

Traceable Measurement of Drivetrain Components for Renewable Energy Systems

Ensure Reliable Quality Assurance for Less Failures and Enhanced Efficiency

Excellence

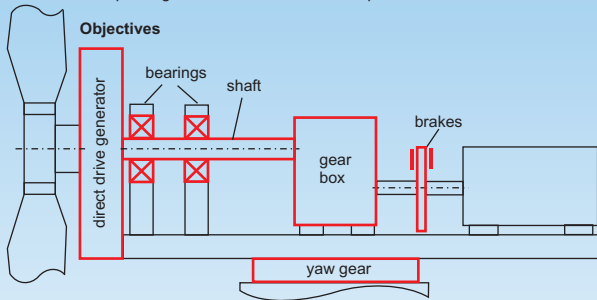
Political / Environmental need

- EU roadmap 2025
- 25% renewable energy; wind energy systems, tidal power systems
- Reduction of carbon dioxide by 20%

Technical / Economical need

- EU industry doubling wind energy systems each 3-4 years
- 30% failures caused by mechanical problems
- Stop losing world market shares of EU products

Objectives



direct drives	bearings	shafts	gears	brakes	components and measurands
position, size	size, form, waviness, roughness	size, form, waviness, roughness	size, form, waviness, roughness	form, roughness	objectives
WP6	WP6	WP6	WP6	WP6	public information
	WP6	WP6	WP6		transfer to standardization bodies
WP5	WP5	WP5	WP5	WP5	transfer to industry
	WP5	WP5	WP5		know how transfer to NMIs
	WP4	WP4	WP4		virtual workpiece within VMP
	WP3	WP3	WP3		temperature influence on workpiece
	WP2	WP2	WP2		measurement standards
	WP1	WP1	WP1	WP1	measurement / evaluation strategies
	WP1	WP1	WP1	WP1	harmonization of written standards

Progress beyond the state of the art

Network of European NMIs

- Metrological infrastructure for drivetrain components
- Product-like measurement standards for size, form, waviness, and roughness
- Monte Carlo simulation to automatically determine MU for end users

Equipment

- Modern coordinate measurement systems
- Sophisticated software and algorithms
- Inimitable temperature chamber
- Inimitable measurement standards

Relevance

Conformity with SRT-g23

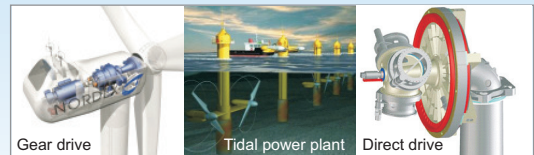
- SRT-objective 1: Traceable CMM measurements → WP1
- SRT-objective 2: Measurement standards → WP2
- SRT-objective 3: Harsh environmental conditions → WP3
- SRT-objective 4: Validation and uncertainty → WP5
- SRT-objective 5: Virtual Measuring Process → WP4

Conformity with overall objectives of the EMRP

- **Integration** of the national research and development efforts of the JRP-Consortium
- **Efficiency** by blending together the different measurement capabilities and facilities
- **Metrology capacity** which extend the metrological capabilities of the NMIs/DIs
- **Innovation** by developing measurement standards and procedures for industry
- **Involvement** of 2 Researcher Excellent Grants and a broad base of stakeholders

Impact

- Direct**
 - Reduction of production and maintenance costs
 - Improvement of the performance of drivetrains
 - Extension of the lifetime of renewable energy systems
- Technological**
 - Reduction of scrap
 - Reworking of expensive large scale workpieces on shop floor
 - FEA based prediction of failure modes and functional performance of drivetrain components
- Indirect**
 - Knowledge transfer and service for other fields e.g. ship and aerospace industry
 - International harmonization of trade
 - Competitiveness of EU renewable energy industry
- Basic**
 - ISO working groups TC 60 (gears) and TC 213 (GPS)
 - National guidelines such as BSI, DIN and VDI
 - Best practice guides



Implementation

JRP-Consortium: 7 NMIs/DIs + 2 REGs + 9 unfunded partners

JRP Management: PTB (Coordinator: Dr.-Ing. Frank Härtig)

All partners have substantial experience and expertise in different fields:

Workpackages	WP leader	Tasks	Task leader
WP1: metrology strategies	NCL	1.1 microprobe	PTB
		1.2 gears (form)	NCL
		1.3 gears (surface and roughness)	NCL
		1.4 bearings	INRIM
		1.5 shaft	MIKES
		1.6 GPS	NCL
		1.7 brakes	DTU
WP2: measurement standards	MIKES	2.1 probing influence	NCL
		2.2 environmental influence	PTB
		2.3 workpiece surface influence	INRIM
		2.4 industrial performance analyse	MIKES
WP3: industrial conditions	PTB	3.1 temperature	PTB
		3.2 other influences	MIKES
WP4: virtual measuring process	CMI	4.1 thermal / elastic deformation	CMI
		4.2 application	CMI
		4.3 validation	PTB
WP5: validation	PTB	5.1 new measurement strategies	NPL
		5.2 measurement uncertainty	PTB
WP6: impact	NPL	6.1 knowledge transfer	NPL
		6.2 training	NPL
		6.3 exploitation	NPL
WP7: coordination	PTB	7.1 management	PTB
		7.2 project meetings	PTB
		7.3 project reporting	NPL

Modern management tools

- Project management board
- Regular project meetings
- Task oriented and dissemination workshops with industry
- Video / web conferences
- Training courses, e-learning
- Active web site

Budget: 4.1 Mio €