InkFormulation 6
Application Notes: Film Thickness Calibration

Introduction

The Film Thickness Calibration module would be used for flexographic, gravure and screen-printing processes. To simplify the explanations below, we are using the term "roller" to represent anilox rollers, gravure rollers or screens.

Today, the calibration data needed to determine the proper ink film thickness for these printing processes is linked to the volume of the roller to be used. There may be deviations between the specified roller volume and its actual volume, due to wear, and to the cleanliness of the roller itself. These elements are usually corrected manually during the formulation process, requiring a lot of work to reformulate, re-measure and draw down the ink until the correct film thickness is achieved.

The Film Thickness Calibration module provides a rapid, automated and precise determination of the required ink film thickness. There is no need to re-measure known recipes with different rollers to adjust the film thickness manually. The algorithm calculates the thickness of the current print conditions automatically compared to the calibration data. All the user has to do is to enter the specific roller as a parameter, and the software will adjust the precise film thickness. This leads to faster make ready, and reduces the number of assortments needed resulting in a streamlined formulation process.

How to calculate thickness for a reference assortment

In order create film thickness parameters for a reference assortment, the user must define at least one recipe for each roller. There are two options available in the software to do this:

Option 1:

Select the automated calibration mode. After entering the necessary presets in InkFormulation, a recipe is created for this specific calibration.
Option 2:

Select the manual calibration mode. This mode uses an existing recipe in order to get the information needed to create the calibration data.

Figure 1 shows that reference assortment A is created for an unknown roller.

Read known recipes to calculate precise film thickness needed for all rollers. The known recipes contain the base colorant data of assortment A, and also the reference print conditions for the different rollers.

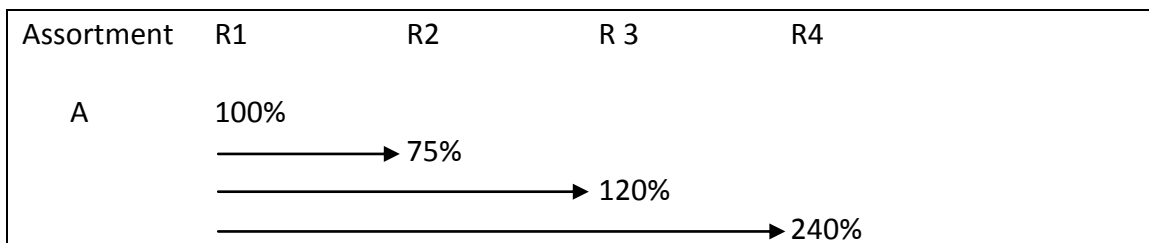The thickness object is re-calculated with those measurement values and returned to the user:

Assortment	R1	R2	R 3	R4
A	100%			
		→ 75%		
			→ 120%	
				→ 240%

Figure 1

The parameters of the thickness calibration data are stored in the system.

Film thickness calibration in relation to other assortments

If you create a new assortment, there is no relationship to the existing film thickness data sets. Only one recipe is required to establish the necessary relationship. The recipe used needs to be based on the new assortment, and needs to be printed with the known roller. This would then allow the software to establish the relationship to all previous thickness data sets, as shown in figure 2.

Assortment B is created and calibrated with the film thickness R5. That thickness has no relation to other existing film thickness objects in the system. By printing ONE recipe within assortment B using roller R4, assortment B can be updated with correct thickness calibration data.

Assortment	R1	R2	R3	R4	R5
A	**1.0**	0.75	1.2	2.4	1.71
C	0.581	0.438	0.7	1.4	**1.0**

Figure 2

Using the Film Thickness Calibration module, the system can quickly and effectively determine film thickness data requirements and adjust them for other assortments. Your formulation process can be completed faster, with fewer steps. You end up needing fewer assortments, as you no longer need to create data sets for each roller.

Film thickness calibration across substrates

The Film Thickness Calibration module calculates volume requirements across different substrates. The calibration set does not have to be re-measured for each substrate. Even so, we do not recommend creating recipes for various substrates based on data from just one.

If you are using different substrates for an assortment, we recommend creating categories; some examples follow:

- Coated
- Uncoated (newsprint)
- Uncoated (for different substrate textures)
- Color uncoated

You should create specific assortments for each general substrate application. InkFormulation can automatically create recipes across different substrates, but recipe quality can suffer if the substrate characteristics vary widely.

You have to make sure you are using the correct substrate when calibrating thicknesses. The system cannot calculate the accurate thickness characterization data with incorrect substrate data.

Ease-of-use

This module simplifies ink formulation in production. The user selects an assortment with the required color attributes and starts formulating a recipe. The thickness can be defined during and after formulation. The system recalculates the recipe instantly.

Exporting assortments and thickness characterization data

Assortments can be exported directly out of InkFormulation without losing the calibrated thickness data. The characterization data itself has to be transferred separately through the database. *

Calibrating thickness - Exercise:

The following exercise outlines thickness calibration using the standard assortment "Flexo/gravure printing including colorant elements (Pol, Leneta)". This application does not require a measurement device. To simplify the exercise, we will refer only to rollers, but it also applies to screens.

The exercise uses the standard assortment found in InkFormulation. You can also use your custom company calibration sets. If you would like to compare the thickness data you calculate to the ones in this exercise, we recommend using our assortment during this exercise. The assortment has to be exported first. The relation of the calculated data will also be created by the second standard assortment.

Select "Assortment" from the Database menu to export your assortment. Select the standard assortment "Flexo/gravure printing incl. colorant elements (Pol, Lenta)" and click *Export*. *Save* the calibration set on your hard drive.
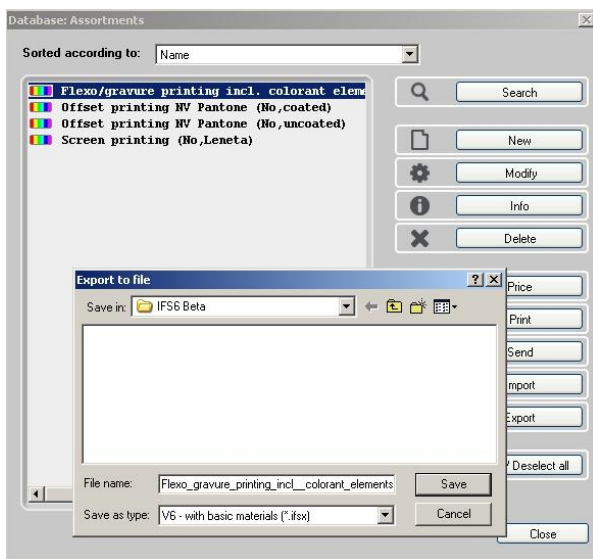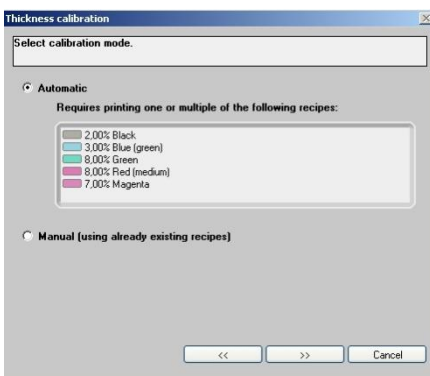
Creating thickness objects

Select *Thickness Objects* from the Database menu.

A window opens. Click *New* to create a new thickness object and then click *Calibrate* to define it.
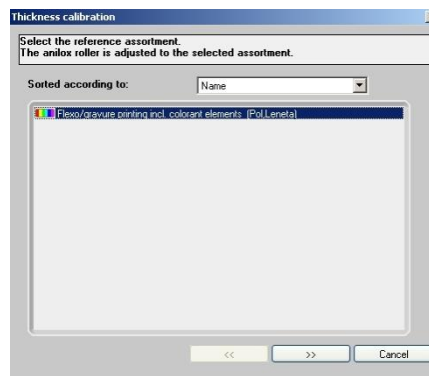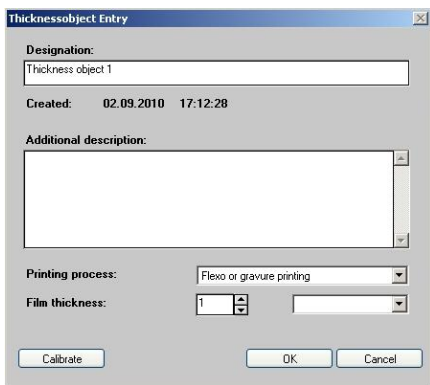
You can select different calibration modes depending on the reference assortment (i.e. the standard assortment):

a)   Automatic

For automatic thickness calibration you will need to create recipes as required by InkFormulation.

b)   Manual

The manual calibration is based on existing, measured recipes, which have been saved in InkFormulation for the selected assortment.

We are now looking at the automatic mode because there are no measured recipes with different thicknesses in the reference assortment.

Automatic calibration mode

During automatic calibration, you are first asked which substrate you would like to use. Select *Substrate of current assortment*.
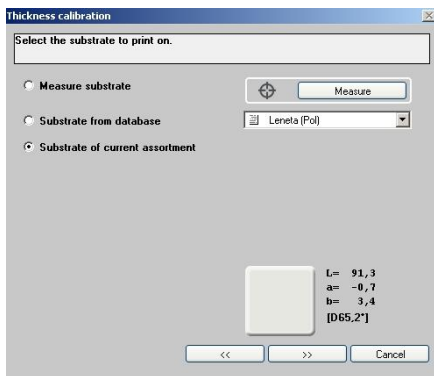
After selecting the substrate, you can select one or more of the recipes suggested by InkFormulation:
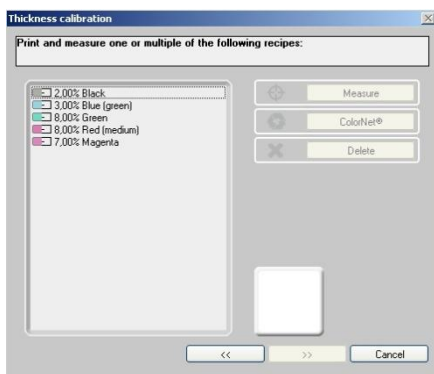
These recipes are made up of mixtures of transparent white plus one colorant. Click on a recipe name to see additional information about the colorant amounts used. A dialog box opens, showing you a list with the colorant name and percentage. Please select the recipe "8.00% Green".
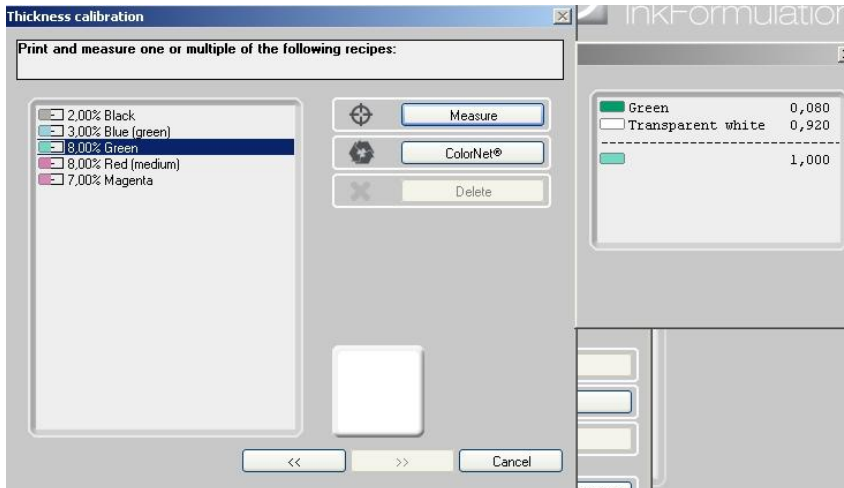
The selected recipe is mixed, then drawn down using the selected roller and then measured. For our application, click *ColorNet* to select the colorant green in the assortment "Flexo/gravure printing incl. colorants elements (Pol, Leneta)" and then click on "5% of the calibration set".
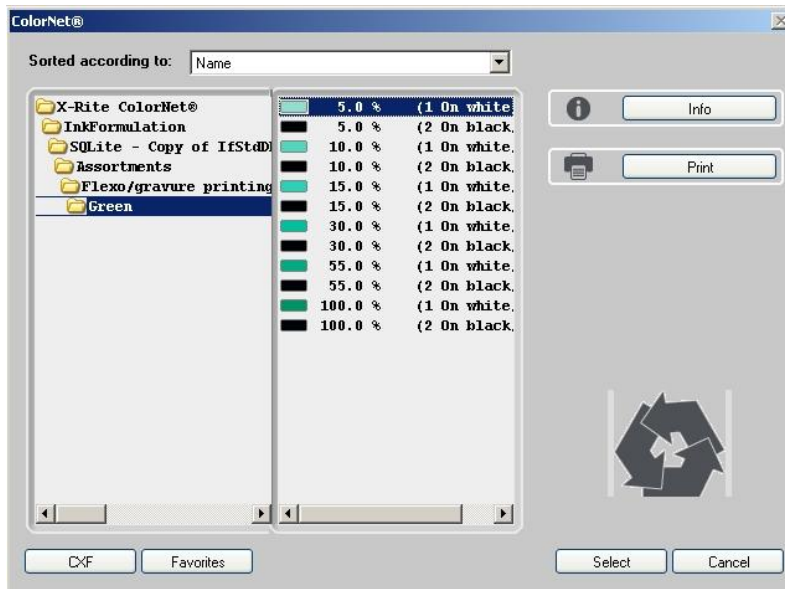
The measurement of the 5% green sample is assigned to the 8% green recipe. Additional recipes that have been drawn down using the same roller can be measured now.
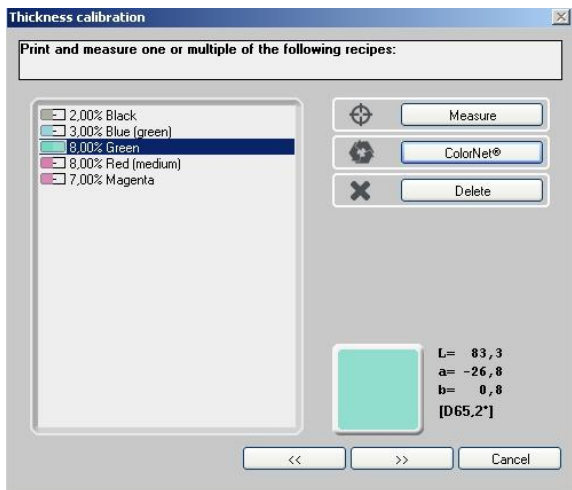
After defining the measurement for green, click >>. Now InkFormulation calculates the thickness for this roller.

Our example contains a measurement sample from that assortment but with different color intensity.

From the measured sample, the application calculates a thickness of 61.13%.
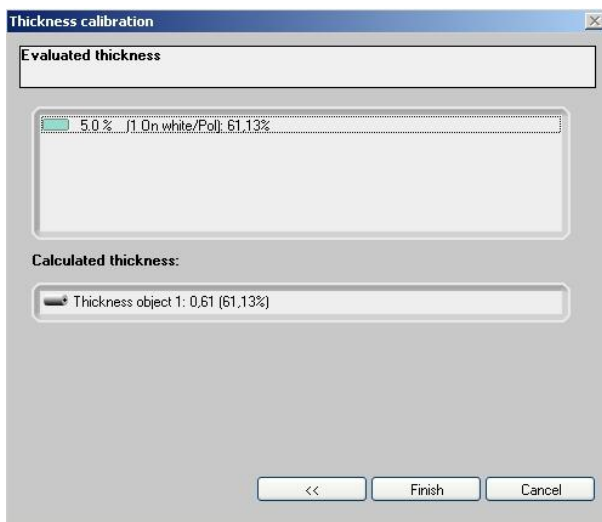
Click >> to end the calibration of the thickness object.

For the reference assortment "Flexo/gravure printing incl. colorants elements (Pol, Leneta)" the thickness object 1 has been determined as 61.1%, relative to the thickness of the assortment.
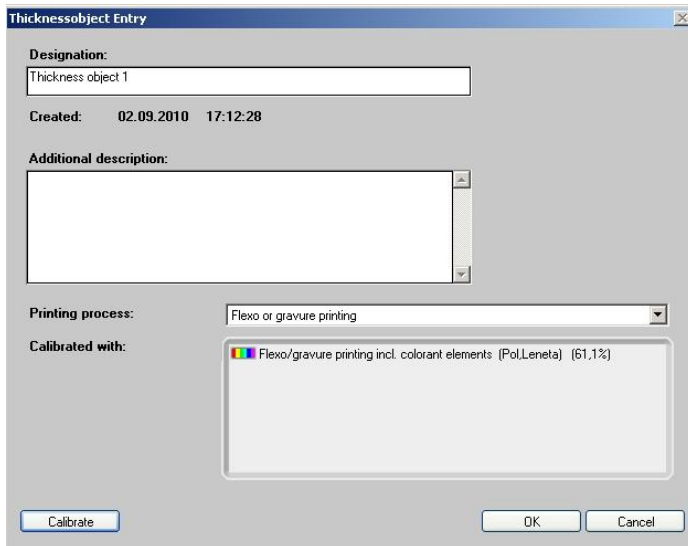
Please calibrate additional thickness objects for reference assortment 3 with the following settings:

- Calibration mode: automatic
- Substrate: Use assortment substrate
- Recipe: 8% Green
- Copy measurement sample from ColorNet:
Thickness object 2	10% Green
Thickness object 3	15% Green
Thickness object 4	30% Green

The following values are the result of the 4 calibrated thickness objects.

- Thickness object 2   134,7%
- Thickness object 3   177,8%
- Thickness object 4   382,2%

Create a relation to a second assortment

The next step will create a relationship to a second assortment. If you are using the standard assortment, import the assortment you originally exported at the beginning of the exercise.

Select *Assortment* from the Database menu and click on *Import*. Select the assortment, and click *OK*. Since the database designation already exists, prefix it with *"new_"*.

If you are using your own assortment, you do not need to import any data.
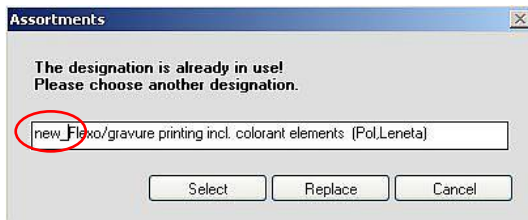
To create a relationship to the thickness objects, open the *Database thickness object* and select the *Thickness object 1*.
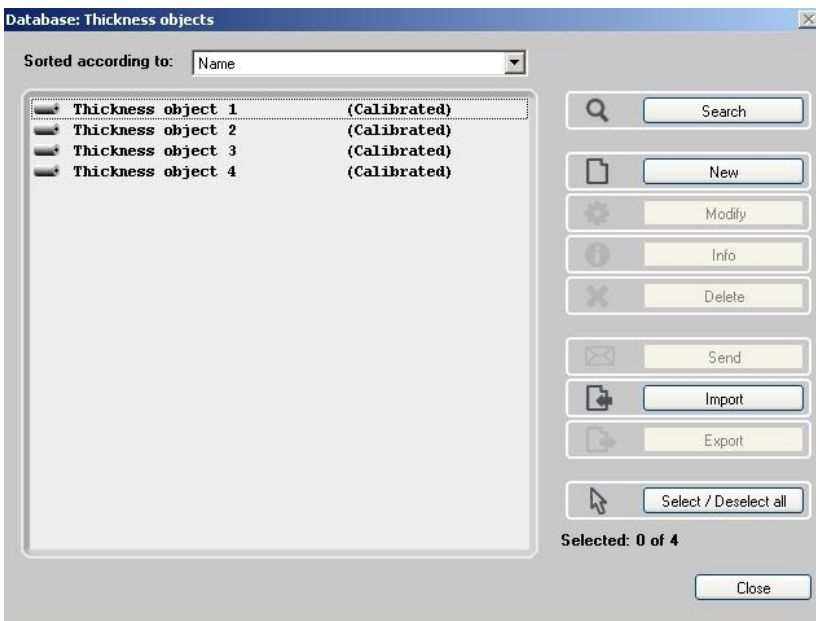
The dialog box named Thickness Object Entry contains information about the calibrated assortments. Click on *Calibrate* for additional calculations for the assortment. Follow the calibration steps as previously explained.
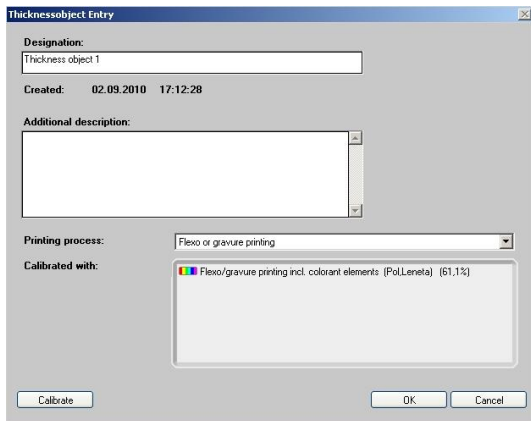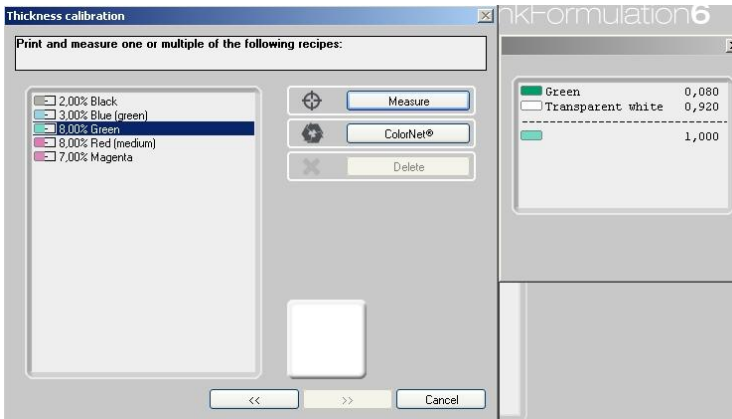

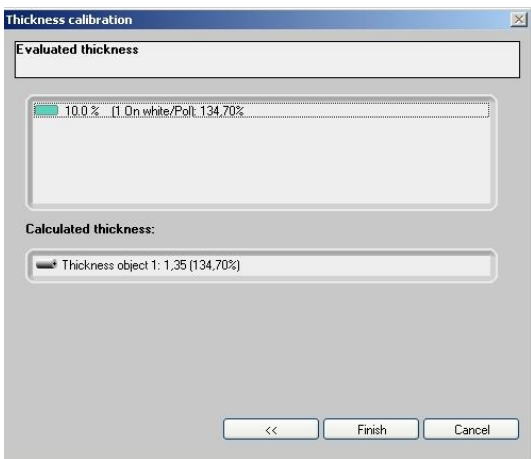Select the reference assortment you just imported.
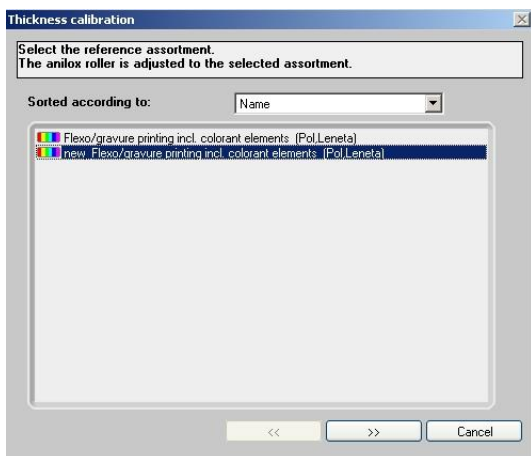
Make sure the substrate you want to print on corresponds to the current assortment and is selected.
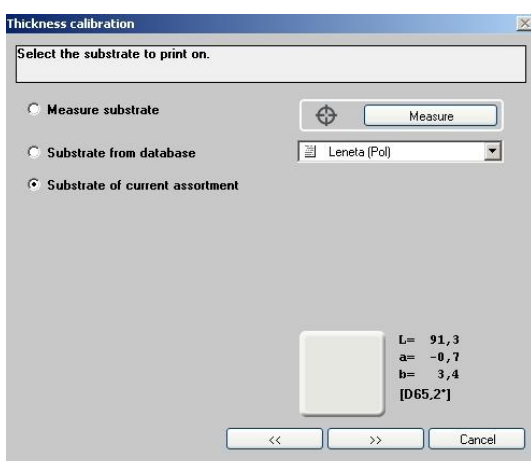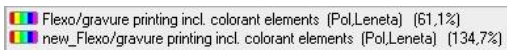
Again select the recipe 8.00% Green and load the 10% green sample from *ColorNet*.
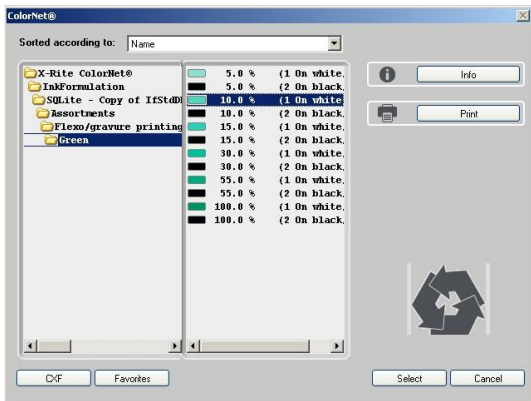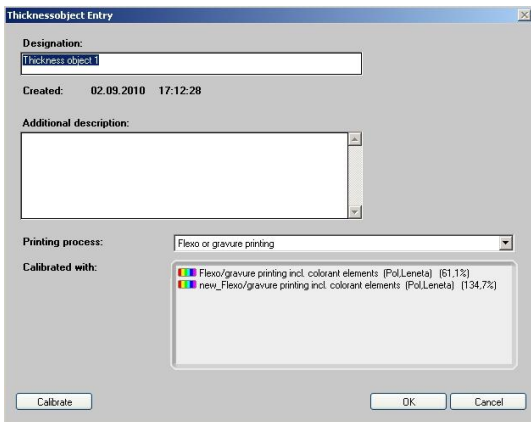

With this data, the system calculates a thickness object of 134.7%.

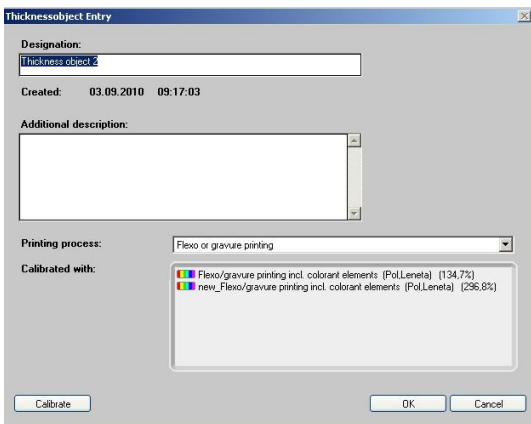For the thickness object 1, the following data is calculated:

In the Thickness Object Entry dialog box, click OK to end the calibration.
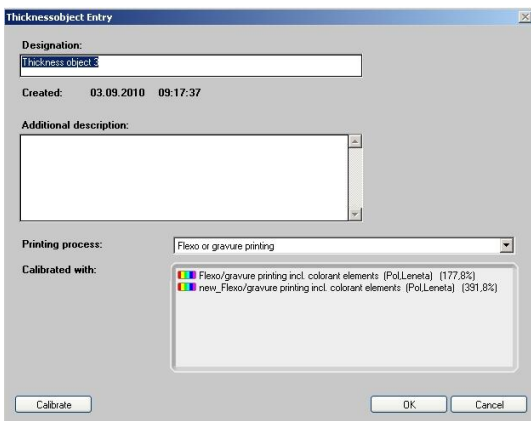

This calibration created a relation to all thickness objects. All thickness objects (1-4) contain the standard object as well as the reference assortment.

Thickness object 2:

Thickness object 3:

Thickness object 4: