# A thermal boundary control method for a flexible thin disk rotating over critical and supercritical speeds

Yong-Chen Pei, Chris Chatwin, Ling He, Wen-Zuo Li

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**Table 1** Numerical model validation using the natural frequency for a free rotating disk

| Parameters | Disk mode | Current work (Hz) | ANSYS Workbench (Hz) |
|---|---|---|---|
| Disk rotating speed $\Omega$=0 rpm<br>Shaft temperature increment $\Theta_D$=20 K | (0,0) | 34.0345 | 33.798 |
| | (0,1) | 50.5412 | 50.412 |
| | (0,2) | 109.7484 | 109.76 |
| | (0,3) | 207.2632 | 207.18 |
| | (0,4) | 336.1603 | 335.87 |
| | (1,0) | 373.3374 | 373.07 |
| | (1,1) | 410.6060 | 410.12 |
| | (0,5) | 494.7116 | 494.11 |
| | (1,2) | 531.5171 | 530.62 |
| Disk rotating speed $\Omega$=6000 rpm<br>Shaft temperature increment $\Theta_D$=60 K | (0,0) | 55.4631 | 55.054 |
| | (0,1) | 113.6046 | 113.39 |
| | (0,2) | 213.0075 | 213.07 |
| | (0,3) | 331.9636 | 331.99 |
| | (1,0) | 400.9092 | 400.36 |
| | (1,1) | 452.7148 | 452.13 |
| | (0,4) | 472.9953 | 472.85 |
| | (1,2) | 604.6028 | 603.31 |
| | (0,5) | 639.0490 | 638.61 |