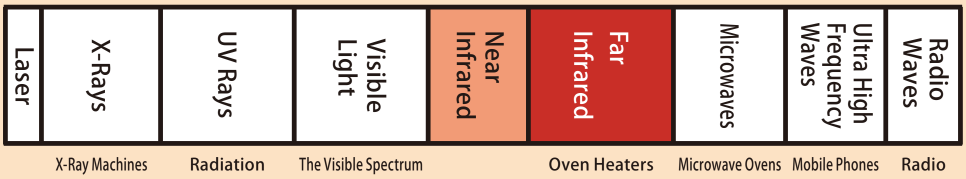
CATALOGUE

Far Infrared Industrial Equipment Catalogue



About Far Infrared Ray Ovens

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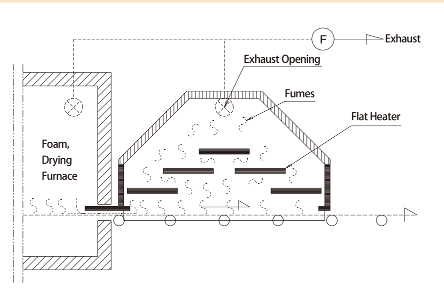


Condensation Prevention Equipment

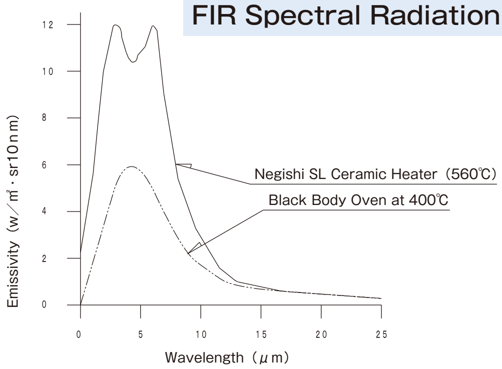
株式会社 根岸製作所
NEGISHI MFG. CO.,LTD.

About Far Infrared Rays

Far Infrared Rays

Far Infrared Rays (FIR) are electromagnetic waves with a wavelength between 4-30 μm and a frequency between 12-75THz.
This doesn't fall within the visible wave spectrum (waves with frequency of between 385-790THz) and as such cannot be seen with the naked eye.
Although electromagnetic waves longer than microwaves (radio waves) are transmitted via antenna, FIR have such a short wavelength that transmission via those kind of devices isn't possible.
Instead, the method used to produce FIR is that of heating ceramic elements,with FIR being emitted from the heated ceramic.
The ability to use this method is thanks to advances in ceramic manufacturing that took place at the start of the 1980s.
These advances led to the development of ceramics that could produce FIR efficiently and mean that nowadays FIR can be used in a diverse range of processes.

FIR Spectral Radiation



Negishi SL Ceramic Output Characteristics

Negishi SL Ceramic

At Negishi MFG we use Negishi SL Ceramic, a proprietary ceramic combining over 12 materials, including aluminium and zirconium.
One strength of our ceramic is its output, as seen in the accompanying spectral radiance graph,
with its peak wavelengths of 3 μ mand 6 μ m (at 560° C).
Negishi SL Ceramics can range from a thickness of 300 μ m ～ 6mm to adapt to required usage and intended application.

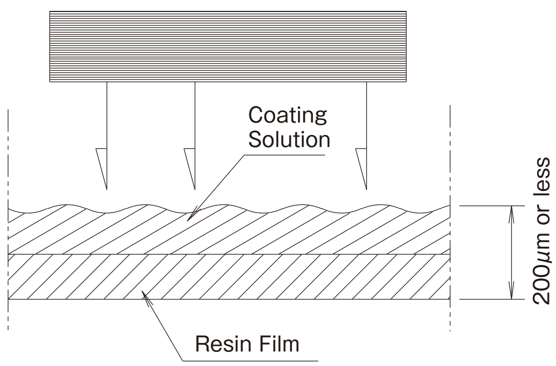
Negishi SL Ceramic Heater (Negishi MFG's proprietary heater)

Our specially developed heaters are built with SL Ceramic elements, a unique cast metal body design with a thin ceramic coat.
Designed to be used in a potentially explosive environment, it produces even heat distribution across the heater element (less than ±1℃) and is a safe, durable and long-lasting heater.

The Heating and Drying of Materials

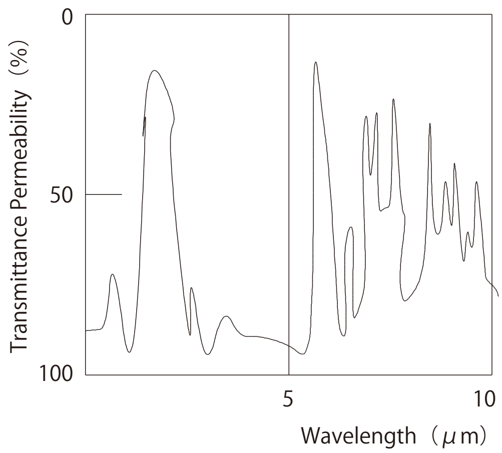
The infrared (IR) absorbtion spectrum of a large range of materials falls between 2 ～ 30 μ m, therefore when those materials are exposed to the far infrared waves emitted by ceramics, rapid molecular movement is generated.
The resulting molecule motion causes bonds to break and this increased thermal energy heats and dries the material.
Molecular movement occurs at depths of up to 200 μ m from the surface of the material.
Anything greater than this causes heating and drying to occur via thermal conduction rather than molecular motion.
As coatings are usually less than 100 μ m thick, this allows them to quickly dry through the thermal energy produced by molecular movement.
This IR spectrum refers to the wavelengths at which FIR is absorbed by materials, and so the film sheets, paper, water, solvents and other substances used in our processes such as coating have these characteristics.

Far Infrared Ray Heater



Total Thicness 200μm>Coating thickness Rapid molecular movement and thermal energy

Thinner IR Spectrum



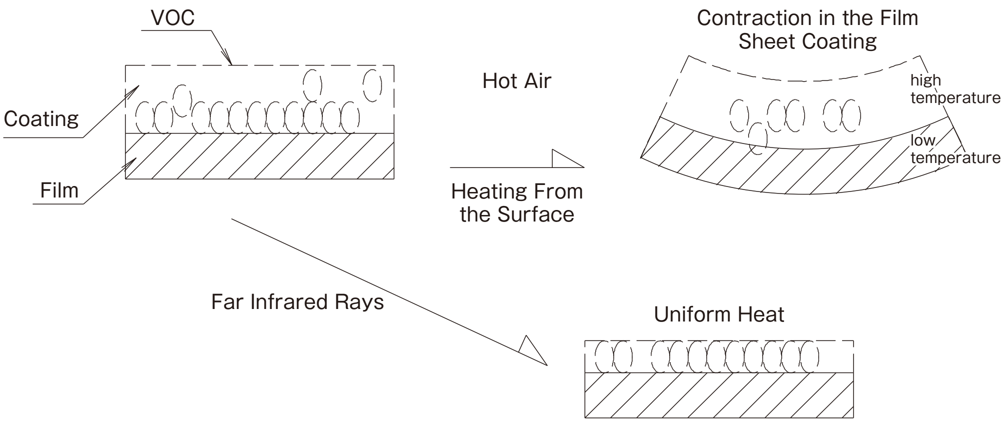
The Advantages of FIR Drying in Comparison to Hot Air Drying

When comparing FIR drying with hot air, FIR drying is often said to be quicker. As well as this though, there are other ways in which FIR performs favourably.

① Warping Prevention

FIR heating, unlike hot air heating, can prevent the occurrence of warping in materials.
Warping is caused by heat shrinkage that occurs during the heating process after the coating is applied.
With hot air, the heating occurs from the surface of the coating, heat transferring through it and then to the substrate.

A Comparison Between FIR and Hot Air's Effect on the substrate



This leads to the coating becoming hotter than the substrate, making it difficult for VOCs to evaporate and resulting in air bubbles remaining in the inner coating.
This creates tension on the surface layer, causing shrinkage and a variance in dimensions, and creating the conditions for warping to occur.
With FIR however, heat transfer occurs through radiant heat, which heats the inner sections gradually and allows for uniform heat distribution across the material and coating.
This consequently doesn't lead to a large variance in dimensions and therefore warping is much less likely to occur.

② Air Bubble Prevention Resulting in a Glossy Finish

Heating by hot air results in higher temperatures closer to the surface, meaning that VOCs may quickly evaporate and a membrane may quickly appear on the surface.
Due to this, when the VOCs are released and break down, the resulting gas creates air bubbles that are trapped by the membrane.
The particle size of these air bubbles falls within the visible wave spectrum, causing the coating film to appear cloudy, losing its sheen.
FIR drying doesn't produce such a membrane, allowing the air bubbles to be released and ensure the coating has a glossy finish.

■ Distance Between FIR Heaters and the Product

Customers often ask about the correct distance between their products and our FIR heaters to set.
This differs depending on the form of the heater, but below is what we have learned from our experiments and experiences with the technology.

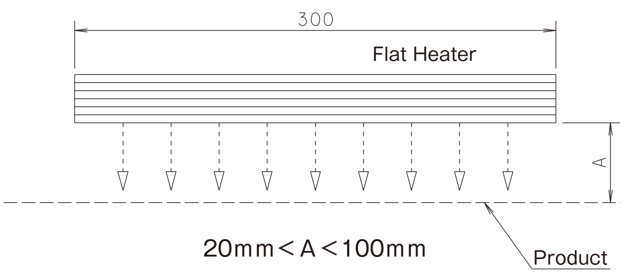
Rod Type

Ordinarily, sheath heaters, cartridge heaters and quartz tube heaters contain coiled nichrome wires and emit FIR through radiation and reflection.
They are efficient heaters, but have poor heat distribution,
so to mitigate the FIR output the products are placed at a distance of 80-150mm from the heater.
As the temperature rises above 500° C there is a possibility of mid and near infrared rays also being emitted. Using a reflective plate increases this effect.

SL Flat Type

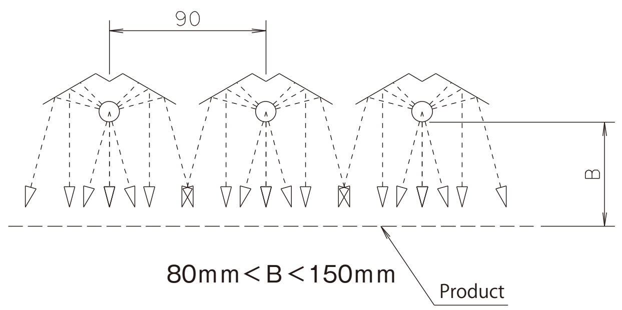
Constructed to be 100mm wider than the product, SL ceramics mainly apply radiant heat.
There is no inconsistency in temperature with this type of heater and therefore no need to use distance to mitigate the emitted FIR. They are used at a distance of 20-100mm from the product.
Although it is often officially explained in the formular ect that electromagnetic waves get weaker in proportion to the square of the distance from the emitter, in reality we have observed that this is not such a significant factor
and when judging the appropriate distance we also take into account the effects of temperature disparity on the quality of products produced.
During the annealing process, the SL ceramics are placed close to both the upper and lower surface of the product, and at a distance of 60mm for drying.
At Neigishi we can draw upon our wealth of experience in the industry to determine the most appropriate and effective distance required.

SL Flat Heater Radiation



20mm＜A＜100mm

Rod Type Heater Radiation and Reflection



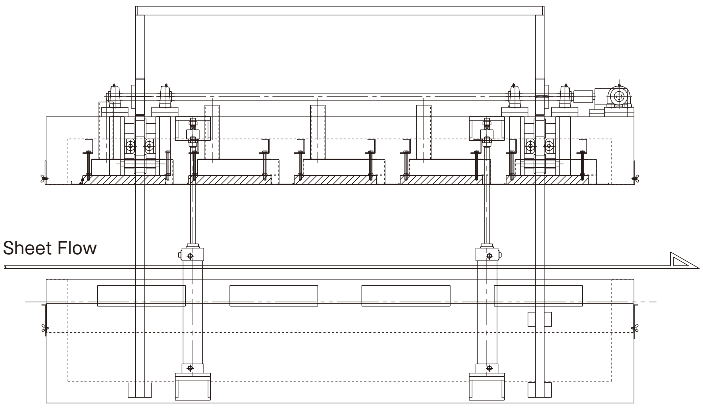
80mm＜B＜150mm

Far Infrared Ray Ovens

Employing electromagnetic far infrared rays（FIR）, these heating devices are safe, quick heating and clean.Those materials with electromagnetic spectrum absorbtion bands in the same range as FIR（such as resin, paper, water and solvents）are especially quick to dry.

Far Infrared Ray Oven Structure

At Negshi MFG we highly recommend our vertical hoist ovens, which maintain a horizontal heater surface as the upper part is lowered and raised to open and close the oven.
Constructed to prevent gas remaining during work stoppage, and including an easy to utilise electromagnetic wave isolation shutter to prevent products in the oven overheating, our vertical heaters are constructed with safe operation in mind.
The hinge-less design also allows for easy cleaing and maintenance.
To ensure that the heat from inside the machine doesn't transfer to the outer walls, the heaters are well insulated.
These ovens can be designed with a hinge or door open/shut mechanism depending on requirements and application.



A Vertical FIR Oven When Opened

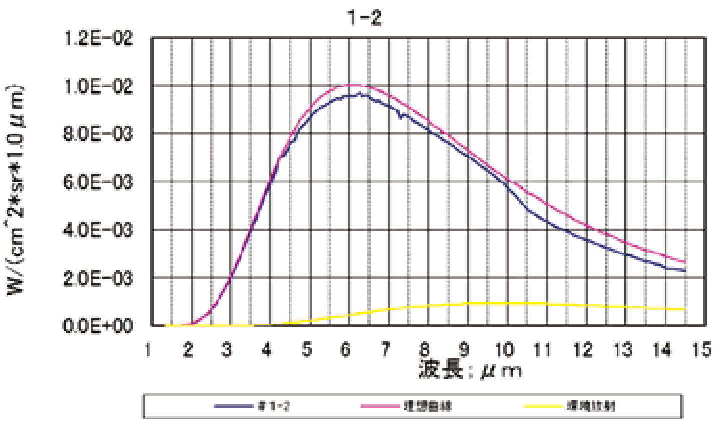
Far Infrared Ray Heaters

Heater Structure（Flat Heater）

When mentioning FIR heaters, the most common are rod types and block types.
At Negishi MFG however we utilise flat heaters constructed with high quality materials that are designed to be wider than the product.
These pure, high quality materials, including 30mm thick aluminium, brass and copper, provide superior thermal conduction and are specially constructed for uniform heat distribution and are installed along with a sensor.

Far Infrared Emitting Ceramics

The surface of our flat type heaters are coated with our high quality proprietary SL ceramics, whose spectrum characteristics and performance can be seen in the accompanying graph.
These ceramics have been specially designed and arranged by our team so that they can emit an almost ideal level of FIR even at low temperatures.



Negish SL Ceramic IR Spectrum Characteristics at 203℃

Hybrid Ovens

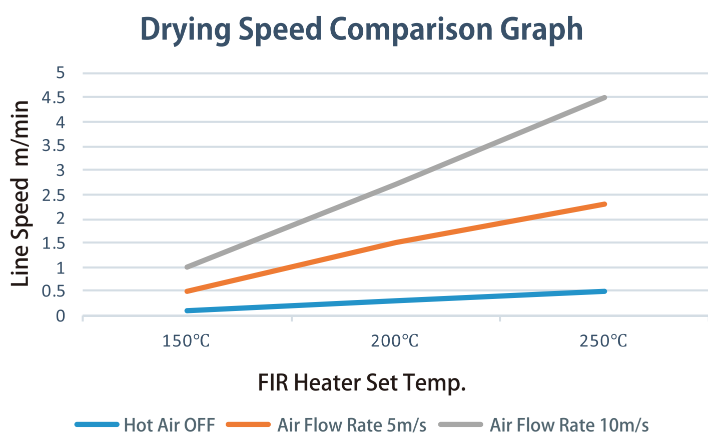
For applications that prioritise drying speed, we recommend a hybrid oven, employing both FIR and hot air.
The hot air utilised in these ovens provide an effective method of preventing solvent adhesion.

Eco Hot Air Type

In these devices a heat exchanger converts the residual heat at the back of the IR ceramic heater panel into clean hot air.
This process ensures that both the running costs and the initial cost are kept low.
The hot air temperature is set at 60% or below that of the FIR heater, but the temperature and air flow rate can be adjusted.

Separate Heat Source Type

For applications that require a hotter temperature than the eco hot air type can provide, we can also install a separate heat source（steam, electric as well as others）.



FIR and Hot Air Speed Usage Comparison Graph

Comparison With Hot Air Drying Ovens

①The effects caused by different method of heat transmittance

	Hot Air	FIR	FIR Advantages	Result
1	Heat conduction from the surface	Heat permeation toward deeper areas	A small difference between surface and interior temperature	A short heating time
2	High temperature heating only	Low and high temperature heating possible, with precise temperature control	Occuence of heat shrinkage is low	The product quality is uniform and occurrence of deformation is low
3	High temperature heating	Low temperature heating	Low occurrence of air oxidization	Low occurrence of long term discolouration
4	Drying from the surface	Uniform drying	No membrane formation	No air bubbles form inside the membrane therefore the coating has a sheen
5	Wrinkles caused by hot air	Uniform heating across the product width.	Relieve stress on the sheet interior	Uniform product quality. No warp or curvature
6	Wind ripple patterns on the product surface cause by blown air	Heating from the interior outwards	No patterns form on the surface of the product	A clean, uniform surface

②The difference between hot-air and FIR drying times

No.	Material	Ink	Coating Thickness	Product Temp. (Max)	Client's Hot Air Drying Time
1.	Film (PP)	Emulsion	Dry 15 μm	≦60° C	Approx.15s
2.	Film (PET)	Emulsion	Dry 25 μm	≦100° C	Approx.30s
3.	Film, Paper	Emulsion	Dry 12 μm	≦60° C	Approx.15s
4.	Carbon	Solvent (Ethyl Acetate)	Dry 20 μm	≦120° C	Approx.2m
5.	Carbon	Solvent (MEK, Ethyl Acetate)	Dry 15 μm	≦150° C	Approx.2m
6.	Ceramic Sheet	Solvent (Ethyl Acetate)	Dry 15 μm	≦100° C	Approx.2m
7.	Carbon	Emulsion	Dry 10 μm	≦360° C	Approx.30m
8.	Carbon	Emulsion	Dry 30 μm	≦250° C	Approx.15m
9.	Carbon	Solvent (MEK, Ethyl Acetate)	Wet 60% Impregnated	≦200° C	Approx.4m
10.	Non-woven Fabrics	Emulsion	—	≦200° C	Approx.30m
11.	Ceramic Sheet	Emulsion	—	≦120° C	Approx.60m

IR Device's Drying Time and Products	用途及び目的
3s	3s Laminated Film
10s	10s Protective Film
4s	4s Line Speed 150m/min
15s	15s Adhesive Film
20s	20s Medical Plaster
15s	15s Adhesive Film
30s	30s Multipurpose Use
1m	1m Multipurpose Use
25s	25s Automobile Parts
10m	10m Full Dry of Moisture
5m	5m Full Dry of Moisture

※ From our test data at Miyoshi Factory

The Strengths of FIR Ovens

1. High Efficiency

FIR has a high permeation rate, heating materials from the inside which makes it highly suitable for use in ovens.

The rapid molecular movement caused by electromagnetic waves results in the interior of the material heating up first, with heating progressing to the surface and greatly reducing the chance of ruptures in the product. This quality also makes FIR suitable for heating before embossing and laminating processes, as well as being highly effective in annealing applications.

2.FIR Has a High Hermetic Sealing Performance

Not requiring the use of air results in FIR ovens having a high sealing performace, as well as making vacuum drying, nitogen purge drying and clean drying possible.

3. Low Running Costs and Efficient Use of Space

Compared to thermal oil boilers, FIR heaters offer significantly decreased running costs.

They also require less than a quarter of the space taken up by current hot air ovens.

4. Precise Temperature Control

Our proprietary Negishi SL ceramic heaters allow for precise temperature control with high temperature uniformity - a tolerance of up to ±1° C across the web width can be achieved.

Removal of temperature irregularity is often linked to an improvement in product quality.

5. The Heating Process

As the heat source is electric, temperatures can be easily adjusted to ensure an exact heating process can be setup.

For products prone to foaming; low temperature, medium temperature and high temperature settings can be utilised to prevent foaming occuring.

Real Industrial Solutions

Vertical Oven (Double-Sided Heating)

Specifications	
Structure:	Vertical Double-Sided Heater Hybrid Type
Web Width :	500mm
Oven Length	3000mm
Power :	67.2kw
Heater Temperature :	600℃ Max
Control :	12 zone PID Control
Support :	Roll & Conveyor
Environment :	Non-hazardous

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Vertical Oven (Upper Side Heating)

Specifications	
Structure:	Vertical Single-Sided Heater
Web Width :	1200mm
Oven Length :	2000mm
Power :	43.2kw
Heater Temperature :	350℃ Max
Control :	18 zone PID Control
Support :	Roll
Environment :	Class 10000 Non-hazardous

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Vertical Oven (Upper Side Heating)

Specifications	
Structure:	Vertical Single-Sided Heater Eco IR + Air Hybrid Type
Web Width :	300mm
Oven Length :	2000mm
Power :	13.5kw
Heater Temperature :	400℃ Max
Control :	5 zone PID Control
Support :	Roll
Environment :	Non-hazardous

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Wide Single Hinge Oven (Upper Side Heating)

Specifications	
Structure:	Single Hinge Single-Sided Heater
Web Width :	3200mm
Oven Length :	12m
Power :	420kw
Heater Temperature :	400℃ Max
Control :	10 zone PID Control
Support :	Conveyor
Environment :	Non-hazardous

Single Hinge Oven (Upper Side Heating)

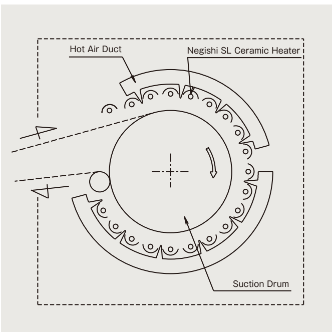
Specifications	
Structure:	Single Hinge Single-Sided Heater Eco IR + Air Hybrid Type
Web Width :	300mm
Oven Length :	1000mm
Power :	6.6kw
Heater Temperature :	500℃ Max
Control :	3 zone PID Control
Support :	Roll
Environment :	Non-hazardous

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Vertical Double-Sided FIR Oven

Specifications	
Structure:	Vertical Double-Sided Heater
Web Width :	200mm
Oven Length :	2400mm
Power :	1.8kw
Heater Temperature :	350℃ Max
Control :	6 zone PID Control
Support :	Flotation Dryer
Environment :	Non-hazardous

Suction Drum FIR Oven



Specifications	
Structure:	Suction Drum Construction
Oven Length :	2000mm (φ 800)
Width:	600mm
Heater Power :	16.2kw
Heater Temperature :	700℃ Max
Control :	4 zone PID Control

Far IR Ovens for Use in Hazardous Locations

Flat type Heater designed for hazardous environments

For the drying of coatings containing solvents, a lot of companies opt for hot air ovens.
Normal far infrared (FIR) ovens cannot be employed due to explosion risks.
Increasing pressure in the heater terminal box or wiring conduit to conduct an air purge as a counter-measure is also not an approved prevention method, preventing the obtaining of official certification and approval.
Putting FIR emitting surfaces in purged enclosures also leads to electromagnetic dampening.
Our FIR ovens specially designed for hazardous locations however have succeeded in receiving approval from the Ministry of Health, Labour and Welfare in Japan.

There are 3 important conditions that require consideration when constructing ovens for hazardous locations.

1. A structure that ensures there is no possibility of solvent gas ignition within the heater terminal box.
2. A safe structure that prevents heat from within the heater transferring to the outer walls of the oven enclosure.
3. An incorporated circuit design that safeguards against gases reaching ignition temperature, regardless of the condition of the heater.

There are of course other considerations and our machines have submitted data that has cleared all testing and passed inspection - allowing our machines to acquire official approval and certification.
There are currently many companies looking to install specially designed FIR ovens in their hazourdous environments as a means of improving product quality and speed of production.

Rod type heater designed for hazardous environments

■ Usage as a Pre-Dryer

Used as a high concentration solvent drying machine soon after coating. This doesn't completely dry the coating, but instead is a first-stage dryer, preventing disturbances to the coat in subsequent drying stages which may involve forced air.

Merits

1. A Smooth Drying Surface
FIR ovens don't use forced air and as such disturbances, such as ripples, don't form, and even if hot air is used after the pre-drying process a smooth surface is maintained.
2. Improved Line Speed
Installing an 3m FIR oven in front of a 30m hot air furnace improves drying speed by 50-80%, and is also effective when drying water-based materials.
3. Greater Product Quality
The occurrence of warping, splitting and curvature is much reduced, improving the quality of the final product.

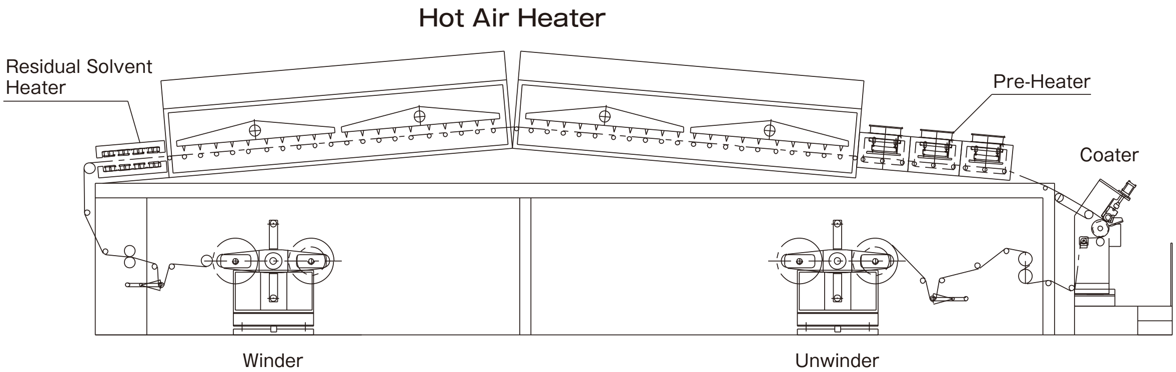
■ Residual Solvent Remover

For high boiling point solvents such as Toluene, hot air can often not provide a sufficient drying performance, leading to residual solvent.
Installing our heater after the hot air oven can prevent this residual build up and act as a final stage dryer.
To heat the solvent within the coat, a double sided, upper and lower surface heater is employed.。

■ As a High Boiling Point Solvent Oven

Water evaporates at 100° C, but trying to dry high boiling point solvents with just hot air can result in residual solvent. Using a hybrid type oven, combing both hot air and FIR, is effective in these cases.
Thanks to an easy to assemble drying process, a 6 to 18 stage temperature control system can be constructed so that the characterstics of the solvents and solids used can be best realised. This process is significant in the effective drying of high boiling point solvents.

An Example of FIR Oven Usage



Coater Line

Real Industrial Solutions (FIR Ovens for Hazardous Locations)

Vertical Hybrid Oven (Double-Sided Heating)

Specifications

Structure:	Vertical DoubleSided Heater Hybrid Type
Web Width :	1500mm
Oven Length :	3000mm
Power :	40.5kw
Heater Temperature :	350℃ Max
Solvent Gas:	G1 group
Control :	3 zone PID Control
Support :	SUS Conveyor
Environment :	Designed for Hazardous Environments
Temperature :	150℃ Max

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Vertical Hybrid Oven (Upper-Side Heating)

Specifications

Structure:	Vertical Single-Sided Heater
Web Width :	1500mm
Oven Length :	1200mm
Power :	30kw
Heater Temperature :	350℃ Max
Solvent Gas:	Ethyl Acetate
Control :	2 zone PID Control
Support :	None
Environment :	Designed for Hazardous Environments

Kawagoe
Manufacturing Brand
KOEDO E-PRO

Pre-heater

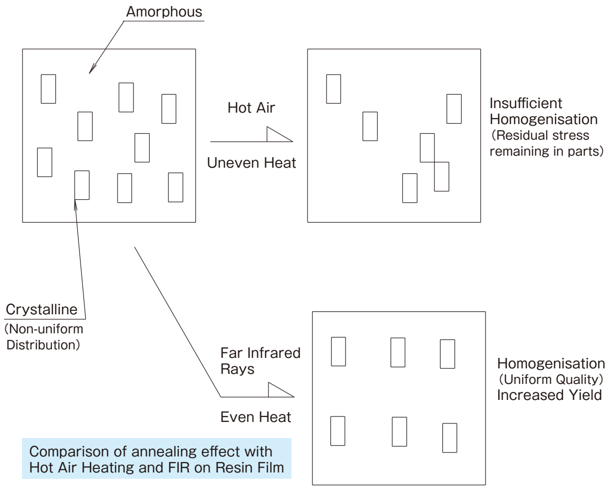
Specifications

Structure:	Hinged Single-Sided Heater
Web Width :	1600mm
Oven Length :	3000mm
Power :	27kw
Heater Temperature :	350℃ Max
Solvent Gas:	G1 Group
Control :	9 zone PID Control
Support :	Roll
Environment :	Designed for Hazardous Environments

FIR Annealing and Heating Device

About Annealing

A film sheet is a stretched polymer that is extruded by applying tension to polymer molecules.
There are crystal parts which have a regular structure, and amorphous parts that are random molecules.
The crystal parts play a knot-like role between the molecules. When the plastic is stretched out, the amorphous parts develop internal tension, which can spring back when released and cause shrinkage or crinkling.
Each crystal part is distributed unevenly in the film sheet. Annealing is the process of redistributing these crystal parts more evenly throughout the material and removing the stress in the amorphous sections.
It prevents the distortion of the dimensions of the film sheet which can result in print misalignment and uneven coating, also improving yield.
Films which have been processed with annealing remain straight after slitting, but unannealed films will curve up and items like adhesive tapes will become shaded and have an undesirable appearance.



Comparison of annealing effect with Hot Air Heating and FIR on Resin Film

Residual Stress Relieve

Placing films and polymers in a thermostatic chamber (at around 60° C to 100° C) for 1 to 2 days can help relieve residual stress, however this requires time and doesn't guarantee complete relieve.
At Negishi MFG we employ SL flat heaters that provide excellent heat distribution along with tension control to produce effective annealing.
With hot air it's difficult to remove stress in a short time due to uneven heat distribution and lack of energy.

Annealing Ovens

At Negishi MFG we can remove film distortion with our SL Ceramic Flat Heaters and tension control lines.
There are also instances of plastics that have been annealed after preparation in a 24 hour thermostatic chamber being annealed in seconds with our IR annealing method.
As well as the above, they can also be seen as important devices in improving the yield of film and sheets.

Essential Requirements for Annealing

1. Heating the product from all directions (Flat Double Sided FIR Heater)
2. Control of the rise in product temperature (SCR control system)
3. Regulation of product tension during heat application (Precise servo mechanism draw control)
4. Sufficient cooling

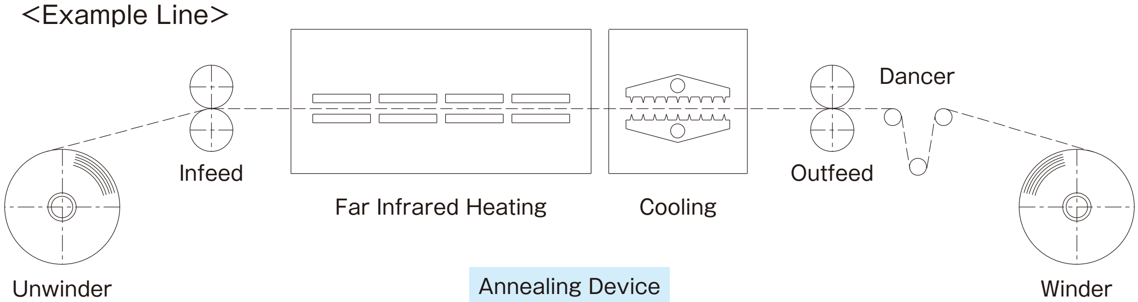
Annealing Completion Confirmation

- To confirm completion of the annealing process we employ methods such as polarising plates and set period stress measurement after heating.
- The measurements provided by the polarising plate are by a specialist data comparison method.

Example of an Annealing Line

◎ Depending on the product, this structure can change.

<Example Line>



Sheet Correction Annealing Device

Aging caused by warehouse storage of items such PVC sheets can be treated before sheet coating, and annealing can also be done with non-woven materials.
※ This can be assmebled from a variety of FIR heating rolls and FIR furnaces

Curing Oven

Constructed for hardening and firing.
Utilises mid and near IR instead of FIR.
The heater temperature is high) 500° C) so insulation is extremely important.
Changes to the substance is required therefore a temperature process control is necessary
Can be produced for a batch or for line application.

Pre-Heating Device

Placed before laminating and emobossing devices, this is a sheet film heater.
If directly before embossing the product doesn't have a uniform temperature, the sharpness and deepness of embossing can be uneven and therefore uniformity of temperature in the width direction is essential.

Used in tandem with a heating roll.
Can also be used as an annealing machine.

Stress Relievling

Specifications	
Line Speed	5m/min Max
Structure	Heating Roll + Hot Roll total 4 rolls
Roll Surface Width	300mm
Heater	SL Ceramics FIR Heater
Power	5kw x 2
Heater Temperature	400℃ Max
Control	Servo Motor Draw Ratio

Curing Oven

Specifications	
Structure	Batch Type Curing Oven
Heater	Log Type Heater Upper and Lower Heating
Power	600w x 12
Heater Temperature	700℃ Max
Control	SSR

Pre-Heating Device

Specifications	
Structure	Heating Roll + Log Type Heater
Line Speed	10m/min Max
Power	36kw
Heatig Roll	Presure Vesel ø800x1600mm
Control	SSR

Condensation Prevention Equipment <Patent Pending>

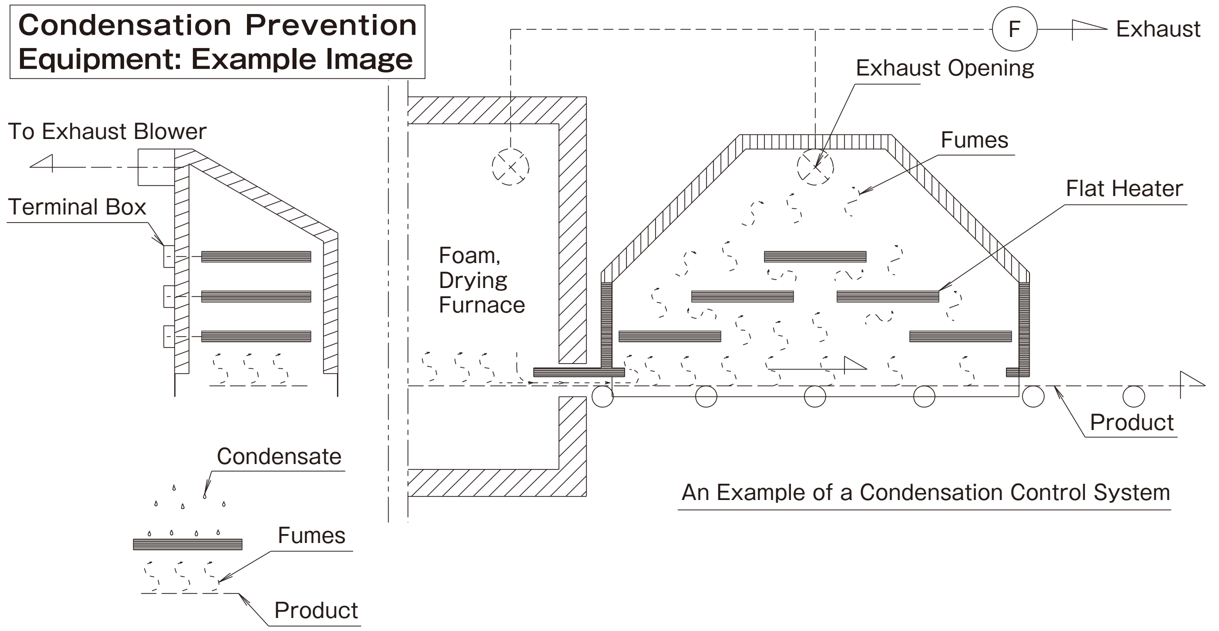
To address the issue of condensate contamination on processes involving oils / compounds

- We have developed a condensation extractor system that can prevent condensation produced during the laminating process from forming at the openings to devices such as foaming ovens and embossers.
- It prevents moisture dropping onto and adhering to your product, mainitaining product quality.
- It can be adapted for any type of vapour thanks to a temperature control system.

Strengths of Our Device

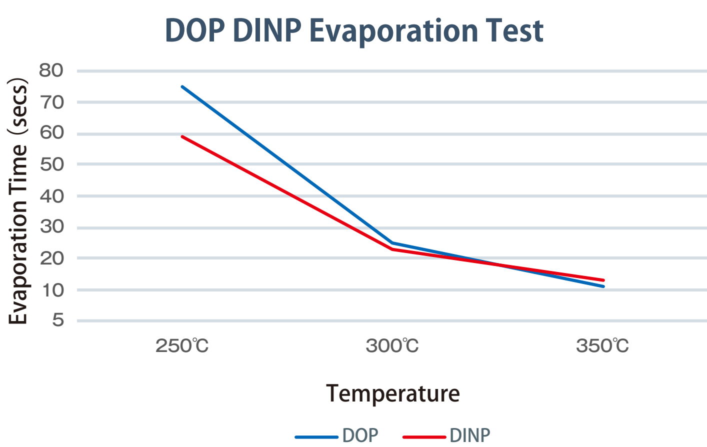
- Utilises our special flat heater that ensures no temperature disparity.
- Prevents condensation occuring in multistage heaters.
- Very low maintenance requirements
- Can be adapted via the integrated temperature control to deal with different types of vapour.
- Especially effective against DOP and DINP plasticisers.
- Effective at preventing condensation in normal flat type heaters, but when coupled with our proprietary SL Ceramic Flat IR Heaters it is also energy saving and low maintenance.

Condensation Prevention Equipment: Example Image



◎At the upper surface, lower surface and in front of the heater, oil condenses. It doesn't carbonise. <PAT申請中>

Condensation Test Device



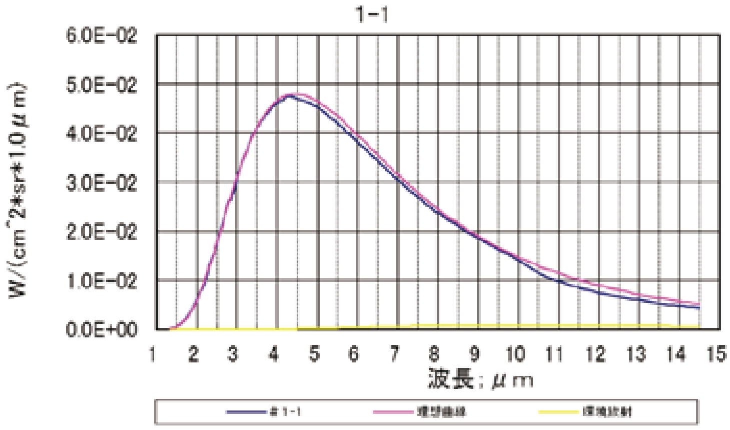
Far Infrared Device Safety Features

■ Structure

We have designed our ovens to be usable in both hazardous and non-hazardous environments
and so even our heaters themselves are tough and won't be broken if they come into contact with other materials.

■ Worker Safety

Our devices don't emit UV rays, just infrared rays classed as IR-C (see attached graph) which aren't harmful to the eyes.
To prevent the risk of burns, the heaters are placed in an enclosure where the operators cannot reach.
This enclosure is also insulated to ensure that its outer wall never reaches a temperature above 50℃ .



Negish SL Ceramic IR Spectrum
Characteristics at 360℃

● Electromagnetic Wave Safety

IR waves are of a different wavelength to UV and can be looked at directly with no risk.
Radiation of a wavelength around 12 μ m is sometimes referred to as 'Growing Light' or 'Raising Rays', used to encourage growth in plants.

● Heater Intensity

As opposed to easily crackable devices such as quartz tube heaters and halogen heaters, our heating elements are cast in pure metals including aluminium, brass and copper and have an embedded construction.
This allows for strong heat intensity and protection from short circuiting. Our heaters designed for hazardous locations are also built with this safe construction.

● Electrical Control

The wiring in our devices is heat resistant, and can also be adapted to hazardous locations with explosion proofing.
In our heaters specially designed for hazardous locations we also install two safety sensors in each heater element, ensuring that no matter what occurs the temperature inside can be controlled and won't reach ignition temperature.
This temperature control is based on PID loop with thermocouple temperature feedback installed in the heater.
Constant current control and others can also be embedded into the device.

■ Fire Prevention

● An example of an emergency stop procedure.

1. Power to the device is cut and at the same time the heater and products are separated by around 400mm. (Vertical ovens)
2. A shutter is inserted between the product and heater. (Option)
3. During the oven opening process, gas inside the device is diffused. (Accumulated air compressor) (Option)

※ We adapt our emergency stop procedures to the substrates used in each client's processes.

Cylinder Type Vertical Heater Opening Mechanism

Far Infrared Testing

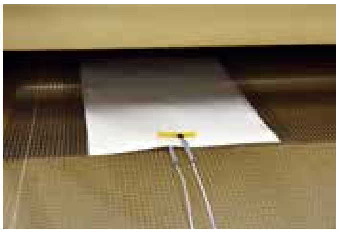
Before preparing an estimate to our clients, we recommend testing our machines.
Based on the data obtained from these tests we can then provide a precise estimate.
Our company has a testing facility in Miyoshi, Saitama, so please visit us if you are interested in seeing our products further.

Testing Method

The simple test method is drying a sheet on our conveyor and confirming the hardness condition of the product.
After the simple test, we can also run a continuous roll-to-roll test, including a coating stage.

Drying Test Devices

Test Machine



Example Testing Method

Specifications

Control :	Upper Side Heating: 6 zone
	Lower Side Heating: 6 zone
	Side by side hot air testing is also possible
Temperature :	600℃ Max（Heater）
	150℃ Max（Hot Air）
Web Width :	500mm
Conveyor Speed:	0.1 ～ 20m/min
Oven Length :	3000mm
Power :	5.6kw ×上下６列＝67.2kw
Control :	17 block PID Control
Support :	Roll & Conveyor
Environment :	Non-hazardous

測　定　器	Keyence 16 Point Logger
	Sensor: Thermocouple
	Radiation Thermometer
	Surface Thermometer (Contact Type)
	VOC Sensor (OSP)
	Balance Scale - all types
	Thermal Thermometer
	Viscometer
Hand Coating (Sheet)	Wire bar - all types
	2 roll coaters and others.
Materials Required from the Client	A3-4 size sheet（Film or sheet that is used in production）
	Coating Solution: For use on over 30 sheets
	Thinning Solution: 10L
	Coating Equipment
	Measuring Instruments
	Past data
Data Measured	Temperature of all zones（Up to 12）
	Conveyor Speed（0.1-20m/min）
	Hot air: Whether it was used, temperature, air flow rate.
	Product temperature（Logger）
	Residual Solvent
Test Facility	Negishi Mfg. Co., Ltd Miyoshi Facility 558 Kitanagai, Miyoshi, Iruma District, Saitama 〒354-0044 Tel: 049-258-2020　Fax: 049-259-2625

Logger

VOC Sensor

All types of Wire Bar

Miscellaneous

An Introduction to Oil Safety Lamps Used in the Coal Mines

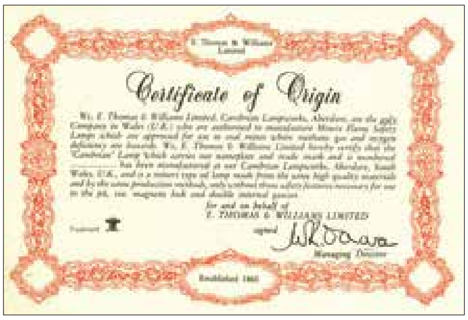
In modern times, operating lighting machinery in a hazardous environment requires special certification and authorisation.
In coal mines in the 1900s however, they used safety lamps for lighting, specially designed to reduce the danger of explosions due to the presence of methane gas.
We'd like to introduce two safety lamps. One from England, where the lamp was invented, and one from Japan.
The first is a Wolf Safety Lamp, produced by E. Thomas & Williams. (※ Image ①)
This lamp comes with a certificate of authenticity (guaranteeing safety).(※ Image ②)

The next is a safety lamp made by Honda Shouten in Japan.
Once taken apart, you can see the safety construction includes two wire mesh layers. (※ Image ③)
Nowadays safety lamps continue to be used when camping, whilst they are also bought as ornaments.

※ Image ①

■ How the Lamp Was Constructed for Safety

Safety lamps are designed so that around the flame of the lamp is a thick layer of heat-resisting glass and a seal that isolates the outside air. On the upper part of the lamp, where the flame comes into contact with the outside air, are two layers of wire mesh that act as a flame arrestor. Methane gas ignites at 595℃ and the wire mesh insulates the flame, keeping it below this ignition temperature.
By looking at the size of the flame the lamp could also be used to observe methane gas levels. The invention of safety lamps, with their flame arresting wire meshes, contributed to a reduction in accidents in coal mines and saved many lives.



Certificate of Origin

for and on behalf of
E. THOMAS & WILLIAMS LIMITED

※ Image ②

※ Image ③

NEGISHI MFG. CO.,LTD.

Kawagoe
Manufacturing Brand
KOEDO E-PRO

A certified Kawagoe Manufacturing Brand

Head Office : 347-3 Kayano, Shimoakasaka, Kawagoe-Shi,Saitama, 350-1155, Japan
TEL +81 - 49 - 242 - 6162　FAX +81 - 49 - 242 - 5672

URL: http://negishi-mfg.co.jp/
E-Mail: cov@negishi-mfg.co.jp

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2019.12