Overview
- HP has developed high speed commercial-scale inkjet presses currently in use at a number of customer sites.
- Books printed under extreme conditions (e.g. high humidity, high picture density, lightweight paper) display waviness, decreasing customer satisfaction.
- Objective: reduce book waviness through optimization of inkjet press printing parameters and application of fundamental engineering principles.

Background
- Paper consists of cellulose fibers (see Figure 1) treated with various coatings to improve durability and performance.
- High levels of tension, significant application of moisture to paper, and aggressive drying during printing cause non-uniform expansion of the cellulose fibers and can lead to permanent deformities recognized as waviness.
- Literature regarding the waviness phenomenon reveals unclear and often contradictory results for common strategies to reduce waviness.

Experimental
- DOE-style experiment altering printing press parameters (Table 1); 23 variations created consisting of 3 repeating test patterns.
- Uniform moisture application across pages (ink and bonding agent) during printing: even expansion across pages.
- Dryer effects: High Temp 1, Low Temp 2 vs. Low Temp 1, High Temp 2.
- Laser profilometry (Figure 2): quantitative measurement of waviness (Figure 3).

Results and Discussion
- DOE Analysis: most tested printing press parameters had negligible effect on waviness.
- First dryer temperature correlated directly with waviness (DOE); further experiments show inconclusive results.
- Higher paper moisture content (post-printing) correlated significantly with less waviness (Figure 4).
- High levels of uniform moisture application reduced waviness. Measured by laser profilometry (Figure 5) and human grading (Figure 6).

References