**Basic knowledge of hot stamping**

1. The hot stamping machine has stamping by moving the hot platen up and down and transfer by rotating a rubber roll.

   A plate is required for the hot stamping machine that moves the hot platen up and down. (Tentatively called UP-DOWN machine)
   There are various types of plates, such as metal plates, rubber plates, etching plates, and plastic plates.
   The main materials for metal plates are iron, alloys (nickel, copper, etc.)
   Rubber plates are available as standard rubber plates and customer-specific rubber molding plates.

   A transfer machine that uses roll rotation requires a heat-resistant rubber roll. (Tentatively called a roll transfer machine)
   Rubber rolls have hardness. The types of hardness are 40 degrees, 60 degrees, 70 degrees, 80 degrees, and 90 degrees.
   (The same applies to the rubber version)

2. Printing components of hot stamping machine

   UP-DOWN machine
   | Stamp | Foil | JIG |
   Roll transfer machine
   | Rubber roll | Foil | JIG |

3. Type of foil

   The foil is divided into pigment foil, vapor deposition foil and transfer foil.
   Pigment foil White, black, red... various kinds of colored foil
   Evaporation foil Gold, silver, rainbow, metallic,
   Transfer foil

4. JIG

   It is a tool to fix the product

5. Hot stamping machine model (Introduction of NAVITAS machines)

   UP-DOWN machine
   It is a general model. Machine that fixes the product and moves the hot platen up and down
   V-08LC V-2 V-6B V-10B
   The jig that fixes the product rotates and runs from right to left.
   It is called a rolling machine. V-08LC RU 35, pen shaft, counter wheel (0-9 characters are engraved)

   Roll transfer machine
   Attach the jig that fixes the product to the table.
   The table with the jig is fixed, and the roll head runs left and right.
   RH-150 RH-300 RT-150 daily necessities sundries, household appliances, panel, IT products
   The roll head is fixed and the jig with the product attached rotates.
   RAS-60 RAS-100 Cosmetic Cap, Compact, Bottle, Cup, Cylindrical Container, Elliptical Container
6 Hot stamping machine condition setting elements

There are 4 items for condition setting of UP-DOWN machine.
The condition settings are ① hot plate temperature, ② stamp time, ③ stamping pressure, and ④ foil delay time.

① Hot plate temperature setting
Different temperature settings depending on foil type and product material
Initial temperature setting starts with the temperature recommended by the foil manufacturer
Raise the temperature of the hot platen when the foil is insufficiently adhered.
When the transferred foil is no longer glossy (called foil burning), the temperature is too high.
Foil burrs (the transferred design does not come off cleanly from the foil and there are foil scraps) are too hot.
There is a difference between the temperature setting of the hot platen and the surface temperature of the metal plate and rubber plate.
To be precise, the surface temperature of the stamp is measured.
To check the temperature setting conditions, adjust the temperature in 5°C increments to set the optimum temperature.
The plastic dough melts. Temperature is too high
Crumpled around the foil after coming out of the stamp. The temperature is too high.
Set the temperature conditions at the end of the other three conditions.

② Set the stamp time and adjust the rising and falling speed of the hot platen
The stamping time correlates with the rising and falling speed of the hot platen, but it emphasizes the actual stamping time.
Setting the stamp time is an adjustment of adhesion
The design of the stamp is transferred well, but it will increase the stamping time when the foil is peeled off with cellophane tape
The plastic dough melts. Stamp time is too long
Initially, the time setting is finely adjusted in 0.5 second to 0.1 second steps.
Adjusting the speed of raising and lowering the heating plate
In a general-purpose hot stamping machine, the speed is adjusted by the speed control of the air cylinder.
The rising and falling speed of the hot platen is set at a normal time (up and down time is about 2.5 seconds) and the stamp time is set.
If you set the stamp time to 0.5 seconds, the one-cycle hot platen vertical time will be about 3 seconds.
NAVITAS UP-DOWN machines are set to the time from when the hot platen descends. Stamp time setting will be accurate
Slowly adjusting the rising speed of the hot platen has the effect of increasing the adhesion.
(For the adhesion of the foil, the adhesive layer (glue) of the foil melts by heat conduction and adheres the foil to the surface of the plastic, but slowly raise the hot platen. Enhances the effect of heat conduction)
However, since the rising and falling speed of the hot platen is related to productivity, adjust the speed so that the adhesion is not affected.

③ Stamp pressure and horizontal adjustment of hot platen
Adjust the pressing pressure so that the entire design can be transferred cleanly.
The important point is to adjust the pressing pressure so that the outline of the design is transferred evenly and clearly.
The pressure is too strong when there is a mark on the entire part when the foil is transferred.
The hot platen is not horizontal with respect to the shape of the molded product if there are imprinted marks on one side or two sides on the left, right, front or back of the design.
Horizontal adjustment of the heating plate is required. The hot stamp of each machine manufacturer has a mechanism for adjusting the hot platen.
The hot stamping of the vertical movement of the hot platen causes the hot platen to move up and down vertically, so the hot platen is adjusted horizontally according to the shape of the molded product.
Horizontal adjustment of the hot platen can be adjusted by pushing down or raising it with the four adjusting bolts on the hot platen.
When adjusting the hot platen with the front, rear, left, and right adjustment bolts, make fine adjustments and stamp while checking the
After the leveling of the hot platen is completed, check the adhesion between the foil and the molded product by peeling the tape.

### 4 Foil delay time

The foil winding operation is not performed immediately after the stamp time ends and the hot platen rises. Delay the start of foil winding with the foil adhered to the molded part. If you set the delay time of the foil, by not peeling the foil immediately after stamping, it can hold the cooling time of the foil paste, which is advantageous for adhesion. This is an effective method for improving adhesion. Set the foil delay time of about 0.3 seconds to an arbitrary time.

### 7 How to adjust adhesion

The conditions were (1) hot plate temperature, (2) stamp time, (3) stamping pressure, and (4) foil delay time. Among the above condition items, the first condition adjustment is the stamping pressure of (3) and the horizontal adjustment of the hot platen. The conditions that have the effect of adhesion are the stamp time in (2) and the temperature of the hot platen. First, adjust the stamp time.

#### Adhesion setting conditions

<table>
<thead>
<tr>
<th>Stamp set time</th>
<th>long</th>
<th>long</th>
<th>short</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting temperature</td>
<td>Low</td>
<td>high</td>
<td>Low</td>
<td>high</td>
</tr>
<tr>
<td>Condition change</td>
<td>Even if the stamp time is extended is extended Adhesion is not improved</td>
<td>Long stamp time Because the hot platen temperature is high Molded product melts Foil burns (whitening)</td>
<td>Shorten stamp time When the hot platen temperature is low Adhesion is not improved</td>
<td>Improved adhesion Stamp time and hot plate From temperature condition Appropriate with high production efficiency set conditions</td>
</tr>
<tr>
<td>Stamp pressure</td>
<td>Increase the pressing pressure Adhesion is not improved</td>
<td>Weaken the pressing pressure Foil burning is not improved</td>
<td>Increase the pressing pressure Adhesion is not improved</td>
<td>Proper pressure Strong or weak pressure suitable for design</td>
</tr>
<tr>
<td>Change setting conditions</td>
<td>Because the hot platen temperature is low temperature is low Raise the temperature</td>
<td>If you shorten the stamp time The foil burns but the adhesion is effective Because the hot platen temperature is high Lower temperature</td>
<td>Even if the stamp time is extended Adhesion is not improved Hot plate temperature is 2°C to 5°C Raise little by little Improved adhesion</td>
<td>Improved adhesion Stamp at set temperature Time in 0.1 second intervals Adhesion is shortening When the heat plate becomes weak temperature is gradually increased by 2-5°C Raise it to check the adhesion and foil burn</td>
</tr>
</tbody>
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8 Hot stamping machine model (Introduction of NAVITAS machines)
Roll transfer machine

(1) Attach the jig that fixes the product to the table.
The table with the jig is fixed, and the roll head runs left and right.
RH-150 RH-300 RT-150 daily necessities sundries, household appliances, panel, IT products

(2) The roll head is fixed and the product attached to the jig rotates in conjunction with the rotation of the roll.
RAS-60 RAS-100 cosmetic cap, compact, bottle, cup, cylindrical container oval, rectangular, square, etc.

9 Configuration of 6 items of roll transfer machine setting conditions
   ① Roll set temperature, ② Roll running speed or rotation speed, ③ Roll pressing force,
   ④ Roll hardness, ⑤ Foil delay time, ⑥ Foil tension

① Roll set temperature
The set temperature of the roll shows the surface temperature of the roll due to the radiant heat of the far infrared heater of the.
   heater cover.
   There is a temperature sensor to detect the surface temperature of the roll, but there is a difference between the set temperature.
   and the surface temperature of the roll.
   Therefore, if the gap between the roll surface and the temperature sensor is as narrow as possible, the set temperature will be stable.
   Also, when the air from an air conditioner or a fan hits the surface of the roll, it is not possible to maintain an accurate set temperature
   and the adhesion becomes unstable.
   Wait until the temperature of the roll mounting shaft rises (usually about 30 minutes after the power switch is turned on)
   and start production.
   The starting temperature of the first roll should start at the part material or foil manufacturer's recommended temperature.
   When setting the material of the molded product, for example, check the adhesion of the foil for the plastic material from ABS 150°C
   to 180°C PP 200°C to 230°C for the first time.
   Transfer materials other than plastic at 180°C-200°C to check the adhesion. Adjust the set temperature from there.

② Roll head running speed or roll rotation speed
The table to which the jig is attached is fixed, and the speed of the roll head is set when the roll head run left and right.
The running speed of the roll head is related to the adhesion of the foil.
   If the foil adhesion is poor, slow the roll head speed. Navitas transfer machine RH-150 RH-300 is a touch panel parameter change
   Roll head speed setting is related to production efficiency.
   Adjust the roll head speed as fast as possible in good foil contact conditions.

   Setting the roll rotation speed when the roll head is fixed and the product attached to the jig rotates in conjunction with the roll rotation.
The rotation speed of the roll is related to the adhesion of the foil.
   If the foil adhesion is poor, slow the roll speed. The volume of Navitas transfer machine RAS-60 RAS-100 is adjusted.
   Roll speed setting is related to production efficiency.
   Adjust the rotation speed of the roll as fast as possible when the foil adhesion conditions are good.
   ** The adhesion of the foil can be improved in addition to the running speed of the roll head or the rotating speed of the roll.
   It is a combination of each condition item such as (1) Temperature of roll, (2) Pressing force, (4) Hardness, (5) Foil delay time,
   and the adhesiveness.

③ Roll pressure
The roll pressure setting is the first condition setting for the roll transfer machine.
How to set the conditions for pressing the roll head roll
The product is set on the jig fixed to the table.
Manually move the roll head to the product position and lower the roll. Check the transfer conditions from the position where the roll is pressed about 1 mm from the position where it comes into contact with the surface of the product. Finely adjust the position of the roll until the entire design can be transferred. Confirm the adhesion with tape when the entire design can be transferred.

The roll head is fixed. How to set the condition of the roll pressing force when the roll rotates
The transfer machine of RAS-60B has the function of slowly contacting the surface of the rotating roll when the product hits it. Check the pressing force
When the product comes into contact with the roll, the product rotates, and the rotation of the roll rotates in conjunction with the rotation speed of the product. Delicate pressure adjustment is possible. While adjusting the position of the jig to which the product is attached, raise the position until the entire design can be transferred. When the entire design can be transferred, check the adhesion with cellophane tape.

It is necessary to adjust the roll (1) temperature (2) running speed or roll rotational speed (4) hardness (5) the foil delay time in relation to the setting of the roll pressing force and the adhesion
The combination of each condition item and the relevance of adhesion will be explained later.

④ Hardness of roll
The material of the roll is silicon. High temperature heat resistant silicone. The hardness of the roll used in the roll transfer machine is generally 70 degrees, 80 degrees and 90 degrees. Standard 70 degrees, slightly hard 80 degrees, hard 90 degrees
A special soft hardness of 40 degrees is used to transfer the lure fish body.

When transferring to a flat surface, the harder the roll, the more effective the adhesion. If the surface shape is not flat, transfer with a roll with a hardness of 70 degrees.

⑤ Foil delay time
We will set the time until the start of winding the foil after the roll transfer is completed. If the foil is wound up immediately after the transfer is completed, the adhesion at the last part of the transfer will not be sufficient, resulting in poor adhesion. The heat of the roll melts the glue layer of the foil, and the foil adheres to the surface of the print target.
Set the cooling time of glue to improve adhesion

⑥ Foil tension
According to the transfer conditions, apply the foil with a certain tension so that the foil does not sag. This function is called back tension. The tension of the first transfer condition is set by adjusting the volume. After that, the roll transfer machine has the function of keeping the tension constant by the variable of the diameter of the transfer foil of the foil hanging device.
Tension adjustment is an effective condition for removing wrinkles on the foil during transfer. The condition for wrinkle removal is set to a higher tension when the transfer surface of the print target is flat.
For curved surfaces, set the tension weaker. Tension adjustment is effective for wrinkle problems