Standards For Components In Concentrating Solar Thermal Power Plants –
Status Of The Spanish Standardization Committee

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First EERA Annual Conference
24-25 November 2016, Birmingham (UK)
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1 - Introduction
1 – Introduction

Spanish committee AENOR CTN 206 / SC 117

- Ideal frame to **develop standardization activity**, balanced participation of all interested parties.
- **AENOR** (Spanish Association for Standardization and Certification) is the only standardization body in Spain (ROYAL DECREE 2200/1995 December 28th), wide experience in all standardization fields, including renewable energies.
1 – Introduction

Spanish committee AENOR CTN 206 / SC 117

TECHNICAL COMMITTEE 206: ELECTRICAL ENERGY PRODUCTION

AEN / CTN 206

SUBCOMMITTEES

SC 117 Thermoelectric Solar Energy Systems
SC 114 Wave, Tidal and other current converters
SC 82 Photovoltaic
SC 4 Hydraulic turbines

WORKING GROUPS

WG 1 Entire CSTP plant
WG 2 components of the solar thermal power plant
WG 3 Thermal storage system
WG1 is composed of 2 different sub-groups, leaded by research centers (CENER and PSA-CIEMAT):

- Sub-group for standardization related to the Typical Meteorological Year (TMY) to define different types of meteorological data and TMY
- Sub-group for standardization related to the commissioning and qualification of the solar fields and the entire plants.
1 – Introduction

Spanish committee AENOR CTN 206 / SC 117

Working group WG2: Development of standards for components of CSP plants

- Led by CENER

- 8 subgroups for each component, led by an industrial company or a research center:
1 – Introduction

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Working group WG3: Thermal storage system

Thermal storage system standardization for concentrating solar applications

- Working group created in 2010
- Coordination led by CIEMAT
- Justification: Non existence of standards, therefore, need of standard related to the thermal storage for solar thermal electricity plants
- Main Goals:
  - Develop new **specific standards for the utilization of thermal storage** in plants with parabolic trough collectors, tower power plants and also for specific components.
  - **Extend standard** for those whose characteristics are not yet included since the existing does not provide for particular operating conditions.
2 - Summary of the working groups
2 - Summary of the working groups

Receiver tubes

- **Heat loss test** (energy balance of an electrically heated receiver under stationary conditions, in W/m)

- **Optical characterization** (solar absorptance $\alpha$ of the absorber tube and solar transmittance $\tau$ of the glass envelope)

- **Durability tests** (abrasion resistance, impact resistance, condensation, internal pressure, external / internal heat shock, overheating, thermal stability, mechanical fatigue)
2 - Summary of the working groups
Solar trackers

- **Kinematics characterization**
- **Mechanical testing**
- **Verification of the astronomic algorithm**
- **Design qualification testing specific to tracker electronic equipment**
- **Durability tests**
- **Performance tests**
- **Functional validation**

First draft based on the standard IEC 62727 for solar tracker of PV
2 - Summary of the working groups
Heat Transfer Fluids

**Fresh used fluid: quality control – liquid** (Appearance and colour, Composition, Water content, Chloride, Sulfur, Acid number, Copper corrosion, Flash point open cup, Flash point closed cup (Pensky-Martens), Fire point, Autoignition temperature, Kinematic viscosity @ 40 °C, Kinematic viscosity @ 100 °C, Density @ 25 °C, Thermal expansion coefficient @ 200 °C, Pour point, Surface tension @ 25 °C, Fusion heat, Boiling point, Specific conductivity @ 20 °C, Thermal Stability, Metals)

**Used fluid condition monitoring** (Appearance and colour, Water content, Acid number, Flash point closed cup (Pensky-Martens), Kinematic viscosity @ 40 °C, Kinematic viscosity @ 100 °C, Composition: “Low Boilers”, Composition :“High Boilers”, pH , Insolubles, Filterable material, Particle count, Foam , Termogravimetry (TG) / DSC , Metals)
2 - Summary of the working groups

Reflectors

- Reflectance and shape (guidelines from SolarPACES Task III)

- Ageing tests
  - Exposure to neutral salt spray test (NSS)
  - Exposure to copper accelerated acetic acid salt spray (CASS)
  - Condensation test
  - Cyclical exposure to temperature and humidity
  - UV radiation exposure test

- Mechanical durability resistance
  - Mechanical tests
  - Abrasion resistance test
  - Impact resistance test (Hail storm)
  - Safety performance under accidental impact test
Sensors used for evaluation of the whole plant, including temperature sensors, heat transfer fluid flow-meters, solar radiation and concentrated solar radiation sensors, and spectral irradiance measurements.

Sensors used for components characterization (i.e. mirrors and absorber tubes characterization, solar trackers, etc.), including reflectometers and spectrophotometers for reflectance measurements, pyrometers and IR-cameras for temperature and thermal properties measurements.

New developments and description of sensors exclusively used on CSP technology are included. For example, requirements of sensors for in-situ HTF characterization and new developments for measuring concentrated solar radiation.
2 - Summary of the working groups
Collector – on-site testing

**Concentrator efficiency:**
Referring to future revision of Standard ISO 9806:2017 with the quasi-dynamic test

- Peak optical efficiency
- Incidence Angle Modifier (IAM)
- Thermal losses

**Tracker accuracy:** based on standard IEC 62817:2014

- Tracking error
3 - Conclusions
3 – Conclusions

- More than **7 years** working in collaboration between industry and R&D centers to improve the quality of current plants and require the best **quality** for future plants.

- **First complete drafts** will be ready by **2017**.

- Most are **expected to be published** within the following years.

- Several standard proposals sent to international committee **IEC 117** (receiver tubes, collector).
3 – Conclusions

National

International
IEC 62862-3-3: 2017
IEC 62862-3-2: 2017
3 – Conclusions

Norms already finished

- **WG 1. UNE 206010:2015.** Tests for the verification of the performance of solar thermal power plants with parabolic trough collector technology. April 2015

- **WG 1. UNE 206011:2014.** Solar thermal electric plants. Procedure for generating a Representative Solar Year. June 2014 - All WG.

- **UNE 206009:2013.** Solar thermal electric plants. Terminology. May 2014
4 - How to join us
4 - How to join us?

To join AEN/CTN 206 SC117 “Thermoelectric Solar Energy Systems” / WG2 “Components of the CSP plants”:

- Be an interested party.
- Be located in Spain (national company/laboratory/manufacture or branch of a multinational company in Spain).
- Ask for information
  
  Contact **AENOR** Carmen Martin Marino : camartin@aenor.es
  
or **WG2 leader** Fabienne Sallaberry : fsallaberry@cener.com

To join IEC 117 “Solar Thermal Electric Plants”:

- Contact your national committee
Thank you for your attention
Please send any questions to:
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