Conference Proceedings of the Simulia India Regional Users Meet 2009

Paper Flow Simulation Using Abaqus

Venkata Mahesh R
Lead Engineer
HCL Technologies
No: 8, M.T.H. Road, Ambattur Industrial Estate
Ambattur, Chennai-600 058
venkatamahesh_r@hcl.in

Mayilvaganan T
Project Leader
HCL Technologies
No: 8, M.T.H. Road, Ambattur Industrial Estate
Ambattur, Chennai-600 058
mayilvaganan.t@hcl.in

S.K.Balaji
Project Leader
HCL Technologies
No: 8, M.T.H. Road, Ambattur Industrial Estate
Ambattur, Chennai-600 058
balaji.kothandaraman@hcl.in

Abbreviations :

GSM	Grams per square meter
RPM	Rotations per minute

Keywords : Paper Flow path, Explicit Dynamics, Skew.

Abstract

Paper transport is one of the areas under media handling methods where papers are transported by rollers through different path ways. The challenge in media handling is to transport the paper smoothly with out jam or in-plane deviation (paper skew). The smooth flow of paper is influenced by grade of paper, complexity of flow path, roller speed, roller pre-loads and significantly the roller material. It is also costly and difficult to develop a physical flow path testing. Hence, there is a high demand for computer simulation to study the paper flow behavior under different path configurations. In this study a typical printer flow path is considered for paper transport simulation and is carried out with different grades of papers. This study also determines the under driven and overdriven conditions of the paper through a flow path configuration. The paper flow simulation is carried in Abaqus V6.8. The Analysis results and lessons learned from this simulation in Abaqus are presented here.

Introduction

Analysis of contact is commonly performed in ABAQUS. In this study we have simulated the paper transport through thin channels with complicated contour in a printing machine. In these machines the paper is often pushed from a channel with no constraint on the leading edge from the time it leaves the channel until it reaches the next guide in the process. The paper is supported as a cantilever structure between the guides. In addition, if the paper is very flexible in bending under the gravity load, the paper undergoes large displacement, large rotation due to changing in boundary condition and push through nip rollers while transport. Because of the possibility of large deflections, this leads to a geometrically nonlinear problem.

The motivation for this work comes from high speed printers. The speed of the paper in these machines can approach two meters per second. We use the simulation to study the effects of different system parameters on the motion of the paper. These include the velocity at which the sheet exits the channel, accelerations to this "transport" velocity, exit angle, and sheet rigidity, etc. Results indicate that dynamic loads have a considerable influence on sheet trajectories.

Download the full conference paper