

# POWER & PERFORMANCE

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## FOR THE BAKING INDUSTRY



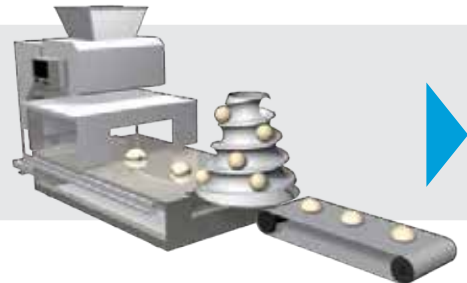
# Bread Production Process

Raw Materials Mixer



P3

Divider/Rounder



P3

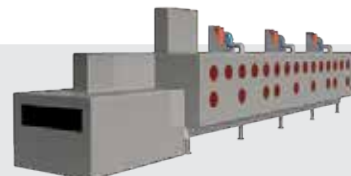


Mould cleaning

P9

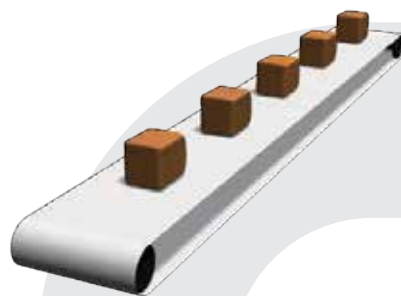


Depanner

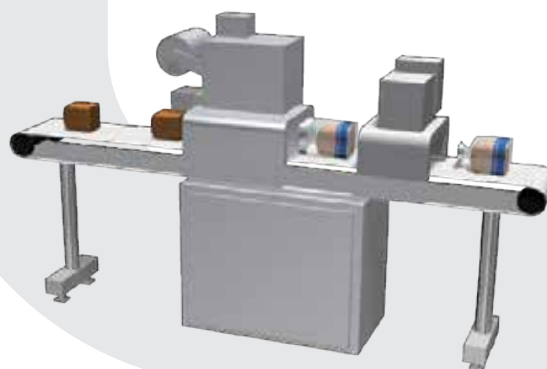


Oven

P5



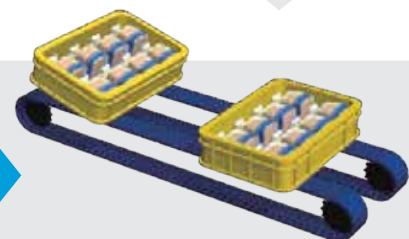
Cooler



Slicer/Bagger

P7-8

Lid storage



Initial Prover

Moulder

P4

P7-8

P9

Cover

P7-8

Final Prover

Washing Machine

P9

Stacker

P6

Shipment

# Preparation Process

Various ingredients are put into the mixer to mix the dough. The mixed dough then continues on to the dividing machine and rounding machine to shape the dough before panning.



## POWER CYLINDER

Sanitary

Power Cylinder can be used to tilt the bowl to knead the dough, and to discharge it.

With hydraulic cylinders there is a risk of oil leakage in hydraulic pressure, whereas power cylinders do not have this problem.



Simplification  
of Machine

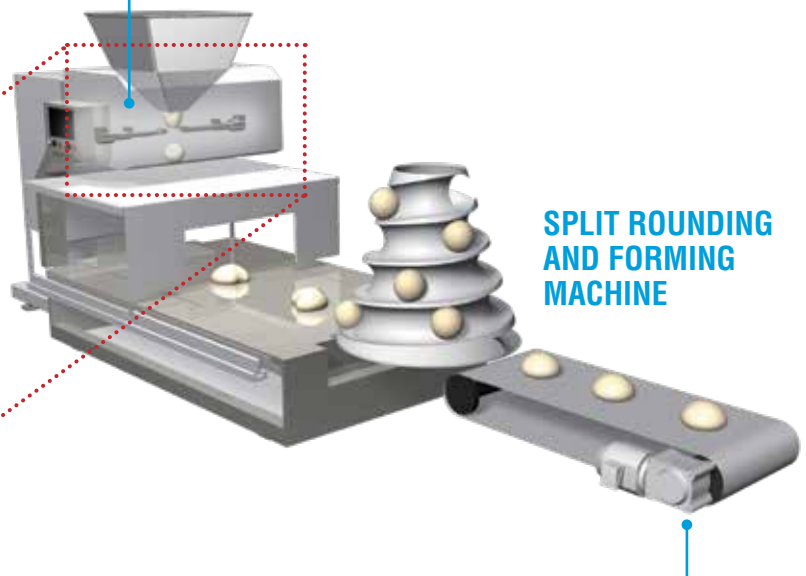
MIXER

## DRIVE CHAIN & SPROCKETS

Tsubaki drive chains are designed to be the most accomplished on the market. Bringing optimum transmission of power from motors, to sprockets and to machinery with minimal maintenance.



Compact



## SPLIT ROUNDING AND FORMING MACHINE

## FOOD TRANSPORTATION WITH HYPOID MOTOR

As the process of transferring the dough requires hygienic conditions, hypoid motors can be used.

- Food grade grease
- Finless
- Antibacterial coating.

Easy to clean

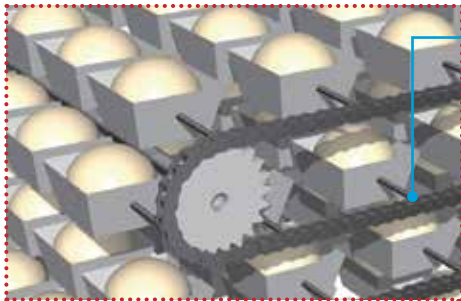
Sanitary





# Fermentation Process

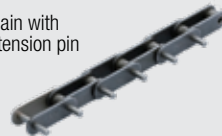
Conveyor chains play an active role in transport of the dough through the fermentation process by driving the panned dough through the prover.



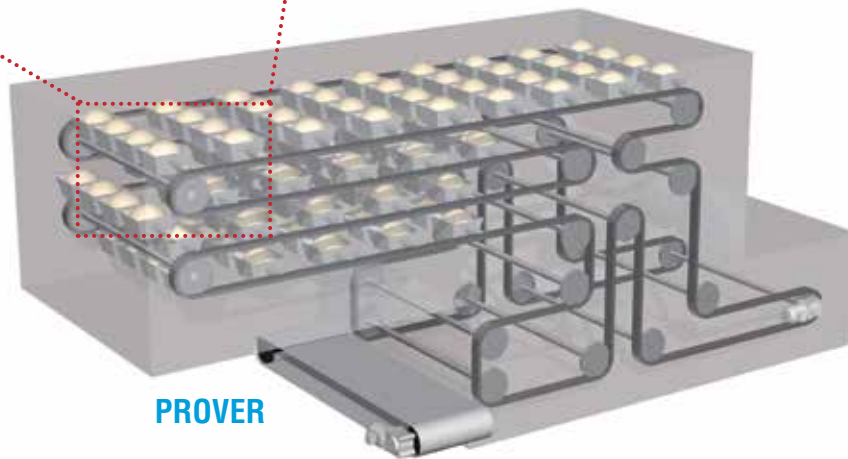
## ATTACHMENT CHAINS

Tsubaki can produce extended pins and special attachments that can be used with various brackets attached to the chain.

Chain with extension pin



Double-pitch chain with attachment

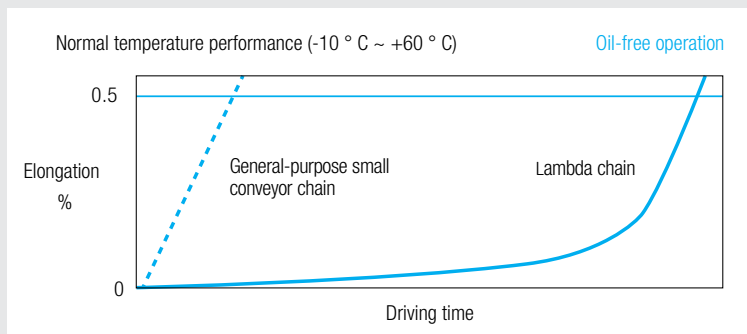


PROVER

## TSUBAKI LAMBDA CHAIN®

For transporting dough, the use of lubricating oil is recommended against. With its Oil-Free operation, Tsubaki's Lambda Chain solves this problem.

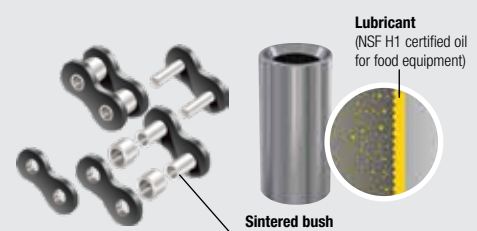
Tsubaki Lambda Chain is self-lubricating with a special oil-impregnated bush, which means that oil does not adhere to the dough.



Oil-free and Hygienic

Long Life

## Basic Structure

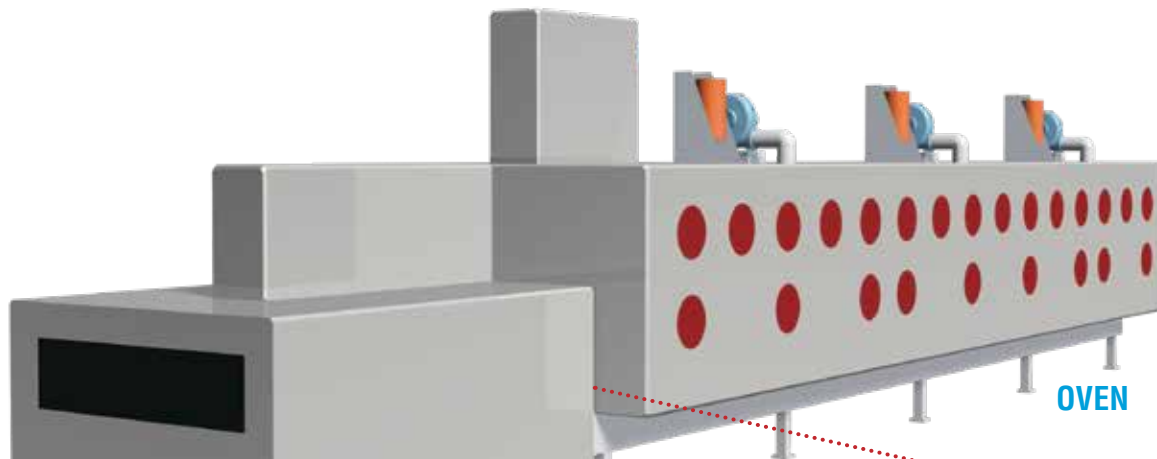


## Lambda chain High Temperature KF specification

The Tsubaki Lambda KF specification chain uses special lubricating oil that does not become volatile or deteriorate in high-temperature atmospheres ( $150^{\circ}\text{C}$  to  $230^{\circ}\text{C}$ ). Lambda Chain is NSF-H1 certified, so it can be used in food machinery that suffers from wear in high-temperature atmospheres.

# Baking Process

After the dough has been through the fermentation process in the prover, the dough is now baked in an oven over time. Tsubaki conveyor chains are used for pan transport throughout the oven.



## TROI DRIVE

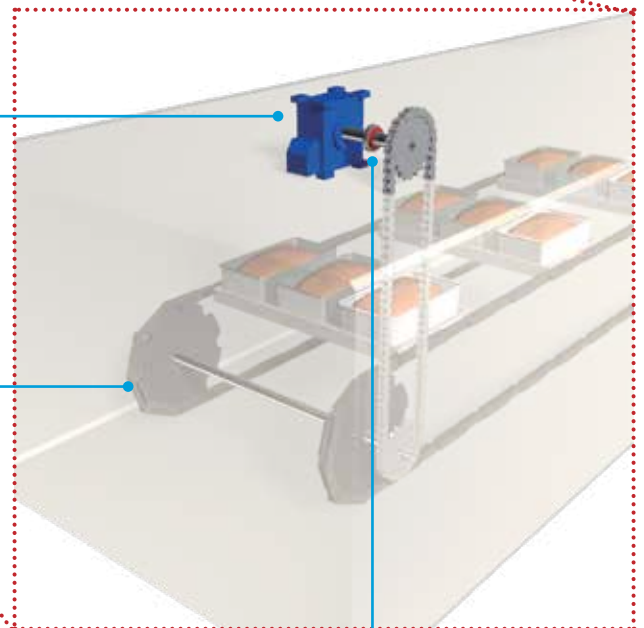
A high-efficiency, compact drive is used for the long-running oven's chain drive.



*TroiDrive*

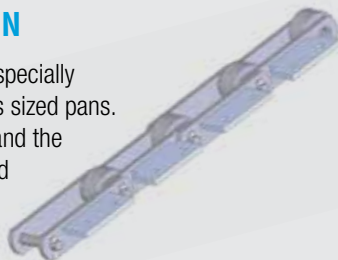
Sanitary

Compact



## LARGE CONVEYOR CHAIN

Pitches and attachments can be specially manufactured to transport various sized pans. Because the oven length is long and the load is high, chains with increased tensile strength and improved wear resistance are also used.



## TORQUE GUARD

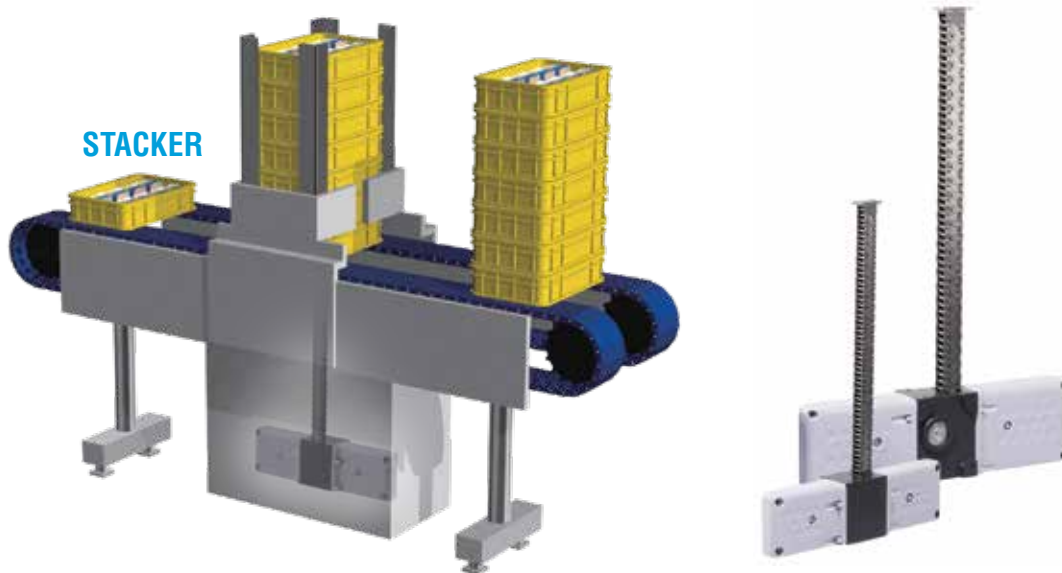
### Overload Protection

Shock guards are used to prevent damage to the equipment when an overload occurs. The mechanical type can be easily restored automatically, preventing a significant line stoppage.



# Lifting device (stacking)

For all stacking and lifting needs in the bread manufacturing process, the Tsubaki Zip Chain Actuator can be used. Compared to traditional lifting methods such as hydraulics and air, the Tsubaki Zip Chain Actuator saves space and power, while also improving speed.



## ZIP CHAIN ACTUATOR

A zip chain is a chain that can be pushed and pulled with a long stroke when two chains are engaged like a zipper to form a solid column. In addition, the disengaged chain can also be stored compactly.

Compared to hydraulic cylinders, the Zip Chain Actuator has many features such as space saving, high speed and high frequency operation, multi-point stop function, high stop accuracy, and mounting in any direction.

### Chain Tip Bracket

Integrated with the chain. Mounting is possible from either top or bottom.

By connecting our own special tooth-shaped pin gear and chain, power is transmitted without waste.

Made of resin, it achieves smooth chain sliding and compact storage.

## Features

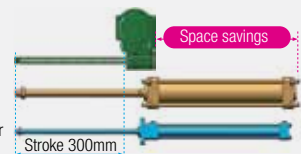
### 1. Compact

It can be installed in a smaller space than various linear actuators. (Superior space saving)

- ZCA125M030-

- Hydraulic cylinder

- Pneumatic cylinder



### 2. High speed

High-speed operation is possible compared to screw-type and oil / pneumatic cylinders. (Max speed: 1000mm / sec)

### 3. Ecology

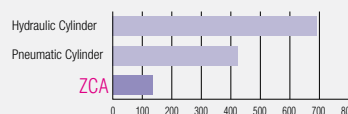
Comparison of annual CO2 emission ratio

ZCA: pneumatic cylinder: hydraulic cylinder = 1: 3: 5

Comparison of annual power consumption ratio

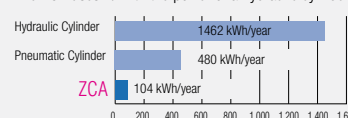
ZCA: pneumatic cylinder: hydraulic cylinder = 1: 5: 14

CO2 emissions from various linear actuators [kg-CO2]



### Annual Power Consumption

The ZCA uses 1/14th the power of a hydraulic cylinder



- Comparison conditions

Thrust: 1 kN

Speed: 200 m/s

Stroke: 500 mm

1 cycle/min. x 12 hrs x 250 days/year  
Includes various drives (induction motor, pneumatic/hydraulic units)

- For comparison purposes. Conveyor disposal/recycling are considered equal and have been omitted from the LCA evaluation.

- Reference: Japan Environmental Management Association for Industry MILCA Ver. 1.20, Tsubaki catalogs, etc.

### 4. Multipoint Stopping

Can be stopped at multiple arbitrary positions with high precision.



### 5. Installation Freedom

Lifting installation

Horizontal installation

Horizontal installation

Hanging installation



# Pan Transportation






Tsubaki plastic top chain is used in the process of transporting food moulds and metal trays. Unlike metal chains, if a plastic top chain is used, the risk of contamination by metal contact is low and food safety can be maintained.

## PLASTIC TOP CHAIN BTC8H & TTUPS840H

BTC8H-826M (for straight) as a transport plastic chain.  
TTUPS840H is used where cornered or curved transport is needed.

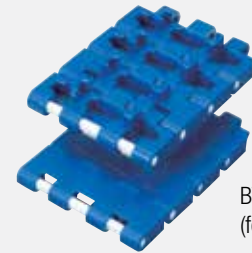
\* Food-friendly blue and anti-static gray are standard products

Special materials are also available for the following applications.

- |  |   |
|--|---|
|  Wear resistance (LF series)      | Ideal for places where accumulation takes place   |
|  Impact resistance (DIA)          | Ideal for places subject to impact  |
|  Antibacterial / antifungal (MWS) | Prevents the growth of bacteria and protects food safety  |
|  Heat resistance (KV series)      | Ideal for oven exit   |
|  Metal detection (MPD, MPW)       | Even if the plastic top chain is damaged, it can be detected with an existing metal inspection machine. |

Note) BTC8H and TTUPS840H cannot be manufactured for heat resistance and metal detection specifications.  
A different chain will be used for these instances.

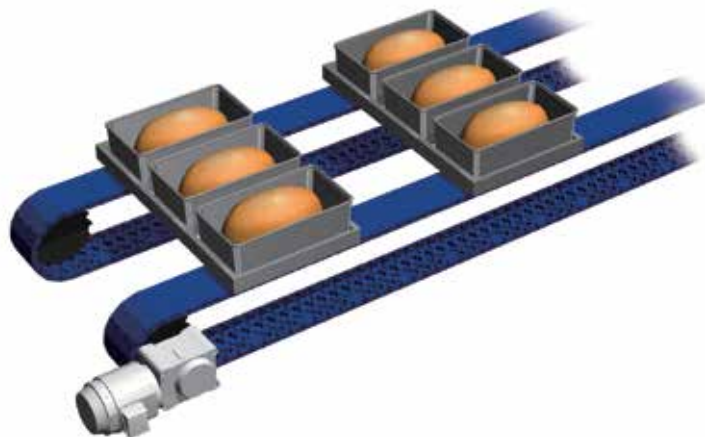
### Sanitary



BTC8H type  
(for straight lines)



TTUPS840H type  
(for curves)



## FOOD TRANSPORT - HYPOID MOTOR

In order to protect food safety, even during the process of cooling the baked bread, food transport grade hypoid motors can be used.

- Food grade grease
- Finless
- Antibacterial coating.



## TSUBAKI PLASTIC RAIL

Conforms to food safety standards. Features excellent slideability, wear resistance, chemical resistance, and impact resistance, and will not absorb water.





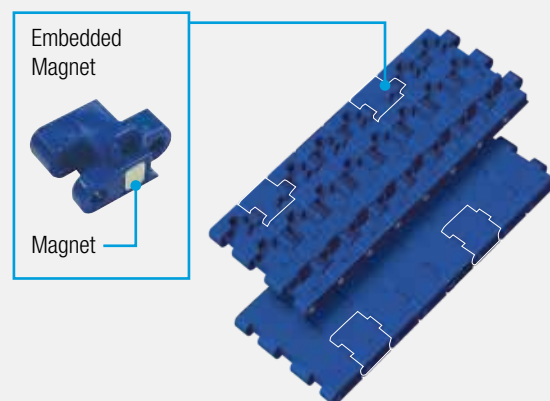
# Tray Transportation

For inclined conveyors and processes that use cooking oil in the bakery, the BTM8H plastic top chain is available. This chain has a magnet embedded in the plastic which is used to ensure reliable conveyance of metal pans under inclined or slippery conditions.

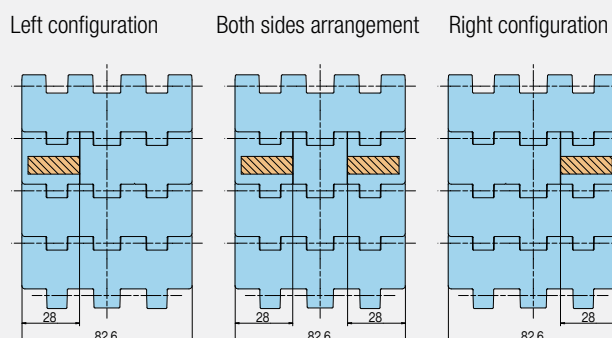
## BTM8H-M TYPE (MAGNET TYPE)

Since the magnet can be arranged freely, it can be arranged according to the mould size and tilt angle.

### Magnet type suitable for inclined transport



### Magnet arrangement example



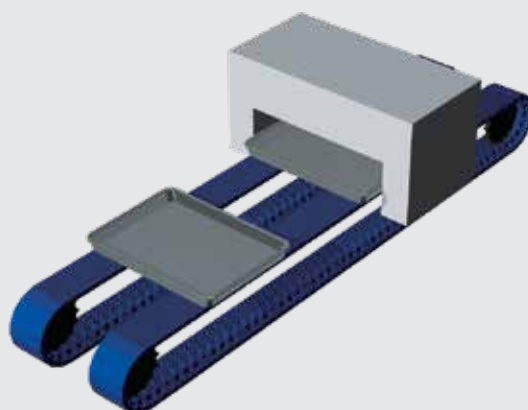
## INCLINED TRANSPORT

The BTM8H type with embedded magnets solves the problem of trays sliding on inclined conveyors, and also solves the problem of metal contact in a food environment.



## COMBATTING SLIP

The BTM8H plastic top chain can also be used when cooking oil such as butter is applied to trays and products in the production process, which makes baking trays slippery and difficult to convey. Embedded magnets in the BTM8H chain solves this problem.

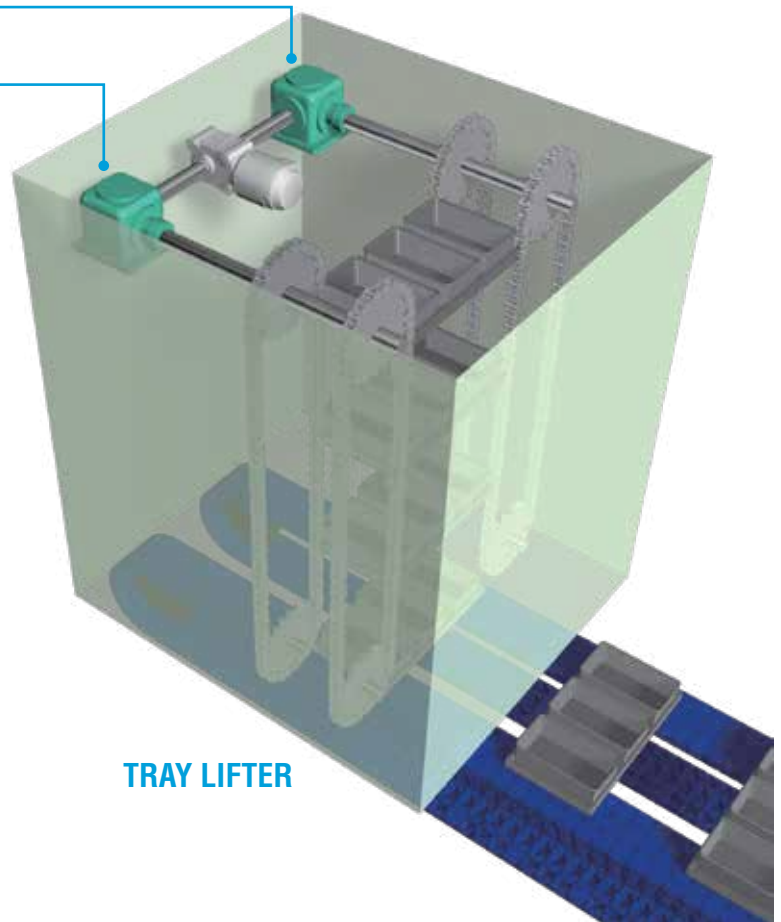


# Other Related Equipment

Tsubaki plastic top chain is used in the process of transporting food moulds and metal trays. Unlike metal chains, if a plastic top chain is used, the risk of contamination by metal contact is low and food safety can be maintained.

## MITER GEAR BOX

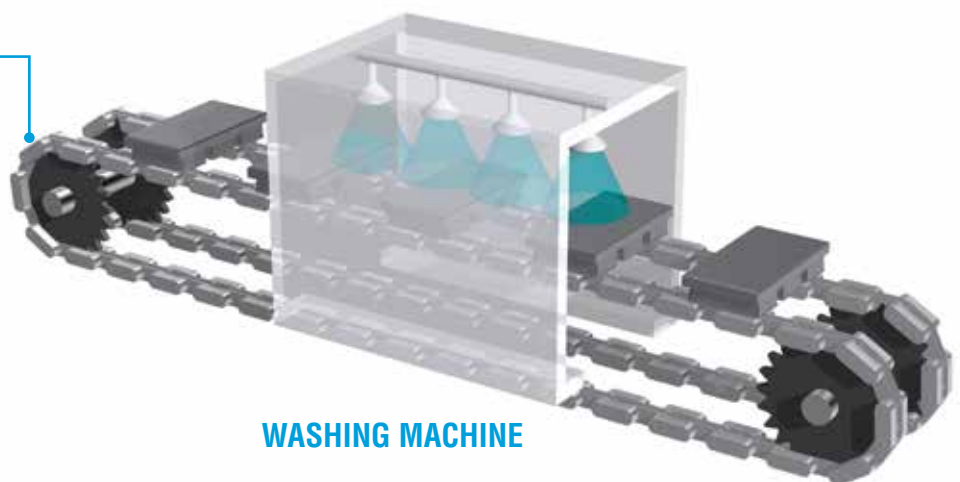
In tray handling processes, a chain is used to move the trays up and down, and a right-angled Miter gear box is used to drive these chains.



TRAY LIFTER

## DOUBLE-PITCH CHAIN WITH MAGNET

A magnet chain is used in the washing machine to withstand water pressure. In addition, the seamless stainless steel cover protects the magnet and prevents foreign matter from entering due to breakage.



WASHING MACHINE

# Tsubaki Sprocket Solutions

Tsubaki has been manufacturing sprockets since 1951. Tsubaki offers sprockets ready-made and made-to-order. Sprockets made-to-order are highly engineered according to customer specifications, with tight tolerances and innovative designs. All Tsubaki sprockets provide seamless interface with premium quality Tsubaki chains.



Tsubaki stands out in sprocket manufacturing through our commitment to quality and service. Selecting the highest grade materials together with controlling our in-house manufacturing processes make Tsubaki your best partner for complete chain drives.



## Tsubaki Smart Tooth™

TSUBAKI SMART TOOTH® sprockets offer users the ability to identify and schedule drive system maintenance before critical component failure occurs. Strategic placement of our patented Wear Indicator pins on one or more sprocket teeth provides visual indication that a sprocket is still within the allowable wear tolerance, or that it needs to be replaced. Available on both roller chain and engineering class chain sprockets.

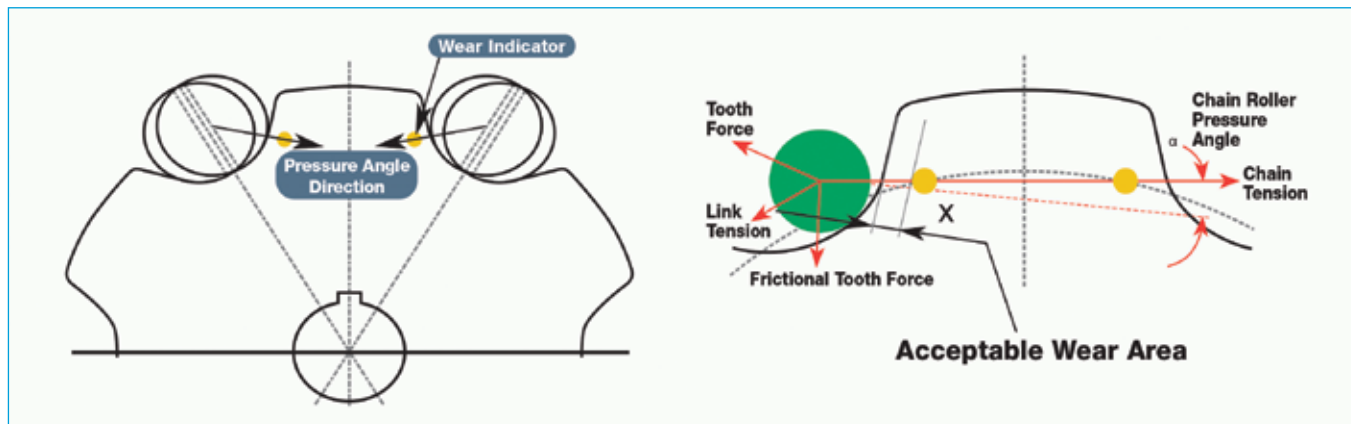


Figure 1 - Theory of Operation

Figure 1 displays how wear indicator pins are strategically placed on the thrust faces of the sprocket tooth, where the resultant pressure angle of the chain roller would create wear.

Figure 2

Comparison - New (1) vs. Worn Sprocket (2)

Figure 2 provides a comparison and example of a sprocket that was removed from service due to chain failure. Notice the difference in chain engagement between the new and worn sprocket.

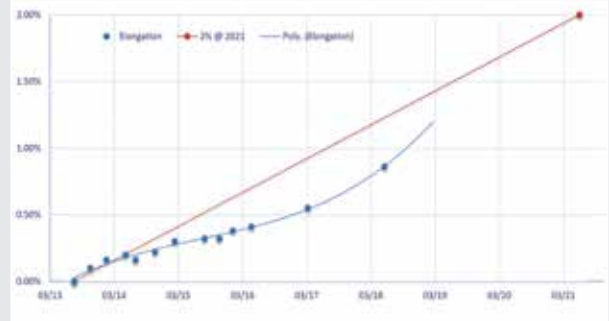


# Tsubaki Reliability Programs

Understanding performance and service life requires quality data collection and analysis. Product wear profiles provide context to allow accurate projections of expected operating life. Tsubaki Reliability Programs are individually tailored to suit your application and needs.

## ON-SITE INSPECTION

Regular check-ups of system health with recommendations for improvement.



## STRIP AND ASSESS

Used product is stripped for sub component analysis against critical limits and assessed for repair.



### APPENDIX A - PART MEASUREMENTS

In Table 1 below the last part of the system (column) has been marked orange to indicate that those figures are subject to further assessment. The measurements taken are those given to the client for comparison to design.

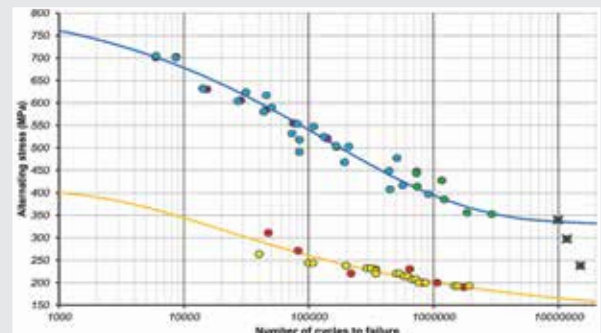
Component	Wear				Gap			
	Start	End	Start	End	Start	End	Start	End
Pin (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71
Bush (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71
Pin (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71
Bush (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71
Pin (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71
Bush (mm)	12.71	12.71	12.71	12.71	12.71	12.71	12.71	12.71

Table 2 below indicates the wear assessment of the parts where broken bushings are found (green light).

Component	Start		Wear %	End	
	Start	End		Start	End
Broken Bush	12.71	12.71	12.71	12.71	12.71
Pin (mm)	12.71	12.71	12.71	12.71	12.71
Bush (mm)	12.71	12.71	12.71	12.71	12.71

## ENDURANCE TESTING

A sample of chain is loaded at high frequency until failure at our Kyoto research facility to accurately determine remaining service life.



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Contact our engineering team to discuss services applicable to your industry and application requirements.

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