

## **Good manufacturing practice for the production of food packages - implementation instructions for printing companies**

This Technical Review provides some general instructions on good manufacturing practices from a printing ink manufacturer's viewpoint.

If you order low-migration inks from Flint Group, you get inks and varnishes which are manufactured so that aspects of migration or contamination with undesired substances in all process steps, such as formulation development and production, are taken into account by the ink maker.

See also EuPIA: Good manufacturing practice for the production of packaging inks applied to the non-food contact side of food packages and articles<sup>1</sup>.

### **Auxiliaries and additives**

Printing inks for food packages are formulated with special raw materials to minimize migration and organoleptic deterioration of the packed food. Therefore, the maker may use only approved auxiliaries and additives with the specified dosage quantities for the respective ink system.

### **Containers**

Printing inks and varnishes should be used from the original food-grade containers. In the event that this is not possible, the containers and the tools used for decanting must not have been contaminated and they must be suitable for storing the products. Substances can migrate from plastic containers or from internal coatings into the printing inks and later into the packed food in printed packages.

### **Quantity of ink**

Depending on the type of package, the global migration limit can be exceeded when certain quantities of migration-harmless inks are exceeded. If, during the production run, it becomes apparent that more ink has to be applied than originally planned, an assessment must be completed to ensure that the global migration limit will still be observed.

The aim of our technical documents is to inform and advise our customers. However, the transferability of general values known from experience and laboratory results to concrete practical applications depends on a number of factors which are beyond our control. We therefore ask for your understanding that these advice documents cannot be used as the basis for claims in law.

## Mixing of printing inks

When printing inks are mixed by the press operator, the following criteria have to be considered and ensured by suitable measures:

- Appropriate components and auxiliaries must be used. Steps should be taken to ensure that other existing products will not be used by mistake.
- To reduce the viscosity of low migration inks only Novasens PREMIUM Reducer may be used.
- To allow batch tracing, batch numbers have to be specified for mixed formulations and the formulation has to be recorded together with the batch numbers of the formulation components. Using suitable databases is very helpful here.
- To ensure contamination-free production, measures must be defined for preventing contamination with other inks / auxiliaries.
- It would be optimal to have a mixing station which is in a different location than those used for standard inks.
- Mixed inks shall be marked uniquely. All mixes get a reference or ink number and a batch number in addition to the ink designation.
- Devices and tools shall be cleaned properly with suitable, food-grade agents, such as Novasens PREMIUM Reducer. There shall be no contamination with cleaning agents.

## Leftovers of ink

Surplus ink in opened cans may only be used if you can make sure that they were not contaminated and the cans are resealed. Inks from the ink duct must not be reused.

## Minimum shelf lives

The minimum shelf lives specified by the ink maker have to be taken into account. Oil-based offset inks typically have shelf lives of several years. Water-based varnishes can usually be used up to six months and UV inks and varnishes can be used within 18 months.

In particular, the organoleptic properties of water-based systems may deteriorate if the minimum shelf life has been exceeded.

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## Conditions for low-migration printing

### Good technical expertise

Before low-migration printing can take place, all operators have to be trained. The importance of absolute cleanliness, even of the environment of the printing machine, must be emphasized in particular. If samples are to be sent for migration examination, it is advisable to discuss size and package with the examining laboratory. Usually, DIN A4 is sufficient. All samples must be packed carefully in aluminium foil and be labelled uniquely.

### Expendable items

It is particularly important that all expendable items are suitable for low-migration printing. (Printing substrate, ink, varnishes, damping solution, etc.) The suppliers have to be informed about the application. This is essential for them to be able to provide an optimal recommendation. If spot colours are to be mixed by the press operator, it must be ensured that all components used for mixing are suitable for low-migration printing. Even the smallest quantities of conventional inks added would damage the suitability for low-migration printing.

### Storage options

It has been proven that substances can migrate from one stack to the stack next to it. Therefore, the low-migration prints have to be stored separately. If this is not possible, the products should be stored at least in a well ventilated room.

### Documentation

Traceability must be ensured at all times. For this purpose the data of the used expendable items must be documented with the order data.

## **Preparation of printing machine (switching from conventional or low-odour printing)**

The printing machine must be cleaned from all residues of conventional products. Ink ducts have to be emptied completely and have to be cleaned.

Note that all polymer materials (rollers, blanket) can absorb liquids (e.g. oils) into their surface. They can diffuse from there back into the low-migration ink during the printing process. Rollers and blanket have to be cleaned carefully and subsequently rinsed with plenty of water, before being dried with a clean, lint-free rag. If required, the blanket should be changed.

Ink knives must be cleaned carefully or, preferably, replaced. If applicable, the ink duct foil has to be replaced in any case.

The printing machine manufacturer shall be asked about the suitability of the lubricants. Where there are suction units, proper maintenance is important.

When the system is changed to low-migration damping solution, the tank has to be cleaned - this applies likewise to the filter. Coloured residues are an indication of contamination and should be removed. When the system is changed to low-migration varnish, feed lines and pumps must be cleaned and rinsed with at least 20 litres of water.

Spoil sheets have to be produced to remove ink or ink components from the rollers and blanket. Type, age and history of the polymer materials influence this process and, thus, the number of spoil sheets. Here you have to distinguish whether BIO or mineral-oil-based inks were used before the change. Since BIO inks mainly contain evaluated materials (vegetable oils and vegetable oil esters), the risk of contamination with non-evaluated materials (mineral oil) is lower. If possible, some low-migration ink should be applied to rollers and blanket for some hours prior to the production run to condition the polymer surfaces.

## **The low-migration printing process / processing procedure**

Only such ink additives may be used for printing which have expressly been approved by the ink maker.

If central ink tapping devices are used, the ink must only be transported to the machine in new steel or PE cans. PVC buckets contain plasticisers and, therefore, they must not be used.

Washing solutions are a source of migratable substances. Therefore, they must never get into the ink or damping solution. Printing plates and blankets must be rubbed dry as a matter of principle.

Dirt particles and contaminants, for instance, due to poor work hygiene, mechanics' work or cleaning, can severely impair the migration behaviour of a printing object with actually optimal characteristics.

## **After the low-migration printing process / processing procedure**

Migratable substances, but also odours and taste, can be transferred from conventionally printed stacks stored nearby. Therefore, the stacks of sheets printed with low-migration inks should be stored separately from conventionally printed materials and in addition in an odour neutral environment.

For further processing it has to be ensured that products which are explicitly suitable for low-migration printing are used for every subsequent step (hot foil stamping, gluing, application of special effects in screen printing or printing of individual information by means of inkjet).

The use of stack turners (with fresh air blown in) is suitable only if the ambient air does not contain any significant amounts of migratable substances.

## **Drying of inks**

Low-odour and low-migration offset inks dry only through absorption of the inks by the printing substrate. Since non-migration or low-migration reducers cannot penetrate fast into the cardboard, these inks are absorbed rather slowly or very slowly.

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Therefore, a sufficient waiting time should be allowed between printing and further processing for printing substrates with normal absorptive properties. Experience shows that a 48 hour waiting time is sufficient. The addition of a drying agent does not improve the drying process. Instead it always causes deterioration in the migration and organoleptic characteristics. It is therefore imperative to avoid using drying agents.

In general varnishing with a low-migration water-based coating is recommended.

## UV inks (offset)

The raw materials used in the low-migration UV offset inks have low-migration characteristics only when they have cured. Therefore, good migration results are only achieved with properly cured ink films.

Whether the curing takes place properly, depends on many factors:

- design, power and age of the UV emitters (lamps and reflectors)
- machine speed
- time intervals of printing / drying
- printing substrate (absorbency)
- ink film thickness

The condition of the emitter is decisive here because only the radiation power which actually reaches the printing substrate is decisive for drying. The emitted radiation power of UV emitters decreases with an increasing age. Therefore, the dryer performance has to be checked regularly and documented (e.g. measuring device, measurement labels).

For recurrent orders it must be ensured that the same energy is used as for the previous order.

Such printing substrates have to be selected which do not show any odour impairment due to the exposure to UV light.

## Water-based varnishes

The dryer performance (temperature and air flow) shall be checked and documented regularly.

## **Storing and transporting folded food boxes and expendable materials**

When expendable materials are stored it is important that contamination with undesired substances is avoided.

Expendable materials shall be stored in the original containers, if possible.

Especially paper and cardboard can very easily absorb volatile substances from the ambient air. Air contamination in the storage place, e.g. due to exhaust gases from drying conventional offset printwork, gravure printing, screen printing, UV printing, UV varnishing and lamination and even exhaust gases from diesel-driven forklifts, can migrate to the stored printing substrate.

Even cleaning agents and lacquers for renovation and floor coatings can emit substances which are absorbed by unprinted cardboard and even printed cardboard and which will be found in a migration check.

Complete covering with plastic film (usually PE or OPP film) does not provide any absolute protection against ambient influences.

Microorganisms can breed in printing substrates at air humidities beyond 75% RH. This leads to a clear deterioration in the organoleptic characteristics in many cases.

The film sheets used for wrapping or shrink-wrapping should not have an inherent smell. Film sheets containing plasticisers must not be used since the plasticiser can migrate from the film sheet. Wooden stillages are a potential source of migratable and harmful organoleptic substances. Dirty stillages but also wood treatment with preservation agents against fungal attack are particularly critical. New and dried wooden pallets or plastic pallets stillages shall be preferred.

The storage and transport conditions shall also be observed by the forwarding companies. Special awareness must be raised to the fact that impairments are caused from storing together with other goods and from exposure to diesel exhaust.

## Conclusions

The printing process is a very complex production-technological process. A high volume of expendable materials is refined in a very short time. Here the manufacturers of folded boxes have the task to coordinate all factors and activities with an influence on the printing quality. This necessitates good communication with all parties of the delivery chain concerned, from the supplier of the package manufacturer up to his customer. At all times the requirements of all parties must be known so that the product can be selected optimally and constant product quality can be maintained together. Regardless of the legal responsibility for the package which rests with the manufacturer of the folded boxes, the EuPIA companies are competent experts who are ready to help printing companies and their customers with their chemical expert knowledge.

## Footnotes

- <sup>1</sup> EuPIA - Good manufacturing practice for the production of packaging inks applied to the non-food contact side of food packages and articles.