When metal sheet is wound on to a mandrel the coil is not completely round. This eccentricity can be caused by:

- the strip head on the mandrel (belt wrapper)
- the strip coming out from the gripper slot
- reversing mills: After several passes there is a thickness step from initial thickness at head and tail to the reduced thickness in the body
- eccentricity of the mandrel itself

This coiler eccentricity causes tension oscillations in the strip which in turn can lead to thickness errors and surface defects.

**CHALLENGE**

Since this tension disturbance is repeated with each revolution of the winder, its frequency depends on the rotational speed of the winder. At high rolling speeds this periodic tension change is much too fast to be compensated by the closed loop tension controller. Moreover the behavior of the system to be controlled changes dramatically with speed, coil diameter, strip geometry and pass reduction.

**OUR SOLUTION**

The coil eccentricity compensator Coil Eccentricity Expert is a model based control which uses the fact that the shape of the eccentricity remains relatively constant during coiling. It can therefor model the eccentricity over several revolutions. Using an inverted plant model this eccentricity is transformed into a compensation torque for the coiler drive (pre-control).
PRODUCT FEATURES
The Coil Eccentricity Expert is designed to adapt to all eccentricities occurring during winding.

- Thanks to the model based approach the Coil Eccentricity Expert is stable and has a very high compensation rate:
  - For all speeds (up to 22 Hz!)
  - During acceleration
  - For all strip types
  - For all coil diameters
  - For all pass reductions

The Coil Eccentricity Expert is designed to meet the following restrictions:

- No excitation of the winder shaft resonance frequency
- No risk of exceeding the torque limits
- No tooth-flank rattle to protect the gear box
- Maximum compensation frequency
- Maximum compensation amplitude

SUMMARY
The winder is accelerated by the Coil Eccentricity Expert in such a way that the fast diameter changes caused by the coil eccentricity have no effect on tension and thickness. The model based approach in combination with the modelling of the eccentricity over several revolutions enables the control to be stable in all situations and to provide high compensation rates up to disturbance frequencies of 22Hz.

MAIN BENEFITS
- Better strip quality – stable strip tension leads to better strip thickness tolerances, better strip surface
- Maintenance friendly – using existing sensors and instrumentation for strip tension and coiler rotation, no additional sensors or instrumentation needed
- Fast CAPEX – Easy to implement in existing basic automation environment

FIELDS OF APPLICATION
- Unwinder and rewinder of SCM: Improvement of tension and thickness quality
- Unwinder of batch TCM: Improvement of tension and thickness quality
- Rewinder of tandem mill or processing lines: As the coil eccentricity has only a very limited effect on the thickness the Coil Eccentricity Expert can only improve the tension quality

Influence of Coil Eccentricity Expert on strip tension and thickness in a reversing cold mill

The information (including, e.g., figures and numbers) provided in this document contains merely general descriptions or characteristics of performance based on estimates and assumptions which have not been verified. It is no representation, does not constitute and/or evidence a contract or an offer to enter into a contract to any extent and is not binding upon the parties. Any obligation to provide and/or demonstrate respective characteristics shall only exist if expressly agreed in the terms of the contract. These estimates and assumptions have to be analyzed on a case-to-case basis and might change as a result of further product development. Primetals Technologies excludes any liability whatsoever under or in connection with any provided information, estimates and assumptions. The provided information, estimates and assumptions shall be without prejudice to any possible future offer and/or contract. Any use of information provided by Primetals Technologies to the recipient shall be subject to applicable confidentiality obligations and for the own convenience of and of the sole risk of the recipient.

Primetals is a trademark of Primetals Technologies Ltd.
Primetals Technologies Germany GmbH: Management: Rolf Riedle, Dr. Martin Fleischer
Legal form: Limited liability company, Registered office: Erlangen/Germany
Commercial register: Fürth HRB 14815