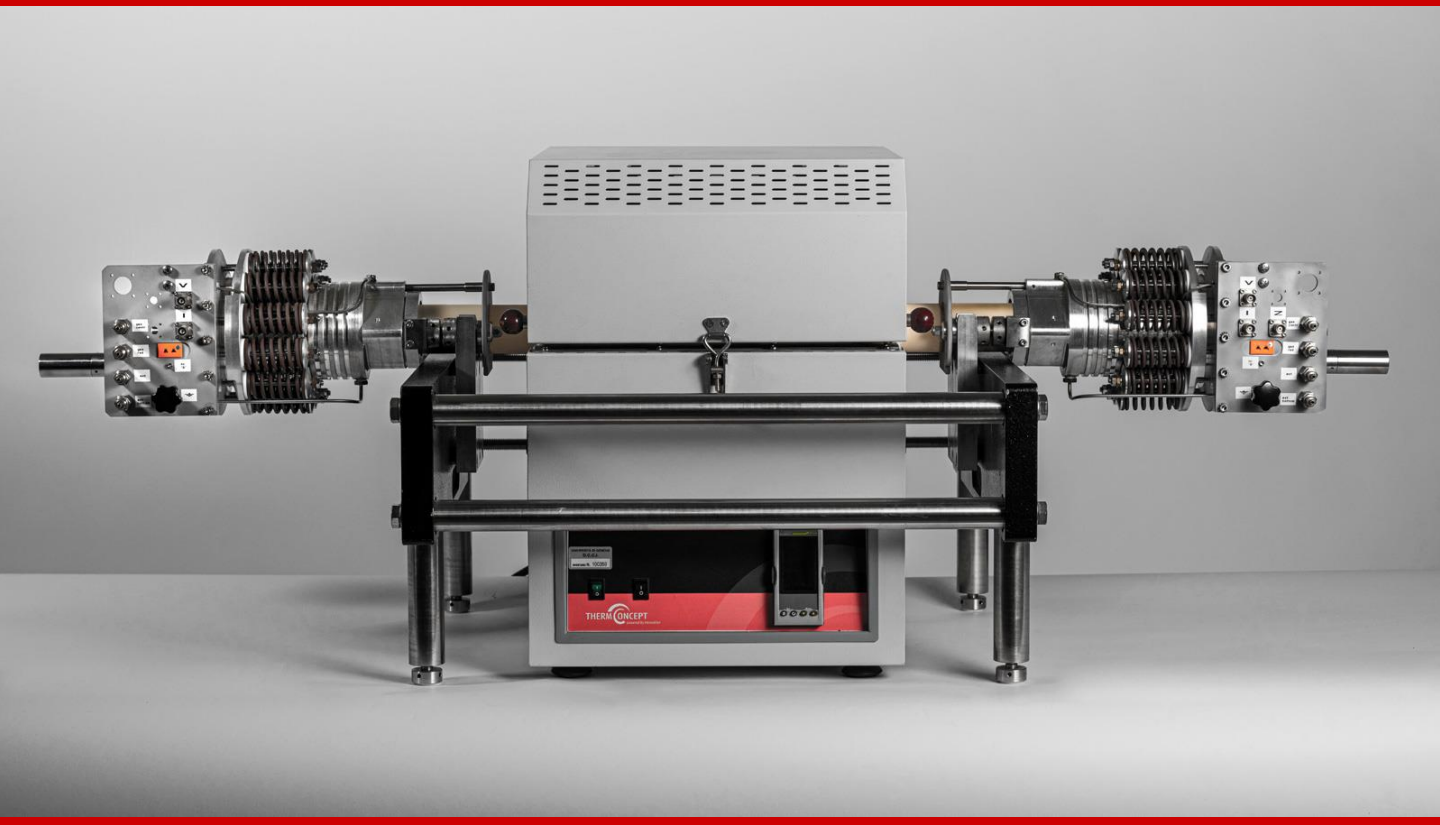
REAL LIFE TESTER



CASE STUDY
WASTE-TO-ENERGY PLANTS

HEAT EXCHANGERS

Corrosion and oxidation analysis of alloys used in exhaust and heat exchangers of a waste to energy plant

REAL LIFE TESTER

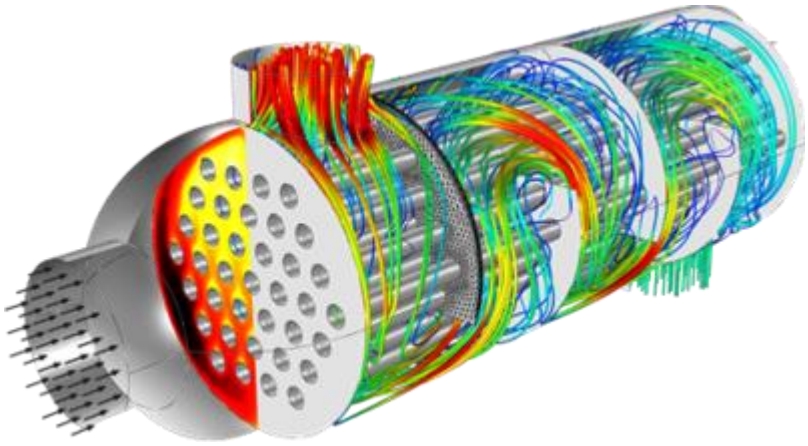
HEAT EXCHANGERS

PROBLEM: Increase the life cycle of the exhaust system and heat exchangers of a waste to energy plant.

SOLUTION: Analyze with Real Life Tester the corrosion and oxidation phenomena of the alloys used in the components of the plant, recreating in the laboratory the operating conditions to test the phenomena on different types of alloys and choose the one that guarantees the best performance.

The heat exchanger is the element that transfers the heat from the combustion exhaust gases to the water which, transformed into steam at high temperature (500-600°C) and high pressure (up to 130 bar), powers the turbines that generate electricity.

The stainless steel alloy that composes it is therefore subject to both corrosion of the exhaust gases from the outside and interaction with the steam from the inside.



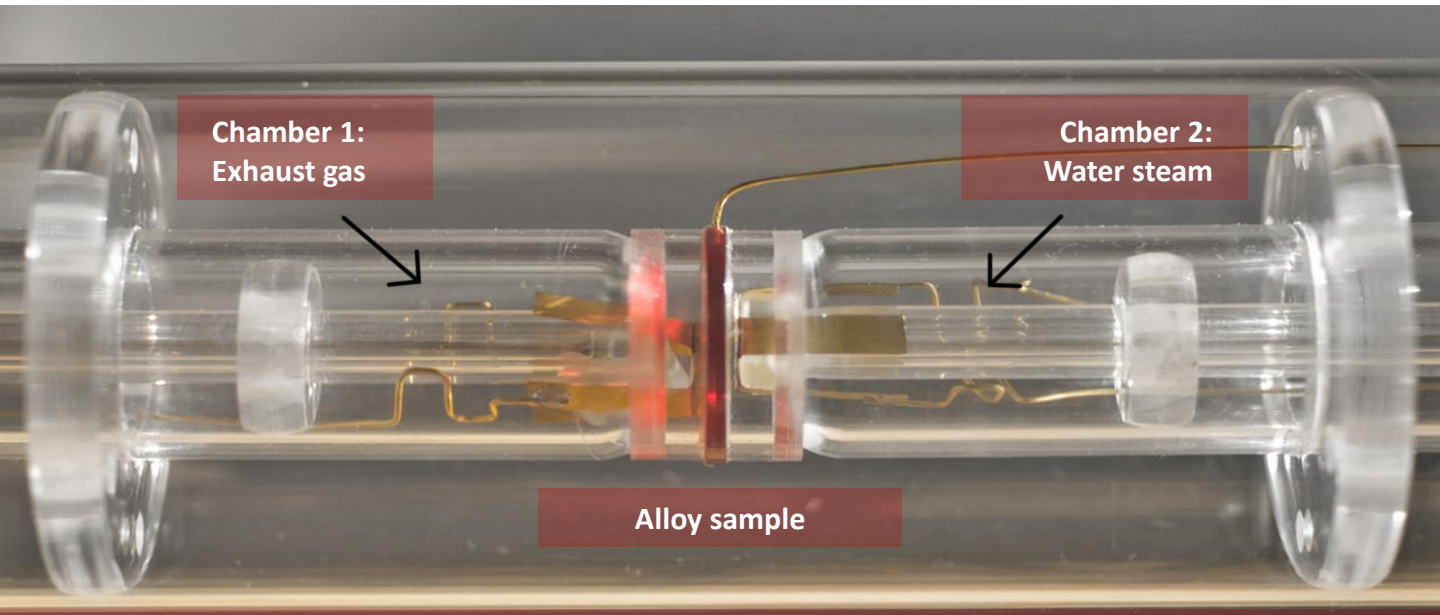
Therefore, being able to bring a small sample of material to the working temperature and apply both the exhaust gases and the water vapour simultaneously on both sides is the best way to faithfully reproduce the operating conditions of the material and study the effects of deterioration over time.

REAL LIFE TESTER

HEAT EXCHANGERS

PROCEDURE

Insert the alloy sample inside the Real Life Tester, bring the environment to a working temperature of about 600°C and let the combustion exhaust gas flow in one chamber and high-pressure water vapor in the other (each chamber is in contact with only one side of the sample). A further increase in temperature and pressure will speed up the processes that are the subject of the study.



Detail of the material sample inside the Real Life Tester.

RESULTS

By performing long life test cycles under operating conditions that are multiple to actual operating conditions, you can increase the rate of material deterioration and estimate the life span of materials and their ability to respond to needs.

MEASUREMENTS

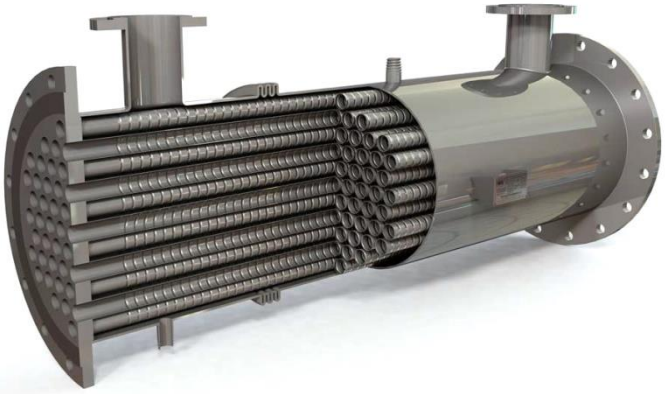
The 4-pole measurement of material resistance is considered a very effective method. The degree of oxidation of the steel used increases in fact the resistance to the passage of current. The addition of a fifth pole gives the possibility to separate the contributions and monitor the behaviour of the sample on each face. The circuit made in platinum avoids any possible alteration and allows to collect data even in extreme operating conditions.

REAL LIFE TESTER

HEAT EXCHANGERS

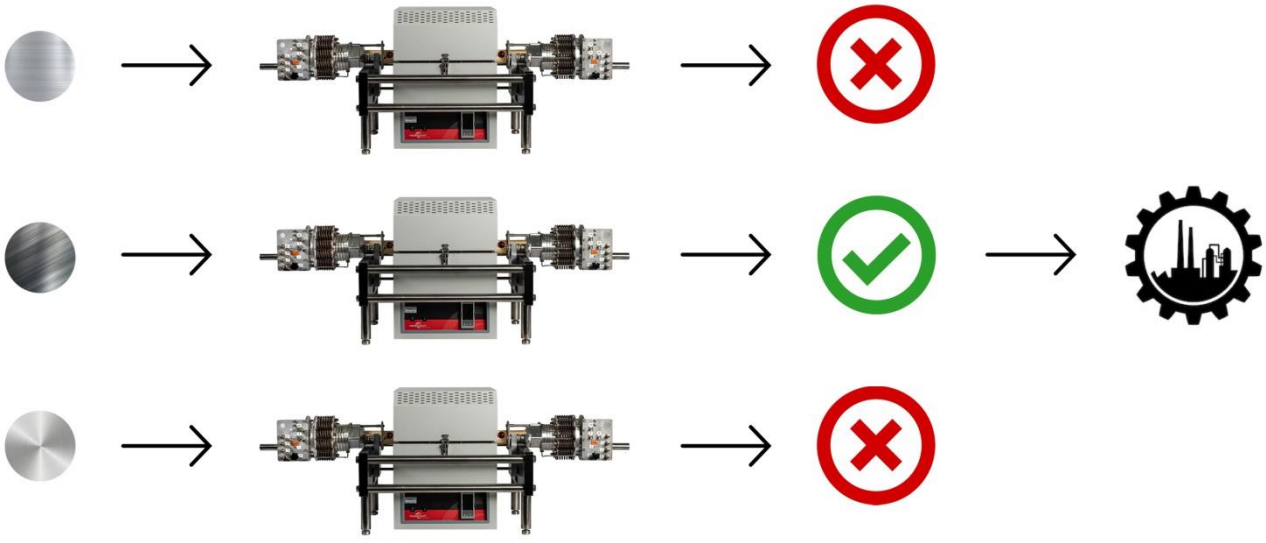
ENHANCE THE PRODUCT PERFORMANCE

Thanks to test cycles that can last from a few hundred to several thousand hours, it is possible to calculate the material's behaviour and thus its life cycle. In this way it is possible to compare several candidate materials for the same function in order to choose the one that guarantees the best performance in the long term.



REDUCE TIME-TO-MARKET BY UP TO 5 TIMES

By placing more Real Life Testers to work in parallel on different samples, at the end of a single test cycle it is possible to immediately compare the data collected on the various types of steel and choose the most performing one.



REAL LIFE TESTER

REAL LIFE TESTER HAS BEEN DEVELOPED IN COLLABORATION WITH

Consiglio Nazionale delle Ricerche

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REAL LIFE TESTER HAS PRODUCED DEMONSTRABLE RESULTS IN THE FOLLOWING EUROPEAN RESEARCH PROJECTS

AD ASTRA

Accelerated Stress Tests and Lifetime Prediction for Solid Oxide Cells

https://www.ad-astra.eu/

Partner Companies: **SOLIDPOWER SPA** (Italy), **SUNFIRE GMBH** (Germany).

Partner Research Institutions : **ENEA** (Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile, Italy), **UNIGE** (Università di Genova, Italy), **EIFER** (European Institute for Energy Research, Germany), **CEA** (Commissariat à l'Énergie Atomique et aux Energies Alternatives,France), **EPFL** (École Politechnique Federale de Lausanne, Switzerland), **DTU** (Danmarks Tekniske Universitet, Denmark), **UNISA** (Università di Salerno, Italy).

ENDURANCE

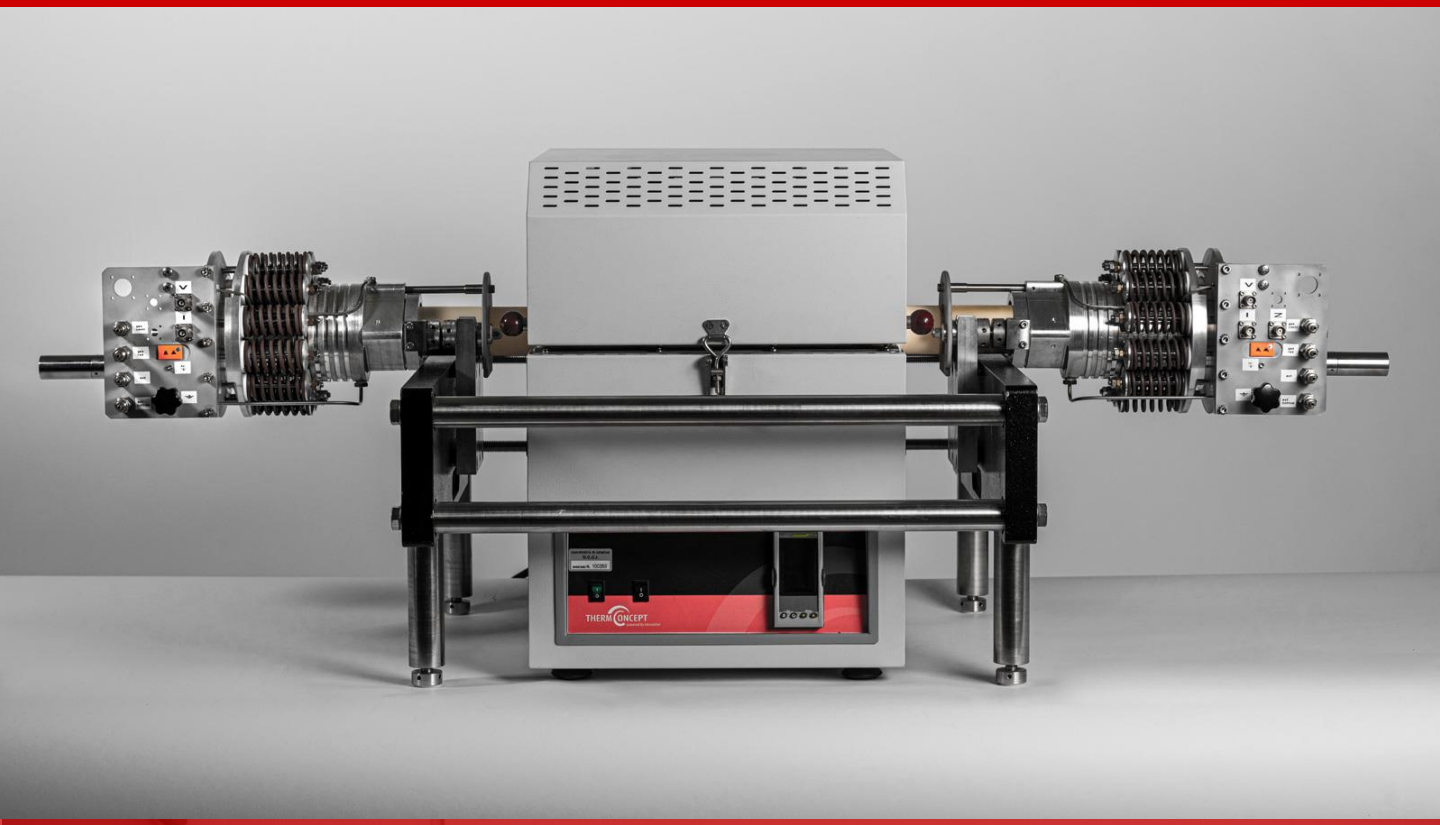
Enhanced Durability Materials for Advanced Stacks of new Solid Oxide Fuel Cells.

http://http://durablepower.eu/

Partner Companies: **SOFCPOWER SPA** (Italy), **SCHOTT AG** (Germany), **HTCERAMIX SA** (Spain), **MARION TECHNOLOGIE** (France).

Partner Research Institutions: **UNIGE** (Università di Genova, Italy), **DLR** (Deutsches Zentrum für Luft- und Raumfahrt, Germany), **IREC** (Institut de Recerca en Energia de Catalunya, Spain), **CNRS-BX** (Centre National de la Recherche Scientifique, France), **EPFL** (Ecole Polytechnique Fédérale de Lausanne, Switzerland), **IEES** (Institute of Electrochemistry and Energy Systems, Bulgary), **CEA** (De la recherche à l'industrie, France), UNIPI (Università di Pisa, Italy).

REAL LIFE TESTER



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Real Life Tester

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