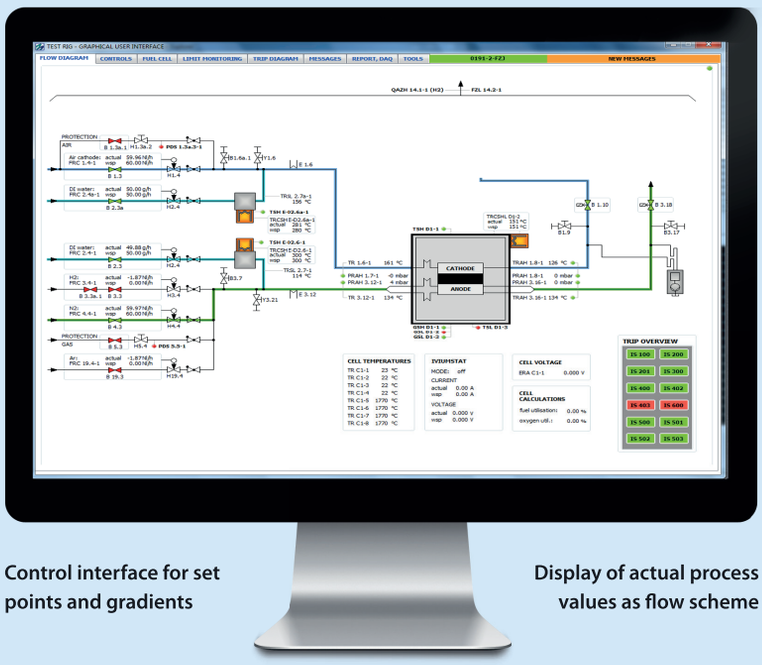
AST Gruppe
Angewandte System Technik

Test Benches

EBZ



Control interface for set points and gradients

Display of actual process values as flow scheme

TEST BENCHES FOR COMPONENTS AND ASSEMBLIES IN PROCESS ENGINEERING

EBZ has more than one decade of experience in engineering, design and construction of test stands and components for Solid Oxide Fuel Cell (SOFC) systems. Based on that, special know-how has been collected in gas processing including catalytic fuel conversions, heat transfer, handling of hot gases, phase changes and burner technologies. The EBZ control and safety systems are easy to use, flexible and allow a highly automated unattended operation.

EBZ KNOWLEDGE

- processes with very low up to medium powers handling of hot process gases
- special materials for high temperatures (>1000°C)
- high flexibility in geometry adjustments on customer demand (in-house developed and manufactured components)
- sensors and actors for high-temperature environments
- automation of processes
- unattended long-term operation up to several 1000 h

CONTROL FUNCTIONALITY

- PLC based measurement and control system
- easy to operate Graphical User Interface (GUI) with tabbed browsing and display of actual values in process flow scheme
- configurable threshold monitoring
- programmable process control: EBZ ProControl
- remote control system access
- event messaging via e-mail or SMS
- sophisticated data management solutions

SAFETY FEATURES

- safety analyses to show compliance with European Directives
- multi-stage safety management system
- independent safety PLC according to EN ISO 13849-1:2008
- test rig ventilation with safeguard
- safeguarding of temperatures, pressures and flow rates, ...
- hard-wired sensors and actuators in case of life and limb threats
- gas sensor and smoke detector equipment

Process Technology

SAMPLE: STEAM REFORMING TEST BENCH

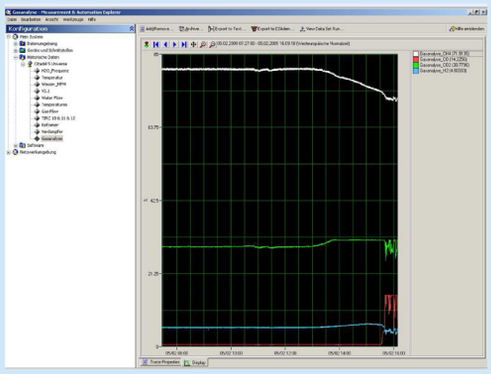
RESEARCH OBJECTIVES

- activity of different catalysts
- soot formation boundaries
- conversion of fuel components over temperature
- heat transfer rates

MAIN EQUIPMENT

- fluid supply including mass flow controller
- evaporator
- fuel/steam mixer and pre-heater
- electrically heated test reactor
- gas analysis: H_2, CO, CH_4, CO_2 and traces of higher hydrocarbons
- reformed after-treatment (afterburner, gas cooler)
- air supply and heater to test reformer in heat exchanger mode
- temperature and pressure measurements
- control and safety system

TYPICAL MEASUREMENTS		
Flow rates Temperatures Pressures	Gas compositions Oxygen contents Humidity conductivity of liquids	Electrical powers Current Voltage



MAX data storage system with real-time monitoring

Test bench equipment	Properties	Limits
Flow controllers and gas mixing	Gases, air, liquids	-
Blowers for air and gas	Air, gases; wide range of flow rates and pressures	-
Liquid pumps	Fuels, DI water, tap water, thermo-oil	-
Water deionization	Including conductivity detector	-
Desulphurizer	THT, mercaptan (thiol), H_2S, COS	-
Air and gas preheaters	Temperature control and safeguard	24 kW_{el} / 850 °C
Gas/gas heat exchangers	Compact plate-type or tube-bundle design	15 kW / 950 °C
Gas coolers	Water or air cooled; temperature control	40 kW / 1200 °C
Furnaces	Lift or clamp type	12 kW_{el} / 1100 °C
Plug flow reactors	Heated and/or cooled; temperature control	15 kW
Humidifiers	Process gas or air	30 Vol.-%
Evaporators	DI water, alcohols	5 g/h - 5 kg/h
Condensators	DI water, alcohols	-
Catalytic and volumetric afterburners	Gases with low calorific value; high modulation range	200 W - 25 kW (LHV)

EBZ

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