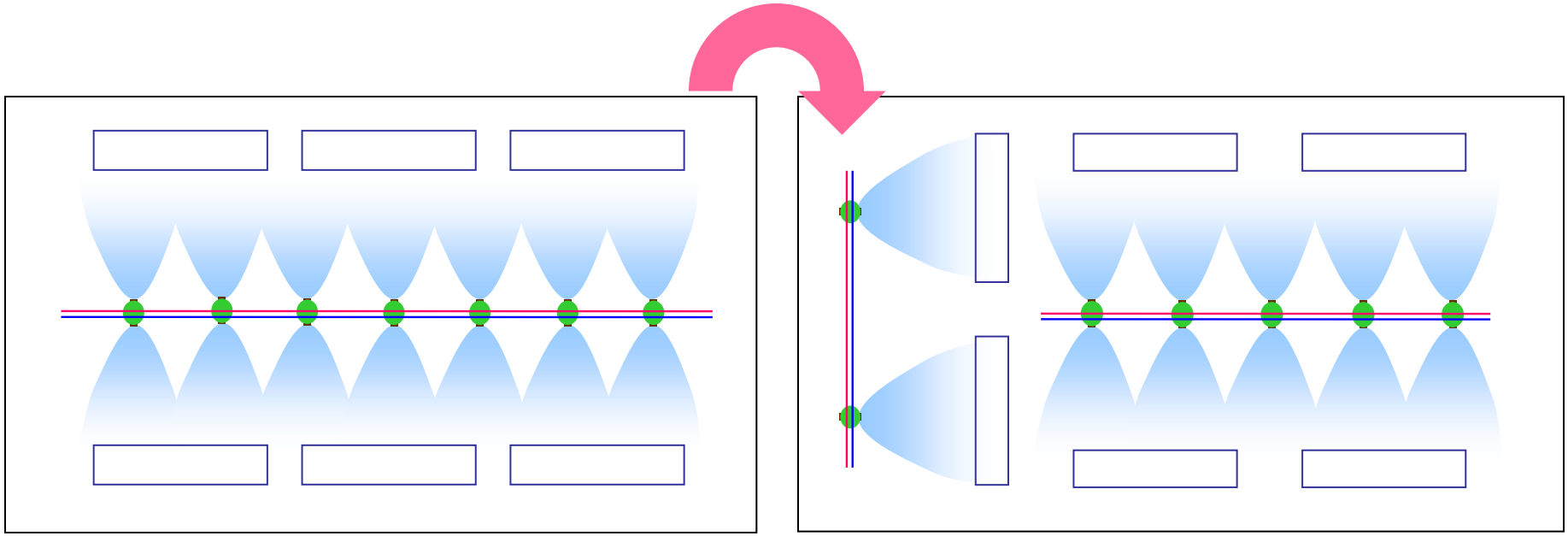


Dry Fog: Maximum droplet 50 microns and mean diameter 10 microns or smaller.

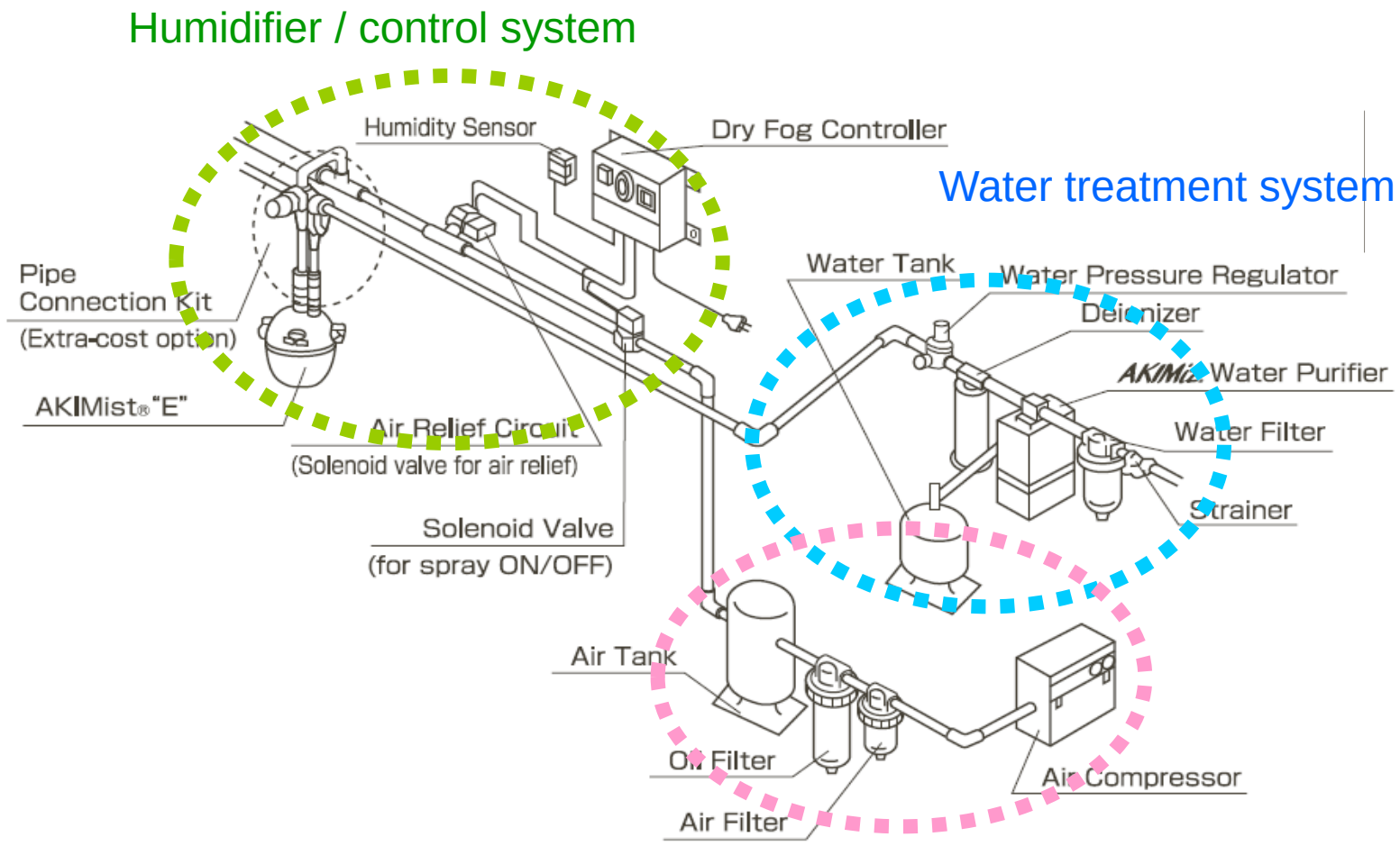
Advantage of AKIMist®: Installation flexibility

The system is installed with compressed air and water piping and relative easily to reroute.

It is suitable to for the room where production layout changes frequently.



Schematic of *AirAKI*® Industrial Humidification System



History of AirAKI® Dry Fog Industrial Humidification System

Proven track record

For kinds of electronics parts production companies adapted AKIMist.
Our technology has proven, effective results.

Semiconductors	IC semiconductor plants, LCD panel, crystal oscillator, chip capacitor, hard disk, GMR head, color filters, backlights, LED elements, pickup lens
Automotive electronics	Engine computer, airbag system, anti-lock brake system, steering system, headlight system, power window unit, maker-installed car navigation
Consumer products	LCD television, cellular phone (media, base stations), DVD recorder/player, all types of memory, medical equipment, digital camera, camera lens. fiber optic cable
Others	Airplane dock (maintenance bay), communications systems, surface mounting, assembly, amusement, etc.

History of AirAKI® Dry Fog Industrial Humidification System

"AirAKI®" is now seeing rapid growth in the electronics industry.