



Production

product design



GENTREX- SCF Injection Molding Machine TK-927

Will Huang

Recycled materials

日本機材貿易株式会社

Agenda

01 Market Trend and Current Situation

02 GENTREX Features

03 Material Application

04 Q&A

MARKET TREND AND CURRENT SITUATION



2050 Net Zero
Zero carbon footprint, Climate neutrality (GHG)



Renewable Electricity
Fleet Electrification, LED Equipment

Sustainable Material: 100% vegan, Bio-Base ingredients



01

100% Recyclable

(Market/Industry Trend)

02

Carbon Emission Reduction

03

Eco-friendly / Sustainable

Revolutionizing Shoe Sole Production by Reducing Carbon Emission

炭素排出量の削減による鞋底生産の革命

版權為天崗所有，請勿

CHALLENGES TO PRODUCTION



Current Challenges to Midsole Manufacturing ミッドソール製造における現在の課題

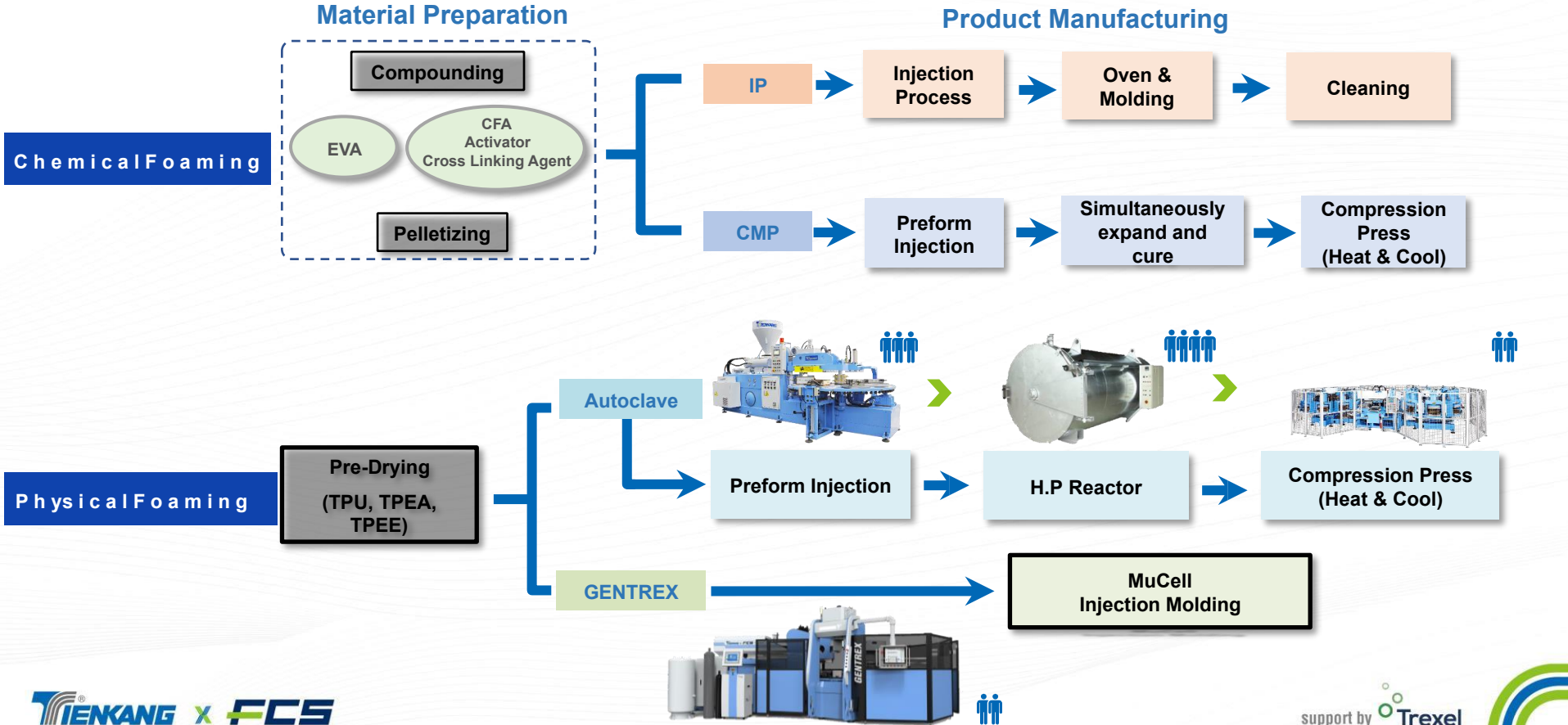
Current Process for building midsole 現在のミッドソール構築プロセス

1. Compression molded EVA Foams (CMEVA) 圧縮成形 EVA フォーム(CMEVA)
2. Injection molded EVA Foams (IMEVA) 射出成形 EVA フォーム (IMEVA)

Issues 課題

1. High labor requirements 高い労働力要件
2. Material scrap 材料スクラップ
3. Crosslinked EVA foams 架橋 EVA フォーム
4. Expansion to final shape occurs outside the mold 金型の外での最終形状への膨張
5. Complex material preparation and curing 複雑な材料の準備と硬化

Chemical and Physical Foaming 化学発泡と物理発泡

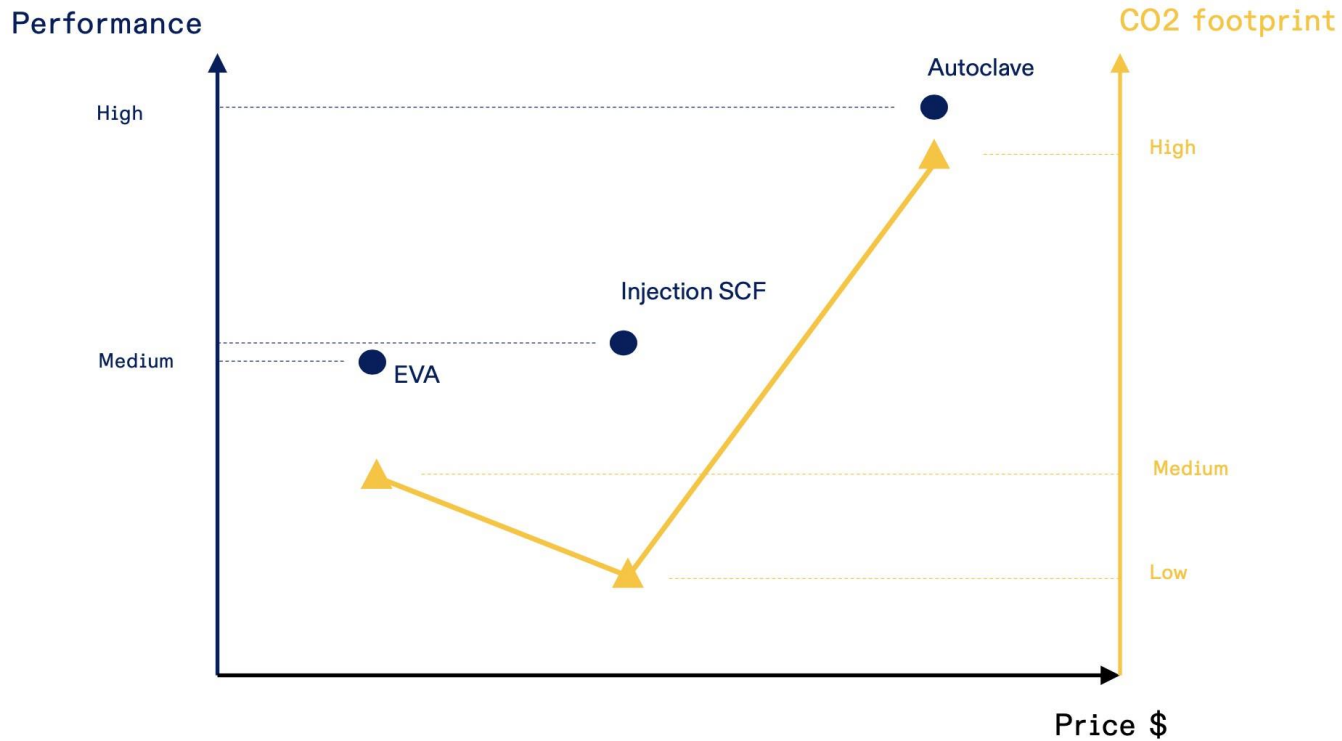


Process Comparison プロセスの比較

Process	Physical Foaming (MuCell Process/Gentrex)	Crosslinked EVA	Autoclave
Recyclable/ Reusable	● ● ● ● ●	● ● ● ○ ○	● ● ● ● ○
Automation	● ● ● ● ●	● ● ● ○ ○	● ○ ○ ○ ○
Process Simplicity	● ● ● ● ●	● ● ● ○ ○	● ○ ○ ○ ○
Dimensional Consistency	● ● ● ● ●	● ● ● ● ○	● ● ○ ○ ○
Operator Safety	● ● ● ● ●	● ● ● ● ○	● ○ ○ ○ ○
Reduced Manpower	● ● ● ● ●	● ● ● ○ ○	● ○ ○ ○ ○
Part Density	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Footprint	● ● ● ● ●	● ● ● ○ ○	● ● ○ ○ ○

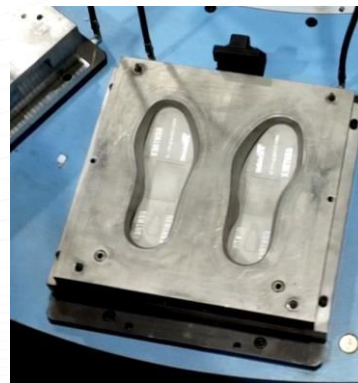


Process Comparison プロセスの比較



Benefits of thermoplastic midsole 熱可塑性樹脂ミッドソールの利点

- **Mold to net shape capability 金型から最終形状効果**
 - More consistent geometry (1:1 molding)
より一貫した形状 (1:1 成形)
 - Reduction in labor 人件費削減
 - Equipment footprint 機器の接地面積
- **Enable circular shoe 環境循環型履物の実現**
 - Enables a fully reclaimable/mono-material
完全に再生可能なモノマテリアルを実現
 - Full consumption on in process scrap
工程内スクラップを全量消費
- **Potential for multi- component assembly 多部品アセンブリの可能性**
- **Improved material performance 材料性能の向上**



Benefits of thermoplastic midsole

熱可塑性樹脂ミッドソールの利点

□ Reduced compression set

圧縮永久歪みの低減

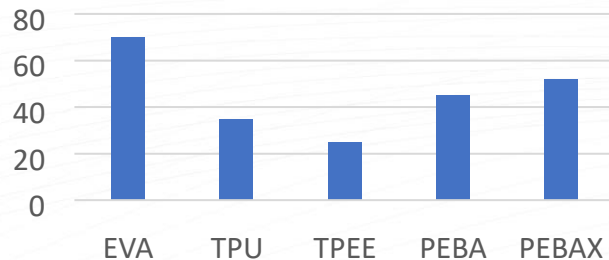
□ Rebound 50% +

50%を超える反発力

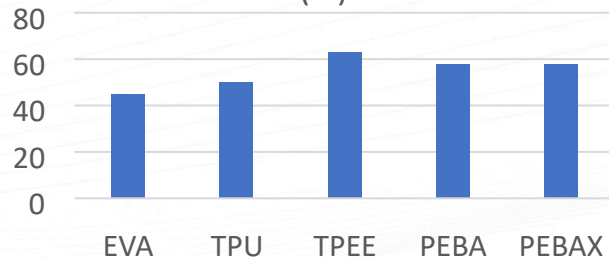
□ Zero Shrinkage in TPU & TPEE

TPU および TPEE のゼロ収縮

Compression Set % - 圧縮永久歪み%
ASTM D395



Resilience by Vertical - 垂直方向の復元力
Rebound(%) - ASTM 2632



HOW THE PROCESS WORKS _ MUCELL PROCESS



Joint Partnership for Service サービスに関する共同パートナーシップ

Joint partnership of 3 leading suppliers for foaming technology system, foaming injection unit and the leading footwear machinery manufacture.

発泡技術システム、発泡射出ユニット、および大手履物機械製造の大手サプライヤー 3 社による共同パートナーシップ。



A leading brand in footwear machinery manufacturing
Over 40 years of experience in producing all kinds of footwear molding machines.

履物機械製造のトップブランド。
あらゆる種類の履物成形機の製造における 40 年以上の経験。



Injection molding technology and system integrator
Over 45 years supply injection molding machines

射出成形技術とシステムインテグレーター。
45 年以上にわたり射出成形機を供給。



MuCell Technology for microcellular foaming
Over 25 years developing and implementing microcellular foam injection molding systems

マイクロセルラー発泡用の MuCell テクノロジー。25 年以上にわたってマイクロセルラー発泡射出成形システムの開発と導入を行っています。

TRENKANG

FCS

Trexel

THE SOLUTION - *GENTREX*



TRENKANG x FCS

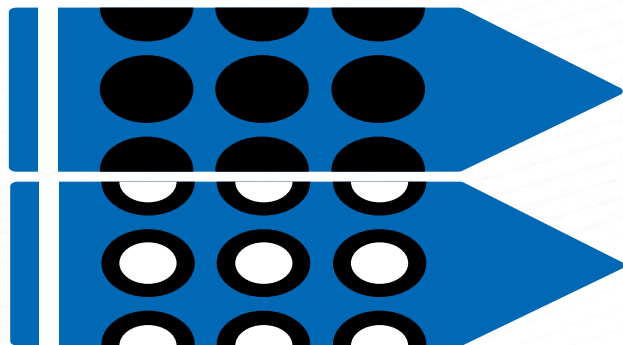
support by **Trexel**

GENTREX – *New Generation of injection tech* 新世代の射出技術

Raw Material in



Material Melting



Injection System



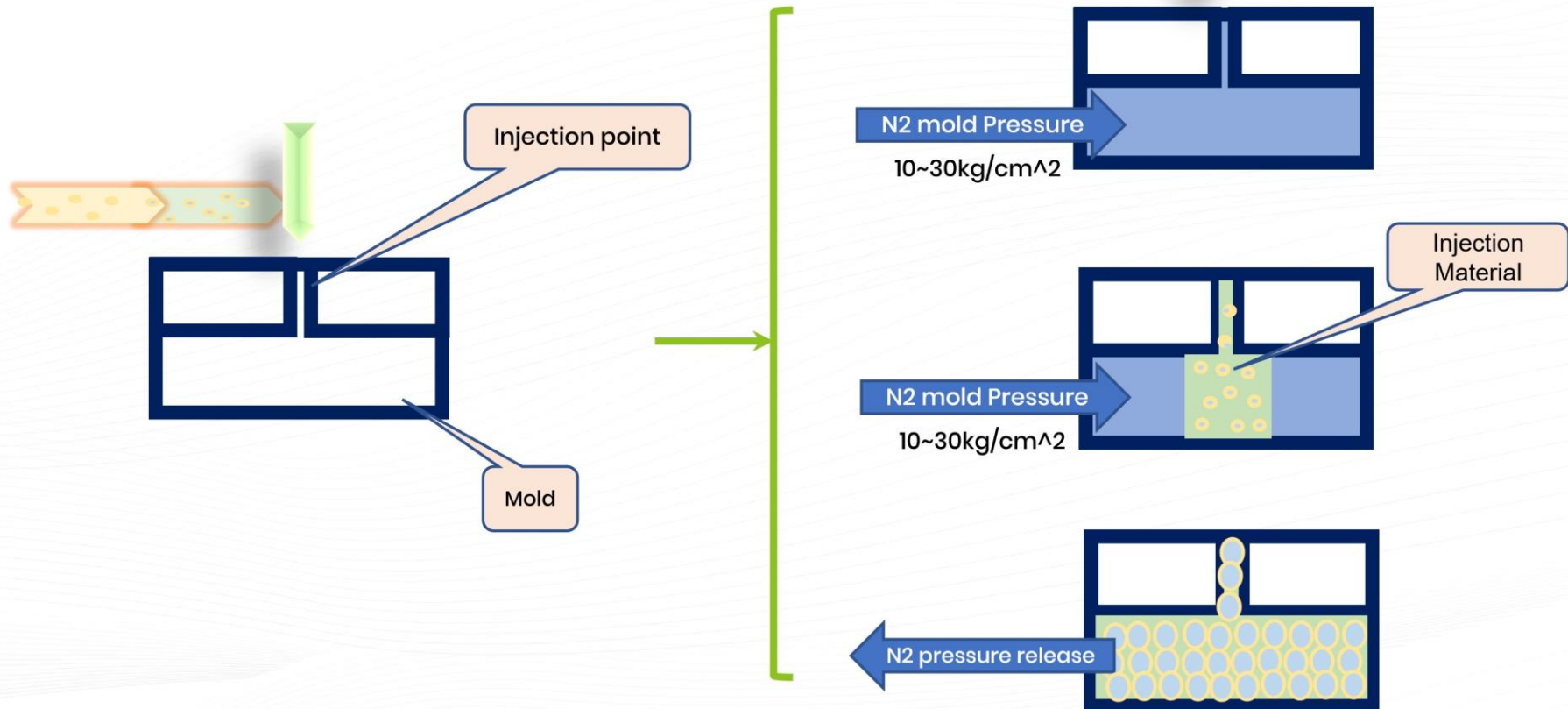
Mixing raw material with N₂

N₂ in



Runner Control

GENTREX – Molding Process 成形工程



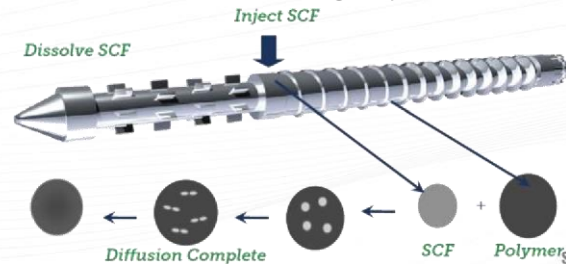
MuCell *Dosing Controls* 投与量の制御

		Without Variable Dose Technology		With Variable Dose Technology	
Shot Weight		% SCF	Dose size	% SCF	Dose size
100 grams	Ex. Size 4	0.75%	0.75g	0.5%	0.5g
150 grams	Size 7	0.5%	0.75g	0.5%	0.75g
200grams	Size 10	0.375%	0.75g	0.5%	1 g

Over dose of %SCF – large voids due to out of solution condition

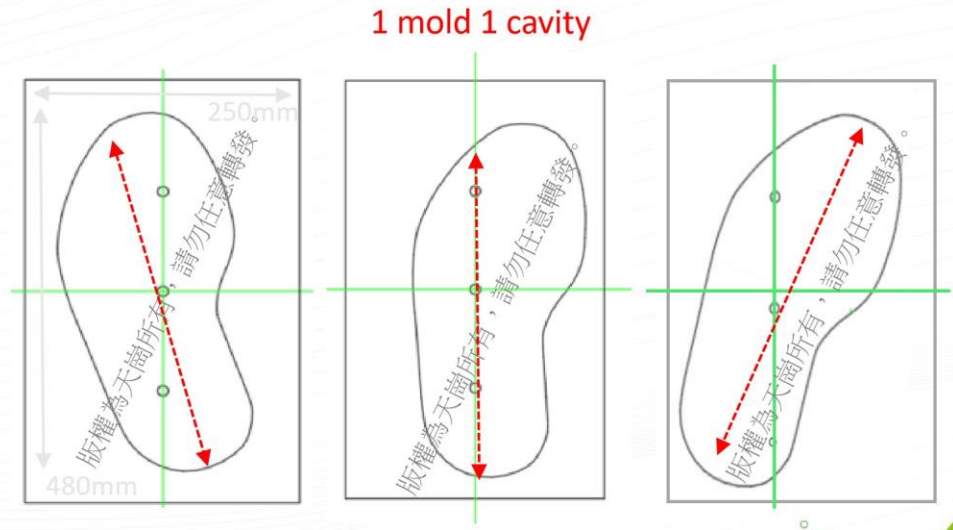
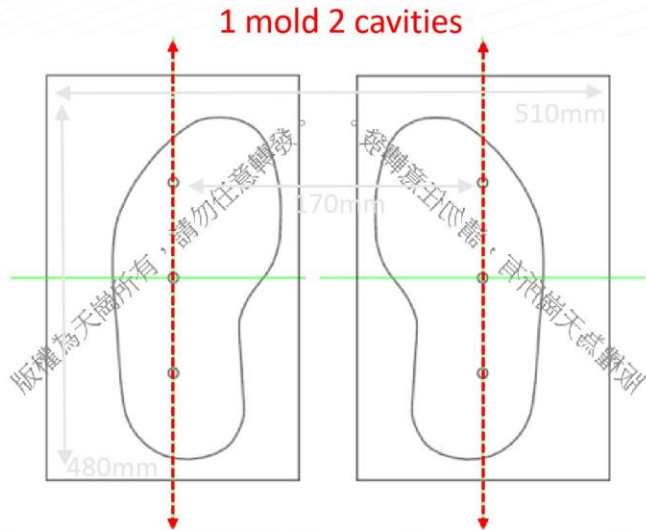
Under dose of %SCF – Cell size too large, density too high

- Fully integrated controls and communications with Trexel SCF Delivery System.
Trexel SCF Delivery System と完全に統合された制御と通信。
- Trexel Variable Dose SCF Controls Package
Trexel 可変投与 SCF 制御パッケージ
- Allow for SCF dosage to change shot to shot to match mold requirements.
金型の要件に合わせて、ショットごとに SCF の投与量を変更できます。
- %SCF constant %SCF 一定
- Actual dose varied to match shot size
実際の線量はショットサイズに合わせて変化します



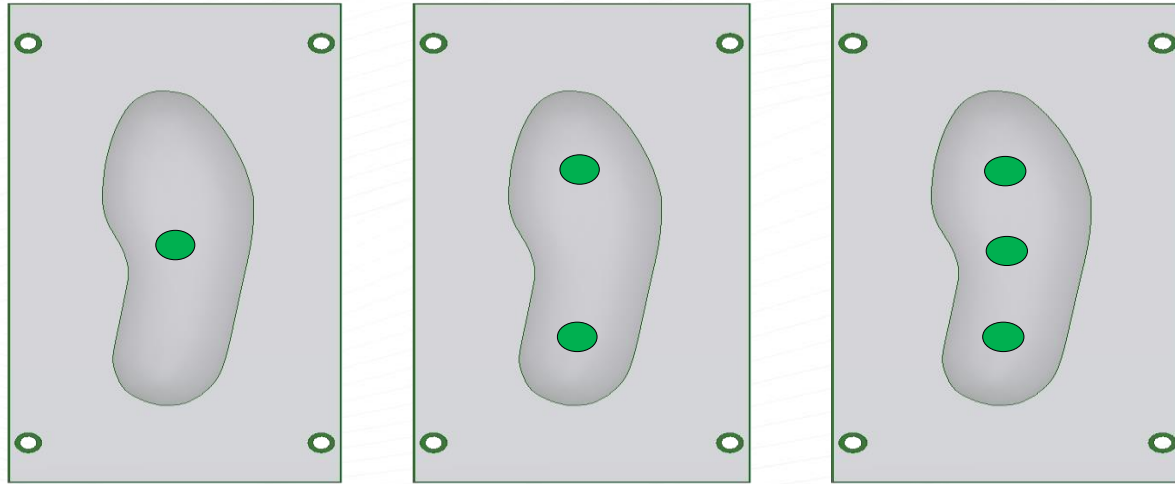
New mold design

- 1 mold 1 foot/cavity
- Cavity is flexible to fit the injection point
- Mold design is flexible



New Injection point design 新しい注入ポイント設計

- Injection points are adjustable -open/close depends on material or design



GENTREX-Product Configurations

GENTREX Mass Production options

MINI-Samples machine	TK-927-12S	One cavity one midsole	MINI- (Samples machine)	12 Stations 650 pairs/day
Mass productions	TK-927-24S -2J	One cavity one midsole	Two injection unit with full function production performance	24 Stations 1300 pairs/day



TK-927-12S
(MINI-Samples machine)

GENTREX – Working Process of TK-927-12S

Model Type: 1 Injectors 12 stations

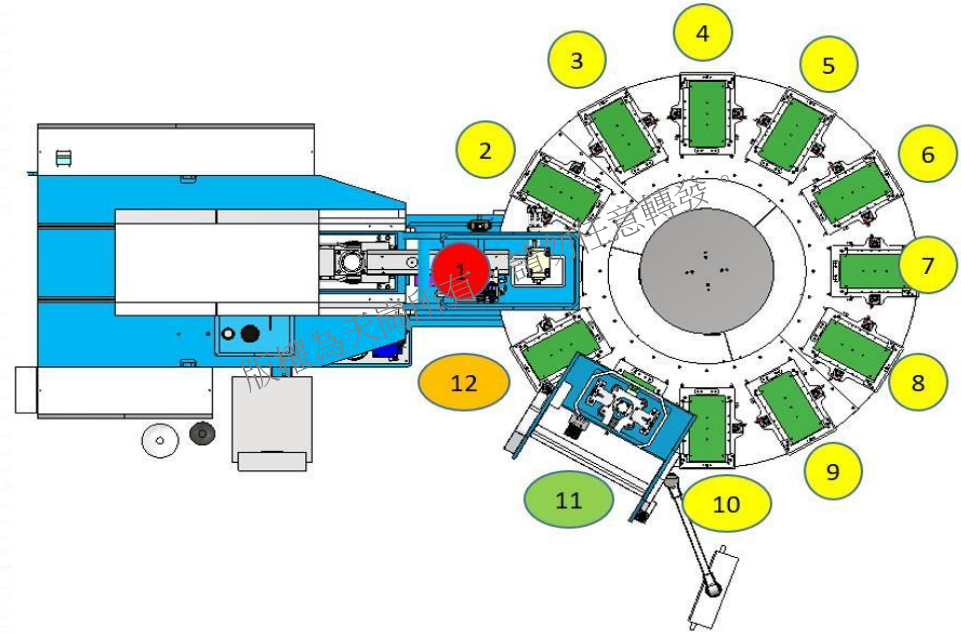
- 1: Injection Station (30tons Clamping Force)
- 2~10: Cooling station
- 11: Operating station
- 12: Ready station

GENTREX

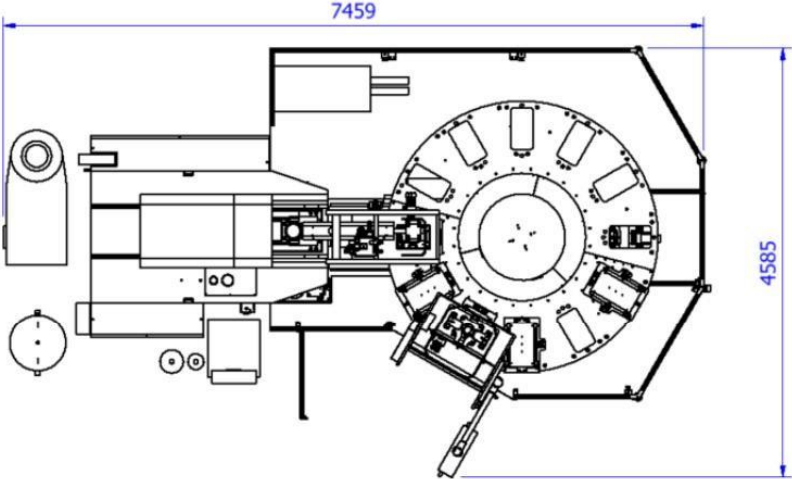
Cooling time calculation:

After injection +Cooling station

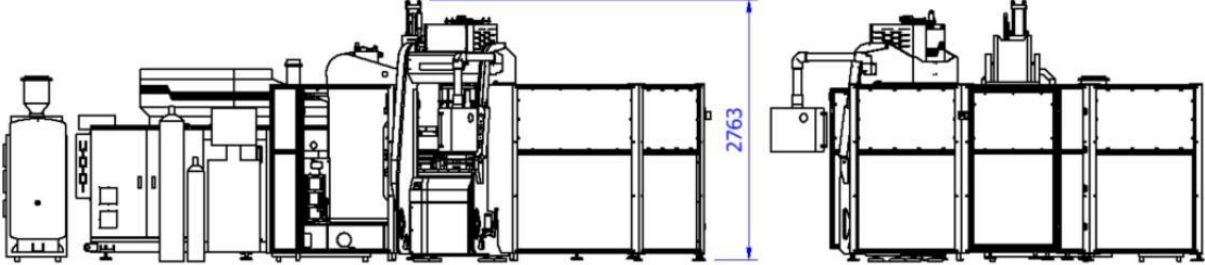
+ Before mold open



GENTREX _TK-927-12S Layout



Machine dimension (LxWxH)
6200*3500*2700 mm



GENTREX – Working Process of TK-927-24S-2J

Model Type: 2 Injectors 24 stations

1: Injection Station (30tons Clamping Force)

2~10: Cooling station

11: Operating station

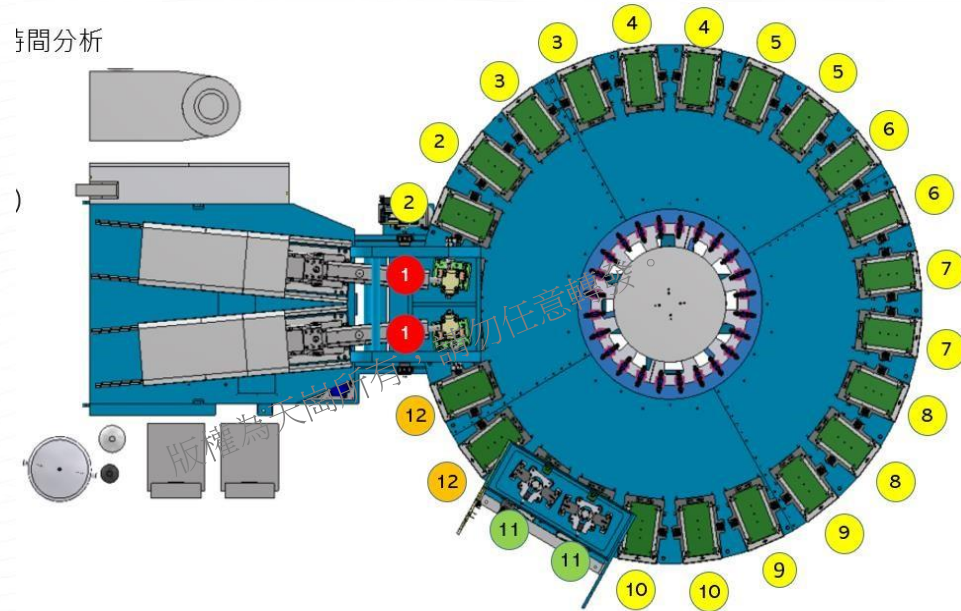
12: Ready station

GENTREX

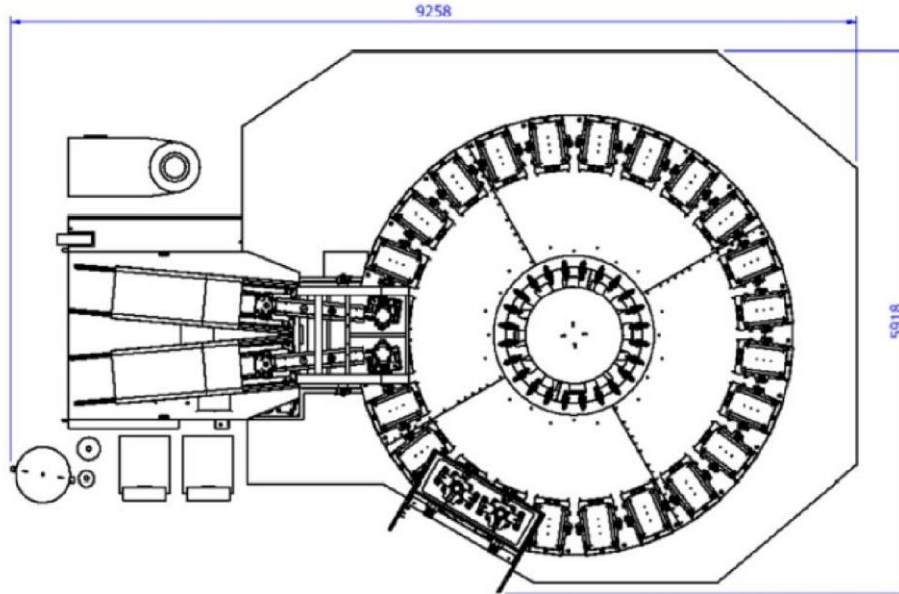
Cooling time calculation:

After injection + Cooling station

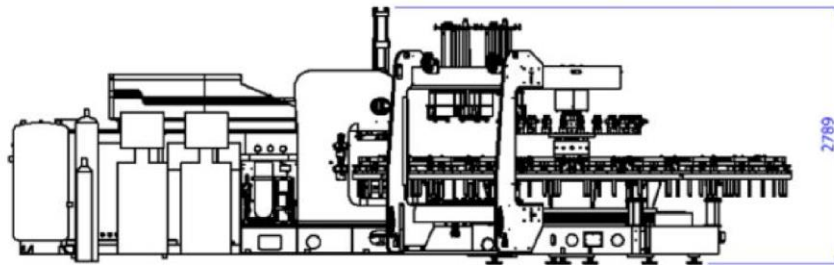
+ Before mold open



GENTREX _TK-927-24S-2J Layout



Machine dimension (LxWxH)
9500*6000*2700 mm



System Achievements- Final Configuration システムの実績 - 最終構成

- **Trexel SCF system for consistent repeatable SCF dosing**
Trexel SCF システムにより、一貫して再現可能な SCF 投与が可能です。
Consistent %SCF regardless of range of shot sizes ショット サイズの範囲に関係ない一貫した %SCF
- **FCS injection unit integrated with the MuCell process** MuCell プロセスと統合された FCS 射出ユニット。
Injection unit function optimized for foaming 発泡に最適化された射出ユニットの機能。
- **TienKang Multi-station rotary table for high output** TienKang 高出力用マルチステーションロータリーテーブル
12 and 24 station units for maximum output 最大出力を実現する 12 ステーションおよび 24 ステーションユニット
- **GENTREX controls integration** 統合された GENTREX コントロール
Seamless operation of the system システムのシームレスな運用
- **GENTREX process/materials optimization** GENTREX プロセス/材料の最適化

GENTREX – Flexible Material Type 各材料における性能比較

エチレン酢酸ビニル共
重合樹脂

熱可塑性ポリウレタン
エラストマ

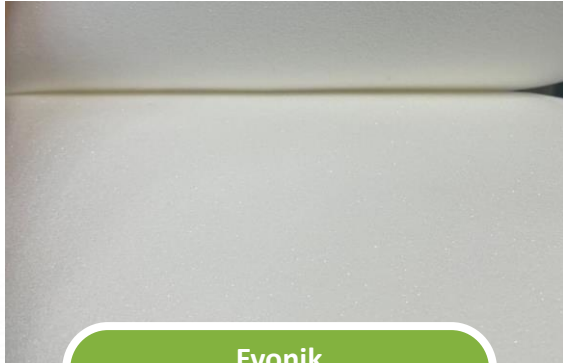
熱可塑性ポリエステル
エラストマ

ひまし油ポリアミドポ
リエーテルコポリマー

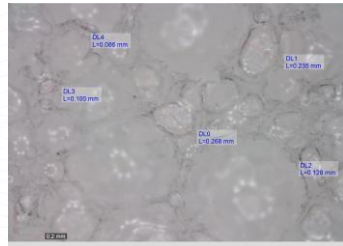
ポリエーテルブロック
アミド

Properties 試験項目	Test Method 試験法	Unit 単位	EVA 20mm	BASF TPU 20mm	DSM TPEE 20mm	Arkema PEBAX 20mm	Evonik PEBA 20mm
Density 密度	ASTM D297	g/cm ³	0.198	0.150	0.170	0.162	0.157
Hardness 硬度	ASTM D2240	Asker C	49-62	33-44	49-62	42-67	55-70
Tensile Strength 引張強度	ASTM D412	kg/cm ²	14.20	13.18	11.34	18.59	16.36
Elongation 伸び率	ASTM D412	%	363	302	212	159	129
Tear Strength 引裂強度	ASTM D624	kg/cm	11.3	11.5	11.2	18.8	12.9
Split Tear Strength 剥離強度	ASTM D3574	kg/cm	2.32	2.30	1.84	2.18	2.69
Resilience Rebound 反発力	ASTM D2632	%	44	50	61	56	57
Compression Set 圧縮永久歪	ASTM D395	%	87.4	70.9	26.2	52.7	49.6
Shrinkage 収縮率	(70°C*40 mins)	%	-0.10	0.32	0.26	0.57	0.21

GENTREX – Material production trial 素材試作



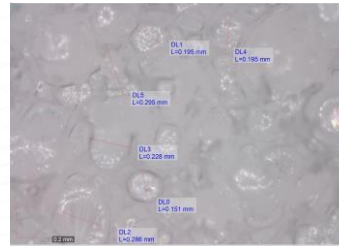
Evonik
Eco Pebax Density: 0.157



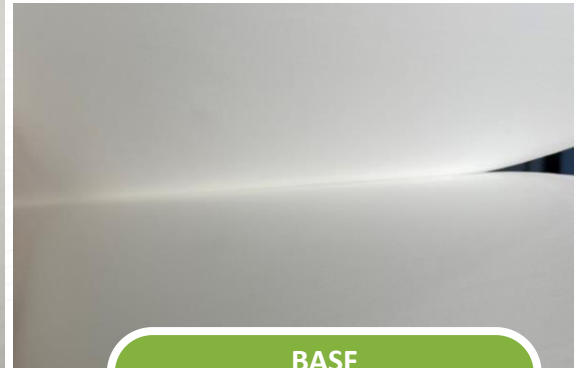
Arkema - Pebax
Evonik - PEBA
0.6 MM



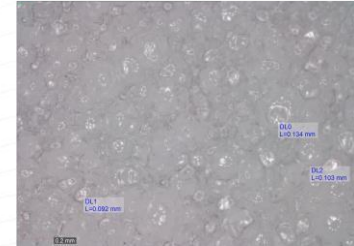
DSM
TPEE Density: 0.165



DSM
TPEE: 0.3MM



BASF
TPU Density: 0.15



BASF
TPU-0.2MM

GENTREX – Future Features 将来の機能

ロボット脱型

インサートインジェクション
(2種材料)

ダイレクト
インジェクションプロセス

パラメーターデータ
活用

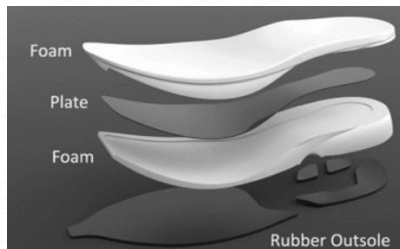
Robot demolding

Insert Injection
(dual material)

GENTREX DIP

Big Data for
parameter setting

SMART
SERIES



We Have Always Been Here



@Tienkang1982



Tienkang Taiwan



Tienkang Taiwan



Tienkang_today

STEPPING IT UP



A wide-angle shot of a modern industrial factory floor. The scene is dominated by blue-painted metal structures, including a long conveyor system with multiple parallel tracks running down the center. On the left, a series of robotic arms with black cables are suspended from the ceiling. On the right, there are safety enclosures with white grid-patterned doors. The background shows more industrial equipment and a high ceiling with structural beams. The overall atmosphere is clean and organized.

Thanks for
your attention.

The logo for IENKANG, featuring a stylized blue and yellow graphic of three curved lines to the left of the word "IENKANG" in a bold, blue, sans-serif font.

IENKANG