Thermal model for Generic Substrate Carrier

About Sioux CCM
Sioux CCM is a well experienced innovative product development company, founded in 1969. For our customers we translate technology into applications in the field of mechatronic products and systems. Our competences in mechatronics, mechanics, electronics and software enable us to support the need of our customers. Please check [www.ccm.nl](http://www.ccm.nl) for more information about Sioux CCM. This assignment is defined by the department of Mechanics.

About the assignment
At Sioux CCM we have developed a Generic Substrate Carrier (GSC). This is a module which can be integrated in all kinds of high productive printing systems to position the substrate to be printed with high accuracy and speed. Typically sizes range from A3 paper format up to panels of more than 5 m$^2$. The range of applications for the GSC is very wide and it is used at strongly varying environmental and process conditions. In high precision machines, thermal variations negatively affect machine accuracy. Especially heat loads due to the printed material or drying processes of the printed material are influencing the behavior of the GSC.

We are looking for a candidate who can help us better understand the behavior of the GSC under varying environmental conditions, such as heat loads and conditioning (cooling) systems. We need a thermal model in FEM of the GSC set up that predicts the temperature distribution in the system. From this temperature load the belt position and deformation has to be simulated also in FEM. We use NX/CAE for these simulations. The current status is that some behavior with respect to heat load and conditioning are tested, these test results are available, there is also a possibility for additional testing. So you will have a jump start in a project that is already at full speed. There is a separate bachelor graduation assignment for the conditioning system. The information of this investigation should be incorporated in this thermal model.

Goal
The main goal of the assignment is to define guidelines for the use of conditioning systems for future projects:
1. Create a thermal model of the GSC in NX/CAE, to simulate the temperature distribution.
2. Derive impact on accuracy of temperature distribution.
3. Derive a model that can be deployed in a real-time environment.
4. Verify the model through measurements.
5. Investigate the possibility to combine this with the control system.

Activities
- Gather input data for the thermal model from existing data such as tests and other investigations; complete this with additional (literature) investigation. Use analytical models to help set up the FEM model.
- Set up thermal model:
  - Components.
  - Define boundary condition.
  - Define thermal loads.
  - Define heat flows.
  - Point of attention: heat transfer/transport by moving parts!
- Transfer thermal result to geometrical result.
- Set up tests for verification.
- Execute tests and use results for (fine) tuning of the model.
- Add conditioning system to model.
- How to use knowledge of model to actively compensate via (motion)control.

Interested?
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