WOOJIN PLAIMM

# CLEANFOAM

Advanced Lightweight Injection Moldi
ng Technology
with Enhanced Surface Finish



HYOSUNG VINA CHEMICALS | Milliken™

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Clean-Foam
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# Woojin Plaimm at a Glance



**1985**
Established (Apr. 20)

**USD 254 M**
Sales

**557**
Employees

**≒ 31.9%**
Export rate

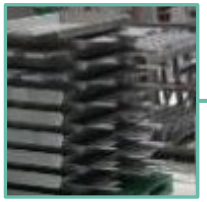
**485,867 ㎡**
Facility area

**Ickwhan Kim**
CEO

| | |
|---|---|
| **Head office** | 100, Woojinplaimm-ro, Jangan-myeon, Boeun-gun, Chungbuk-do, South Korea |
| **Training** | Woojin Plaimm technical training center |
| **C/S center** | SPEED CLUB (1644-0990) |
| **Website** | www.woojinplaimm.com |

# Core Components Built In-House

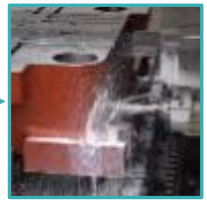
Frame





Platen· Toggle







Smart Storage



Plasticization





# A Global Network: 42 Networks in 29 Countries




**42 networks | 29 countries**

# Injection Molding Machine Lineup

## Hydraulic

### Toggle

- Smart [TB-G5] — [30~850t]



- Premium [TH-A5] — [30~850t]



### Two-Platen

- Smart [DL-G5] — [450~4300t]



- Premium [DL-A5] — [450~4300t]



### Vertical

- Low-floor [VH-RG5]



- General [VHA-RS]



- Low-floor [VHL-RS]



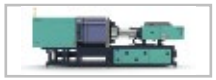
## Electric

### Toggle

- Smart [TE-G5] — [30~850t]



- Premium [TE-A5] — [30~850t]



## Special

### Multi-Injection

- Hydraulic [NC-G5] — [130~220t]



- Premium [DL-A5-2K-T] — [900~1300t]



- Electric [TE-NC] — [150~250t]



- Premium [DL-A5-2K-W] — [500t]



### Super-Foam

- Two-Platen [DL-A5 S.F] — [500~3300t]



- Vertical [SFV 2400]



- Electric [TE-A5 S.F] — [110~850t]



## Dedicated

### PALLET

DL-A5 (PALLET) — [500~3300t]



### MEDICAL

TE-A5 (Medical kit)



### LSR

TE-A5 (LSR) — [30~850t]

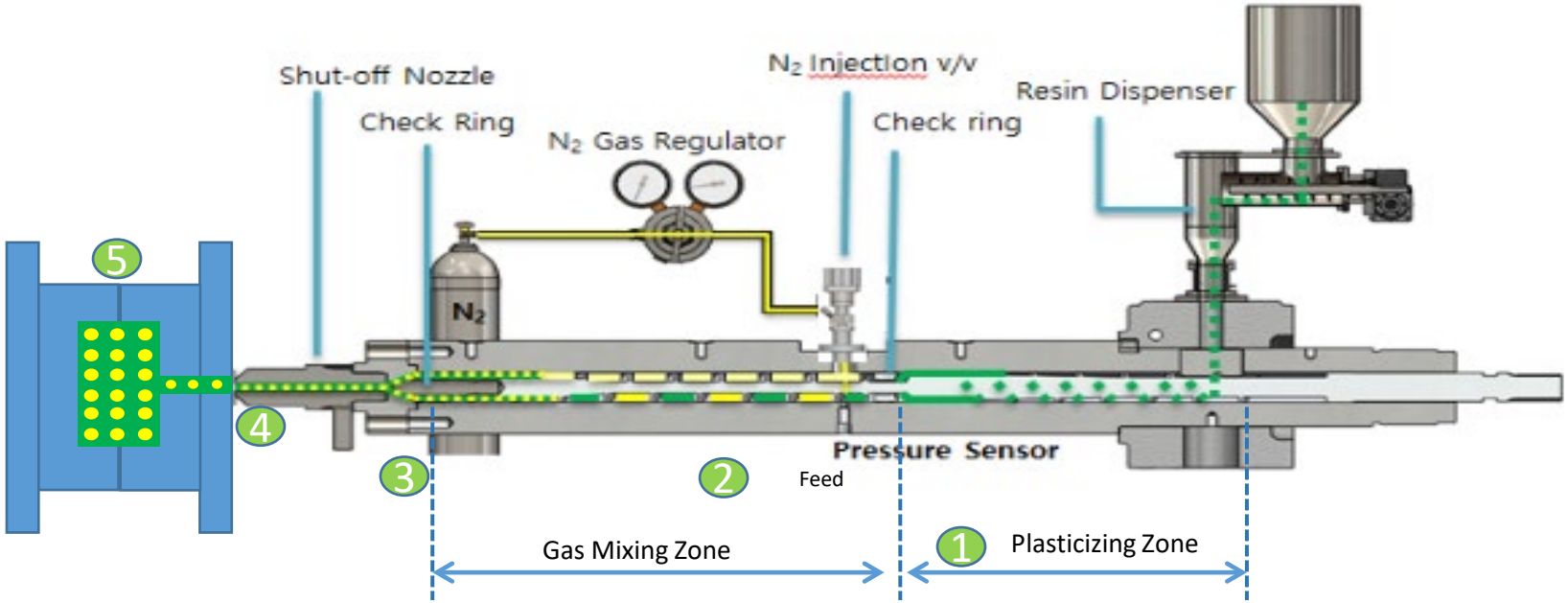


### PET

TH-A5 (PET전용기) — [30~850t]

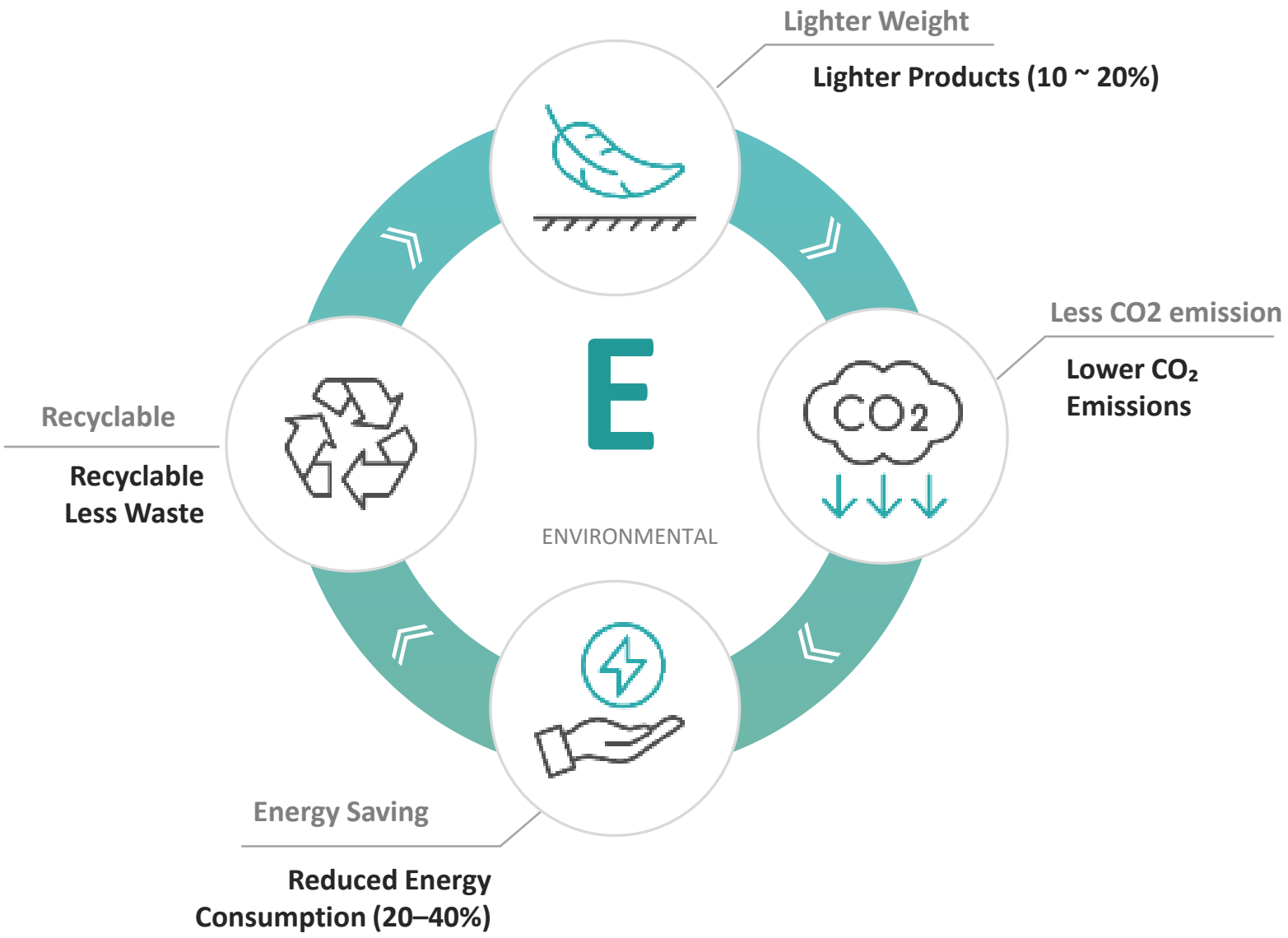


# What Is Super-Foam Physical Foam Molding?




| 01 Molten Resin | 02 Resin + $N_2$ | 03 Resin Metering | 04 Injection & Decompression | 05 Cell Growth |
|---|---|---|---|---|
| Resin melts in the plasticizing zone | Molten resin and $N_2$ are fed into the 2nd-stage feed zone and dissolve into single-phase resin | Single-phase resin is metered in the 2nd-stage metering zone (ready to inject) | Pressure drops during injection and foaming begins in the resin (shut-off nozzle open) | Foam cells grow inside the mold |

# Eco-Friendly Benefits of Physical Foaming



# Key Advantages of Physical Foam Molding

Weight reduction

## 10 ~ 20%

**Lighter Products than conventional Plastic products.**

For ENVIRONMENT

## Recyclable

## Less Waste

## Lower $CO_2$ Emissions

ENERGY

## 20–40%

**Reduced Energy Consumption**

PRECISION

## Less Sink marks

## Less bending.

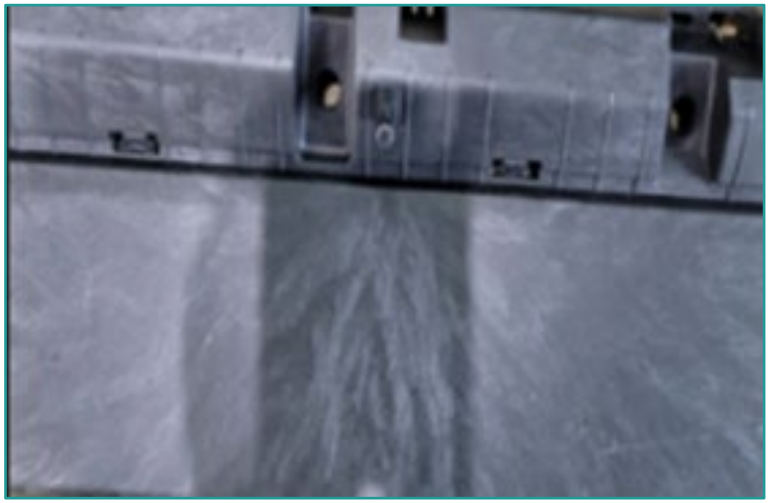
## Improved Accuracy

# Limits of Physical Foaming: Gas Marks and Surface Quality

**Effective**

**Eco Friendly Technology**

**But Limited Usage**



**Gas Marks / Swirl Marks**
Limited use for appearance-critical products

**How can we secure surface quality and the benefits of physical foaming at the same time?**

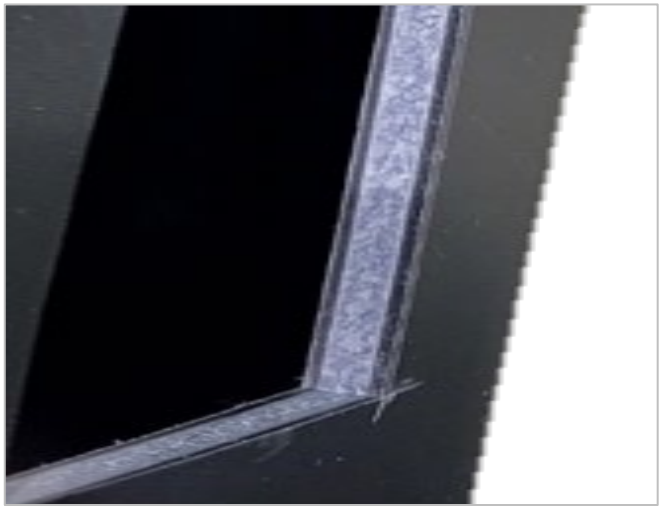
# Solid Skin + Foamed Core Structure

Challenge: gas marks on the surface

**Clean-Foam: solid skin + foamed core**



+



## Skin

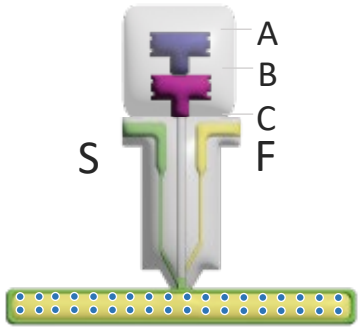
Solid outer layer delivers clean surface quality

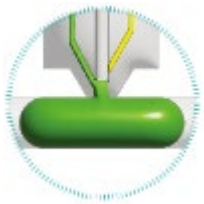
## Core

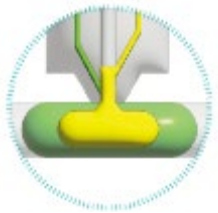
Foamed layer delivers weight reduction and eco-friendliness

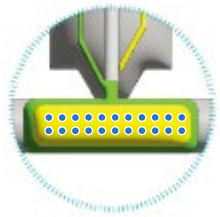
**Surface quality and foaming benefits, secured together**

# Clean-Foam Molding Process

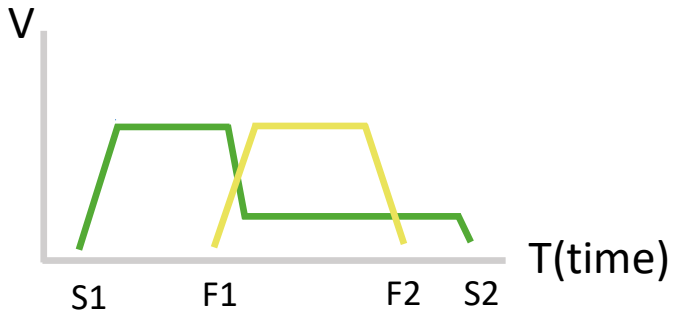






Profile




**S1-F1**

**Stage 1 (S1-F1) / Valve A / C-ON**
- Skin resin injection (target fill 3–10%)
- e.g., target 70% skin: 67–60% fill

**F1-F2**

**Stage 2 (F1-F2) / Valve C-ON**
- Core resin injection (foam injection)
- Skin: switch to packing pressure or ultra-low-speed injection

**F2-S2**

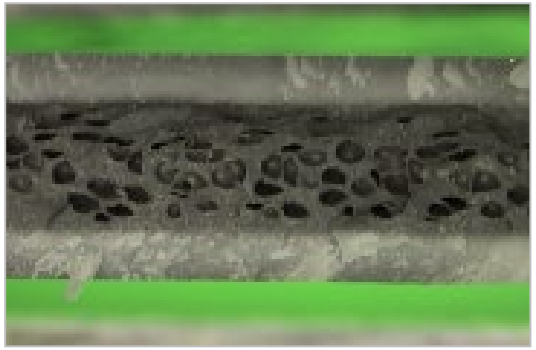
**Stage 3 (F2-S2) / Valve A / C-ON**
- Skin resin injection finish (gate solid packing)

# Case Study 1: Skid Plate









**Cross-section**

Skin layer
Core layer (foamed)
Skin layer

### Excellent surface appearance

Clean skin layer over the foamed core

### Lighter product weight
### 849 -> 813g

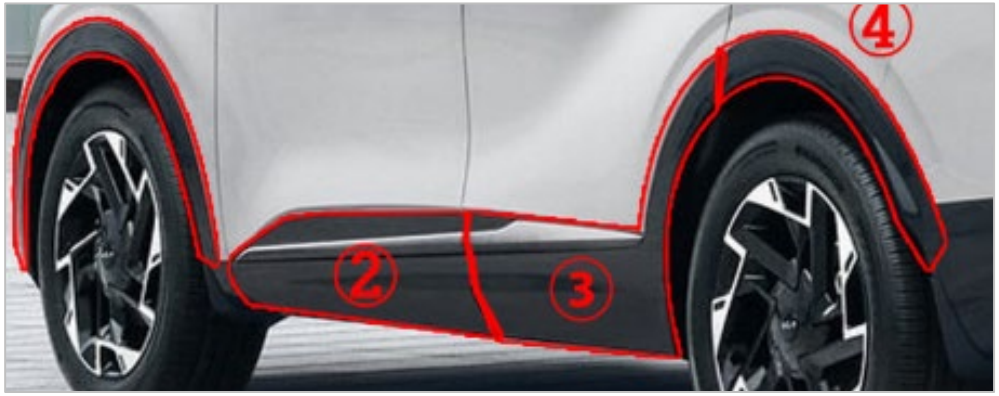
Foamed core lowers the weight of the part

### Thermal insulation and heat shielding

Improved insulation and heat shielding

**Skin: TPO (Metallic) | Core: Foamed TPO-PCR | Total weight: 813 g**

# Case Study 2: Door Garnish








Clean-Foam Door Garnish samples

### Better appearance

Low-pressure molding improves flange, boss, sin k marks and waviness

**15%**

**Lighter weight, lower cost**

weight reduction

### PROCESS SKIP

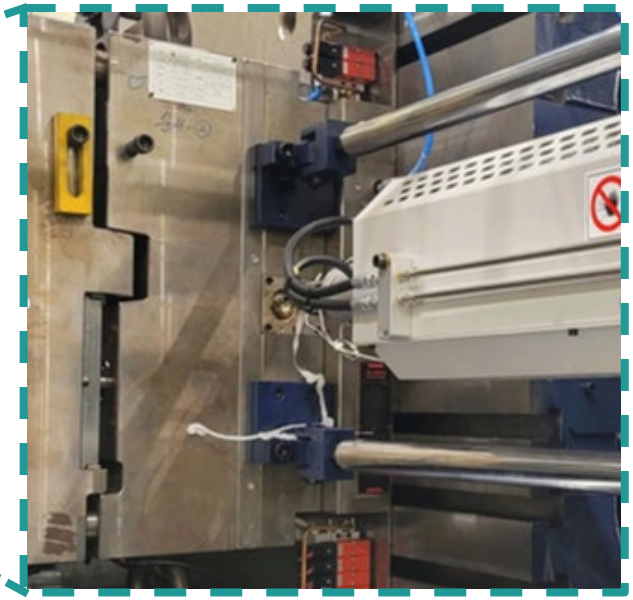
Welding step eliminated since the surface is already clean enough

**Skin: PP | Core: Foamed PP-PCR | Total weight: 1015 g | Foaming ratio: 9.3%**

# Clean-Foam Equipment Specifications (CO-IB2610 / DL1300A5)

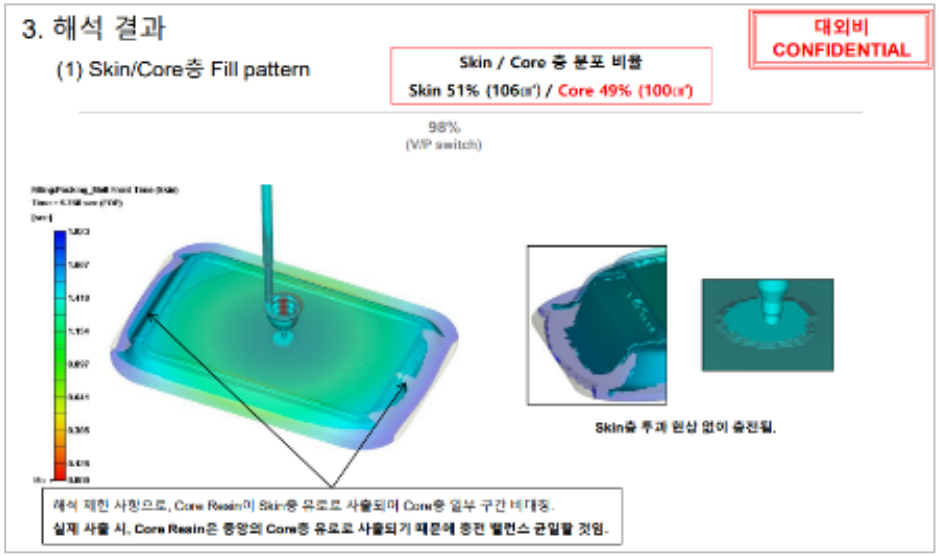
## CO-IB2610-Ø80

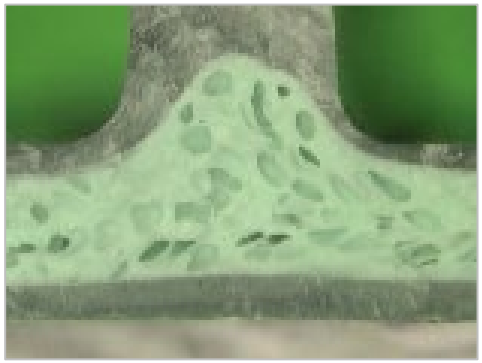




# Case Study 3: Tray



**Cross-section**

Skin layer
Core layer (foamed)
Skin layer

## Excellent surface appearance

Clean skin layer over the foamed core

## Lighter product weight

Foamed core lowers the weight of the part

## Thermal insulation and heat shielding

Improved insulation and heat shielding

**Skin: PP (0.40–0.42 mm) | Core: Foamed PP-PCR (2.0–2.2 mm) | Total: 172.9 g**

# Clean-Foam Equipment Specifications (TL300A5-2K-W)





| TL300A5-2K-W | | Core Foam – IHV8 60 | Skin – IHV490 |
|---|---|---|---|
| **Injection Unit** | | | |
| Screw & barrel type | | **B** | **B** |
| Screw diameter | mm | **55** | **45** |
| Injection pressure | kg/㎠ | **1610** | **1536** |
| | MPa | **158** | **151** |
| Theoretical shot volume | ㎤ | **535** | **318** |
| Shot weight (PS) | g | **493** | **293** |
| Injection rate | ㎤/s | **352** | **231** |
| Screw stroke | mm | **225** | **200** |
| Injection speed | mm/s | **148** | **145** |
| Plasticizing capacity (PS) | kg/h | **233** | **127** |
| Screw speed | rpm | **250** | **300** |
| **Clamping Unit** | | | |
| Clamping force | ton (kN) | **300 (2941)** | |
| Platen size (H x V) | mm | **1120 x 1000** | |
| Mold opening stroke | mm | **900** | |
| Max. daylight (with / without turntable) | mm | **1084 / 1300** | |
| Min. mold thickness (with / without turntable ) | mm | **184 / 400** | |
| Turntable size | mm | **Ø950** | |
| Nozzle pitch (1st / 2nd injection unit) | mm | **200** | |
| Ejector force | ton | **9.2** | |
| Ejector stroke (with / without turntable) | mm | **95 / 200** | |
| Machine size (L x W x H) | m | **8.0 x 2.0 x 2.7** | |

# Why Clean-Foam: Key Advantages

APPEARANCE

## Excellent Surface Appearance

Solid skin layer over a foamed core

QUALITY

## Fewer Surface Defects

Low-pressure molding improves flange, boss, sink marks and waviness

WEIGHT

## Lighter Parts

Foamed core lowers part weight (15% in the Door Garnish case)

PROCESS

## Simpler Process

Welding step eliminated: molding, then painting

THERMAL

## Insulation and Heat Shielding

Foamed core improves thermal insulation and heat shielding

ENVIRONMENT

## Eco-Friendly Materials

Virgin resin for the skin; eco-friendly material for the core

**Surface quality and foaming benefits, together**

# Customized Solutions for Your Product



Foam Showroom: Always in Operation



**1** Visit the Foam Showroom

**2** Run trials with your mold and resin

**3** Get a tailored solution

# Q&A

# THANK YOU




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