Plan of action

Patch up minimization

Content

1. Introduction

Patching up is the main part of the set-up process and therefore plays an important role in process optimization.
As you know, diecutting machines need more and more pressure with increasing running time and an increased need for make-ready.
As a result, the repeat accuracy of the machine is no longer economical from a certain point in time.
In most cases, the main reason is not the worn mechanics of the machine, but the high degree of corrosion of the inner platen. However, this is only one influencing factor, which we would like to examine in more detail below and solve with appropriate actions.

Through our descriptions of the influencing factors, we try to explain in a simple way what the reason of patching up is. This is because the problem is usually not just a single factor (e.g. the diecutting tool), but a whole series of connected factors in the interaction between humans, machines and tools.

With our actions we give you the opportunity to make these unevenness and other factors controllable and show that the minimization of patching up work is very easy to realize.

In our action plan, we mainly concentrate on the topic of patching up, but this is also directly related to die-cutting pressure. This is because too much pressure affects the durability of the tools, cutting plates and the machine itself and can lead to quality problems such as angel hair, dust formation and unclean cuts.

2. Influencing Factors

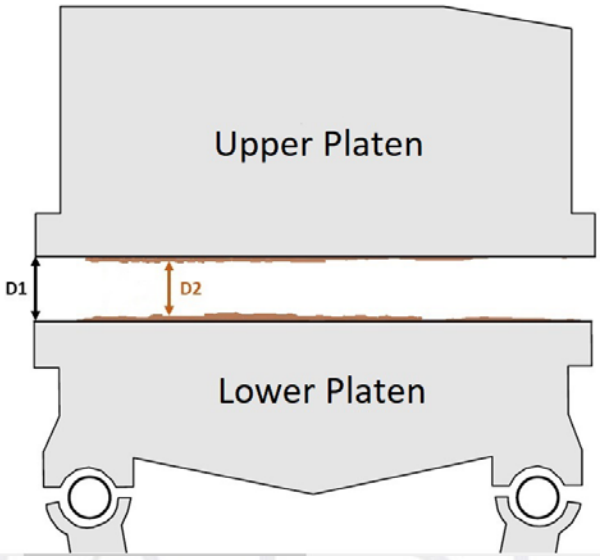
2.1 Machine Precision

2.1.1 Surface Flatness

The uniform flatness of all relevant surfaces is
the basis for minimal make-ready.

The die-cutting pressure is regulated by changing the distance from the upper to the lower platen. This means: the higher the punching pressure, the smaller the distance between the two platens (D1). Corrosion (rust) and contamination of the internal platen thus reduce the distance (D2) selectively and lead to unevenness (Fig. 1).

Fig. 1: Die-Cutting Pressure and Rust



Unevenness because of rust and dirt also occurs on the plates of the upper chase and the lower counter die-cutting bed (Fig. 2 - 5).

This resulting unevenness cause the main part of the make-ready work, because rust layers are not stable and will move under pressure. It cannot be compensated permanently by patching-up. Additional corrosion is always ongoing and will raise step by step.

Affected surfaces:

- Platen (upper and lower side inside of the machine)
- Cutting & Compensation Plate (top and bottom)
- Lower Supporting Plate (top and bottom)
- Chase & Backing Plate
- Make-Ready Protection Plate

Fig. 2: Platen

Fig. 3: Cutting & Compensation Plate

Fig. 4: Lower Supporting Plate

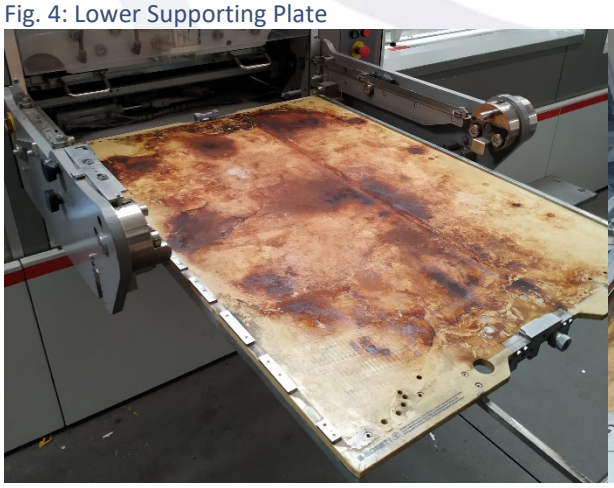
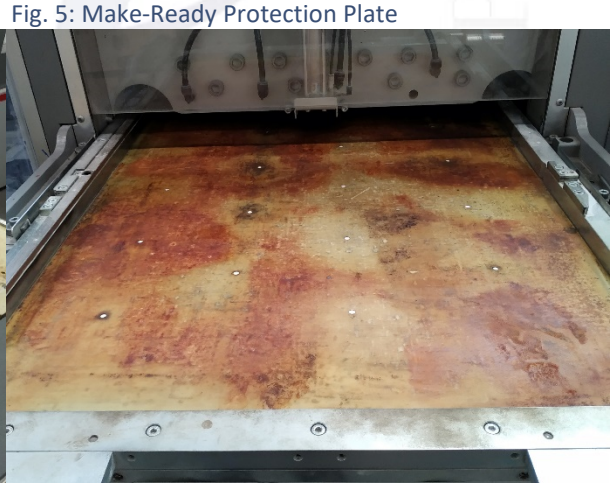


Fig. 5: Make-Ready Protection Plate



Residues of patch-up tape or adhesive tape for fixing the make-ready sheet also means unevenness on the chase and make-ready protection plate (Fig. 6). These in turn become effective during die-cutting.

Fig. 6: Tape Residues

Our platen and chase cleaning equipment represent an immediate solution against all surface unevenness (Fig. 7 - 10). The basic conditioning of all surfaces through our separate service will already reduce make-ready time by 50 - 70%.

Fig. 7 – 10: Platen & Chase Cleaning

In order to maintain the flat surfaces permanently, a cleaning interval should be introduced in any case, which depends primarily on the air humidity. In most cases the interval is about 3-4 months.

To enlarge the cleaning interval, we suggest avoiding condensation inside the machine.

After the production day or if the machine is stopping for some hours simply open all safety doors/windows of the machines and pull out the chases and lower die-cutting bed so that the air can circulate inside the machine.

Additionally for longer production stops, light oiling is needed to avoid new corrosion.

2.1.2 Deflection and Deformation

The chase and platen build
the heart of the die-cutting machine.

Millions of die-cutting strokes under tons of pressure deform the various plates over time (e.g. chase plate) (Fig. 11).

Fig. 11: Bent Chase

Cutting plates should also not be used beyond their wear limit. Bent and notched cutting plates ensure an inaccurate die-cutting result, which is noticeable through unclean cuts, angel hair & dust development as well as burst folds (→ no centering between creasing rule and creasing matrix). In addition, bent cutting plates lead to increased set-up times in order to reach the register.

Unfortunately, the make-ready protection plate is often underrated. However, this is also a very relevant surface that is grounded from both sides. Because any unevenness and damage must be compensated by patch-up tape.

The wear of the chase is difficult to check without the right tool. As a result, critical machine downtimes sometimes occur due to suddenly broken plates or frames (Fig. 12). If there are no replacement parts available, this damage is a very high risk for the production.

Abb. 12: Gerissener Rahmen

These components should therefore be inspected regularly with a straight edge ruler. When cleaning the platen and chase, we check all the plates and replace them on request if they are worn out.
In order to work sustainable, we recommend settling a standardized period of lifetime (number of impressions) for these parts. This gives the chance to do regular maintenance of the chase, complete overhauling or replacing.

2.1.3 Production Tolerance

Each component (e.g. cutting plates, chase plates or platen) is subject to certain production tolerances due to the steel processing. For example, chase and cutting plates have a tolerance in parallelism of + -0.01 mm. Unfortunately, this unevenness are not avoidable and must be patched up accordingly.

Certain tolerances can be permanently compensated by the zone patching (Fig. 13). However, this measure must match the operational way of working. A company that uses several chases for a die-cutting machine can use this technique less than a production that always works with the same chase. It

Fig. 13: Zone Patching

must therefore be decided whether and where the zone patching will be installed:

1. between lower supporting plate and cutting plate
2. between two times 0.5 mm thick make-ready protection plates
3. on the make-ready sheet *(our recommendation)*

Experience shows that in most cases after platen and chase cleaning is done, it is no longer necessary to do a zone patch up.

2.1.4 Die-Cutter Mechanic

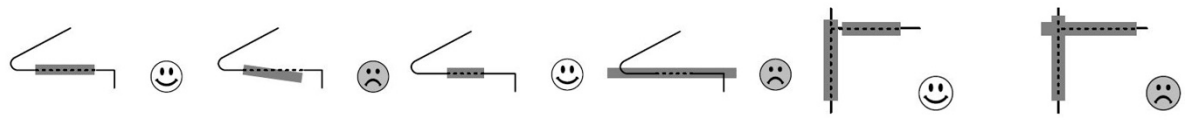
Every machine wears out over time. However, the timing is determined by the machine quality and maintenance. The reduction in machine precision due to worn mechanics will usually only become noticeable in the last third of the machine's service life and can therefore lead to increased make-ready times.

We therefore advise you to follow the maintenance instructions of the supplier, carry out repairs if necessary and keep the die-cutting pressure as low as possible. A more sensitive use of the pressure adjustment promotes the lifetime of the machine.

2.2 Make-Ready Process and Material

The knowledge of the operator plays the major role in the make-ready process. Experience shows that, above all, semi-skilled personnel do not have the appropriate basic knowledge and therefore make the classic mistakes (e.g. overlapping patch-up tape) (Fig. 14) or carry out the make-ready process at the wrong machine speed. In addition, incorrect knowledge will often be passed on.

Fig. 14: Classic Mistakes – Skewness, Overlength & Overlapping



A sustainable training concept through a mix of internal and external trainers proves to be extremely effective. Experience has shown that the effectiveness of a single training session is often limited in time and the “familiar” work condition is taken up again after some time. In addition, the most important rules should be posted so that they are always present.

Only suitable materials should be used for the make-ready process. This includes a calibrated and dimensionally stable patch-up tape (Fig. 15) and make-ready sheets. You should pay particular attention to the quality because this is noticeable in the progress of production.

Fig. 15: Profitape

2.3 Die-Cutting Tool

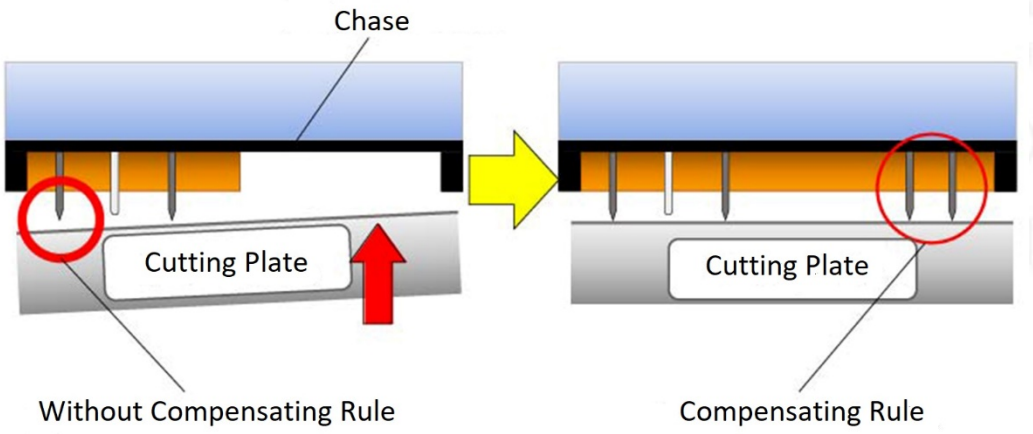
Another important factor for make-ready is the quality and design of the corresponding die-cutting tool. Since this action plan is primarily designed for packaging manufacturers, we will only address the most important issues here, which can be discussed in more detail with the tool manufacturer if necessary.

2.3.1 Even Pressure Distribution

The most even pressure distribution possible on the cutting die is very important for reducing the amount of make-ready work. This is mainly due to the two factors: ejection rubber and cutting rules. The number and different degrees of hardness of the ejection rubber can significantly influence the die-form and therefore the die-cutting process. The most even distribution possible should be achieved and a compensating ejection rubber should be applied if needed.

If more cutting rules are installed on one side, compensating rules are necessary to keep the balance (Fig. 16).

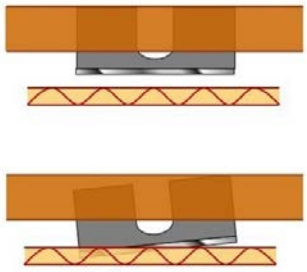
Fig. 16: Compensating Rules



2.3.2 Accurate Cutting Rules

An elementary quality factor for die-making is the precision of the laser machine. If the toolmaker's laser does not work accurately, the cutting gap for the cutting rules is not made exactly and the cutting rules cannot be installed correctly (Fig. 17).

Fig. 17: Laser Cut



The cutting and creasing rules are subject to the general manufacturing tolerances and cannot be influenced. For example, the height tolerance for rules is e.g. approx. +-0.02mm. Therefore, these tolerances must continuously be patched up.

An intensive discussion about the corresponding project and the topic should therefore take place with the respective tool manufacturer.

3. Overview

Machine Precision

Issue	Action
Surface Unevenness	• Platen and chase cleaning • Cleaning interval every 4 months (or adjusted to the air humidity) • Ventilation of the machine after the end of production (open all doors and pull out the chase) • Light oiling of the surfaces
Deflection and Deformation	• Check and, if necessary, replace the plate • Regular maintenance or overhauling • Standardized service life
Unevenness through production tolerances	• Zone patching if necessary
Wear of the mechanics	• Maintenance and / or repair • Lower die-cutting pressure for a longer service life

Make-ready Process

Issue	Action
Knowledge of the operator	• Sustainable training concept • Present make-ready rules • Checking make-ready sheets
Make-ready material	• Use of suitable material

Die-Cutting Tool

Issue	Action
Even pressure distribution	• Consultation with toolmaker • Introduce standards if necessary
Unevenness through production tolerances	• Patching up • Use material from a batch or coil if possible

4. Additional Optimization

There are already some technologies on the market that promise zero make-ready time. However, these can only be tested effectively if the measures described above have been carried out successfully.

The different technologies should also be adapted to the production process. A manufacturer of displays with frequent order changes and small lot sizes has different requirements than a manufacturer of cigarette packaging. For example, self-adjusting cutting rules do not work proper if the die-cutting tool is used on different die-cutting machines.

The machine format should also be taken into account in the selection. The cost-benefit factor of our DaisoMat is e.g. rather inconvenient for large formats (2.1m).

We would be pleased to advise you on our corresponding techniques (Fig. 18 and 19).

Fig.18: DaisoMat

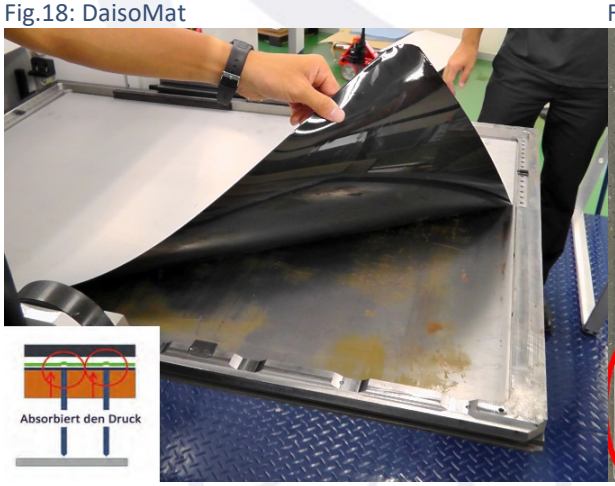
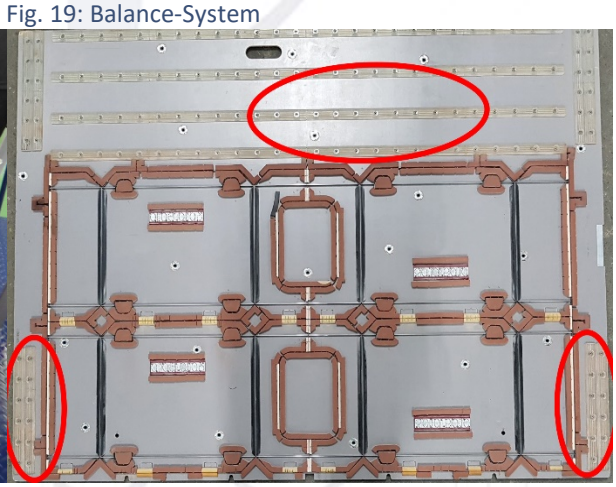


Fig. 19: Balance-System



5. Conclusion

The influencing factors and measures described contain the most important and influential topics for us in the patching up process.
As we are specialized in the field of platen and chase cleaning, we can tell you from experience that you can usually reduce the make-ready time (50 - 70%) and the punching pressure (30 - 50%) immediately by cleaning and replacing any worn-out cutting or lower supporting plates.

We would like to invite you to check the points that apply to you and to contact us in order to clarify open questions and to discuss any further procedure. We can also advise you on all possible additional measures (e.g. training).

Montabaur – March 2020

Daiso Europe

+ 49 2608 86 43 300

info@daiso-europe.com

www.daiso-europe.com