

Tenova is a world-wide supplier of advanced technologies, products and services for the metal and mining industries providing innovative integrated solutions. By combining process automation and metallurgical know-how enhanced value is delivered to the customer. Tenova is committed to develop technology in the areas that most impact the future of the industries it serves: quality of the products delivered by the customers, energy savings and benefits including reductions in greenhouse gas emissions.

Tenova Re Energy is specialized in heat recovery equipment for the energy intensive industries. Located in Düsseldorf (Germany), Tenova Re Energy is the Center of Excellence for heat recovery in the Tenova network. The company boasts an engineering team with extensive experience in heat recovery steam generation and develops its turnkey projects with the aim of increasing energy efficiency and reducing environmental impact, a feature that strengthens Tenova's positioning as a player committed to environmental sustainability and energy recovery.

SAVING ENERGY WITH STEAM

Energy efficiency is a topic that gets more and more importance to all potential customers in the steel and non-ferrous metal industry. 25-30% of the energy input in industrial furnaces is lost in waste gas and cooling water. The Tenova *iRecovery*® technology brings back up to 70% of the energy that would be lost.

Hot cooling is a well established technology in use from many years for reheating furnaces and converters.

The combination of heat recovery system with sophisticated control technology and a wide range of tools for steam buffering, applied to electric arc furnaces and submerged arc furnaces is the innovation that Tenova Re Energy is bringing into the market.

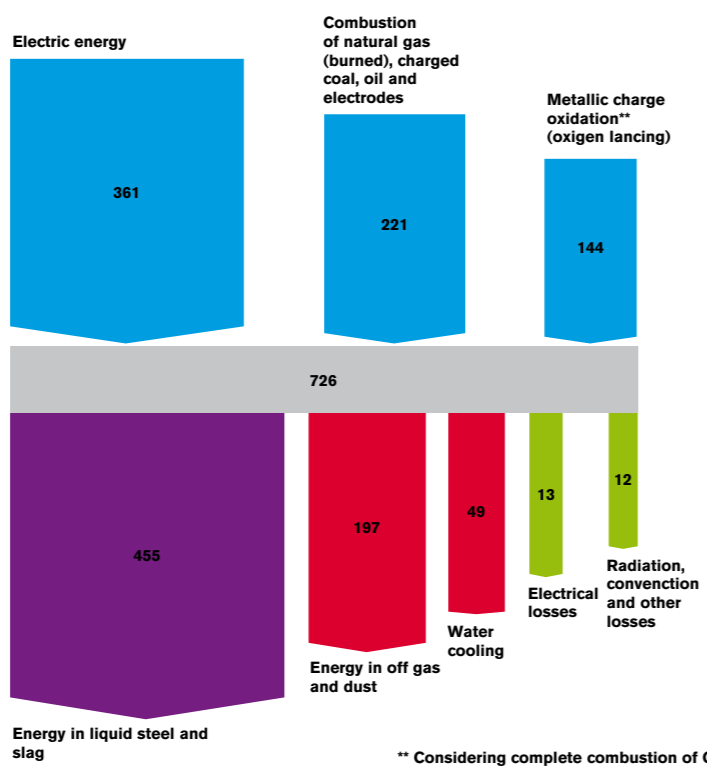
The heat recovery systems installed by Tenova Re Energy have successfully demonstrated their ability to 're-generate' energy from waste gas and reduce environmental impact, while assuring low operating costs for the customers.

MAIN BENEFITS

- Up to 70% off gas energy losses can be recovered.
- Reduced water consumption respect to open cooling towers.
- Reduced duct corrosion, pipes deposit and elimination of sulphuric acid condensation.
- Reduced thermal stress in the off-gas ducts and in the skids.
- Longer life time and less maintenance.
- High flexibility in the characteristics of produced steam (temperature and pressure).
- Applicable for nearly all kind of furnaces.



TYPICAL EAF ENERGY BALANCE



Tenova RE ENERGY
 Tenova Re Energy GmbH
 Graf Adolf Platz 6
 40213 Düsseldorf
 Germany
 Phone +49 211 5409 76 0
 Fax +49 211 5409 76 16
 reenergy@de.tenovagroup.com



Tenova *iRecovery*® Technology

Saving energy with steam, for a combination of heat recovery and environmental sustainability

www.tenovagroup.com

TECHINT GROUP

Printed by Larovere, June 2011

TENOVA is a world-wide supplier of advanced technologies, products and services for the metal and mining industries.

iRECOVERY® TECHNOLOGY

iRecovery® technology is a heat recovery cooling system for different industrial furnaces, among others the electric arc furnaces (EAF), submerged arc furnaces (SAF), basic oxygen furnaces (BOF), walking beam furnaces and pusher type furnaces.

The difference between iRecovery® technology and conventional cooling systems is that energy losses in the waste gas are now recovered as steam. 30% of the primary energy input of a typical EAF is lost in the off gas: iRecovery® technology allows recovering 35-70% of these losses, bringing back 10-25% of the primary energy input.

The technology is based on the following process:

- Pressurized water at the boiling point is pumped towards the cooled waste gas duct. The pressure can be set in a wide range between 5-55 bar depending on the steam usage.

- The off gas heat is exploited by the process of evaporation, cooling down the waste gas in the same way as conventional cooling.
- A mix of steam and water is flowing back to the steam drum where steam gets spilled for different purposes.

Tenova iRecovery® is part of the iSteel technologies portfolio, the Tenova program for increasing the furnace process efficiency. Belong to the iSteel portfolio also:

- iEAF™, an innovative automation system, based on continuous, real time process measurements and online process models, developed for the dynamic control and optimization of the EAF.
- iBOF®, a breakthrough technology designed to reduce GHG emissions while improving yield, productivity and scrap-melting capability and cutting operating costs.



TECHNOLOGICAL FEATURES

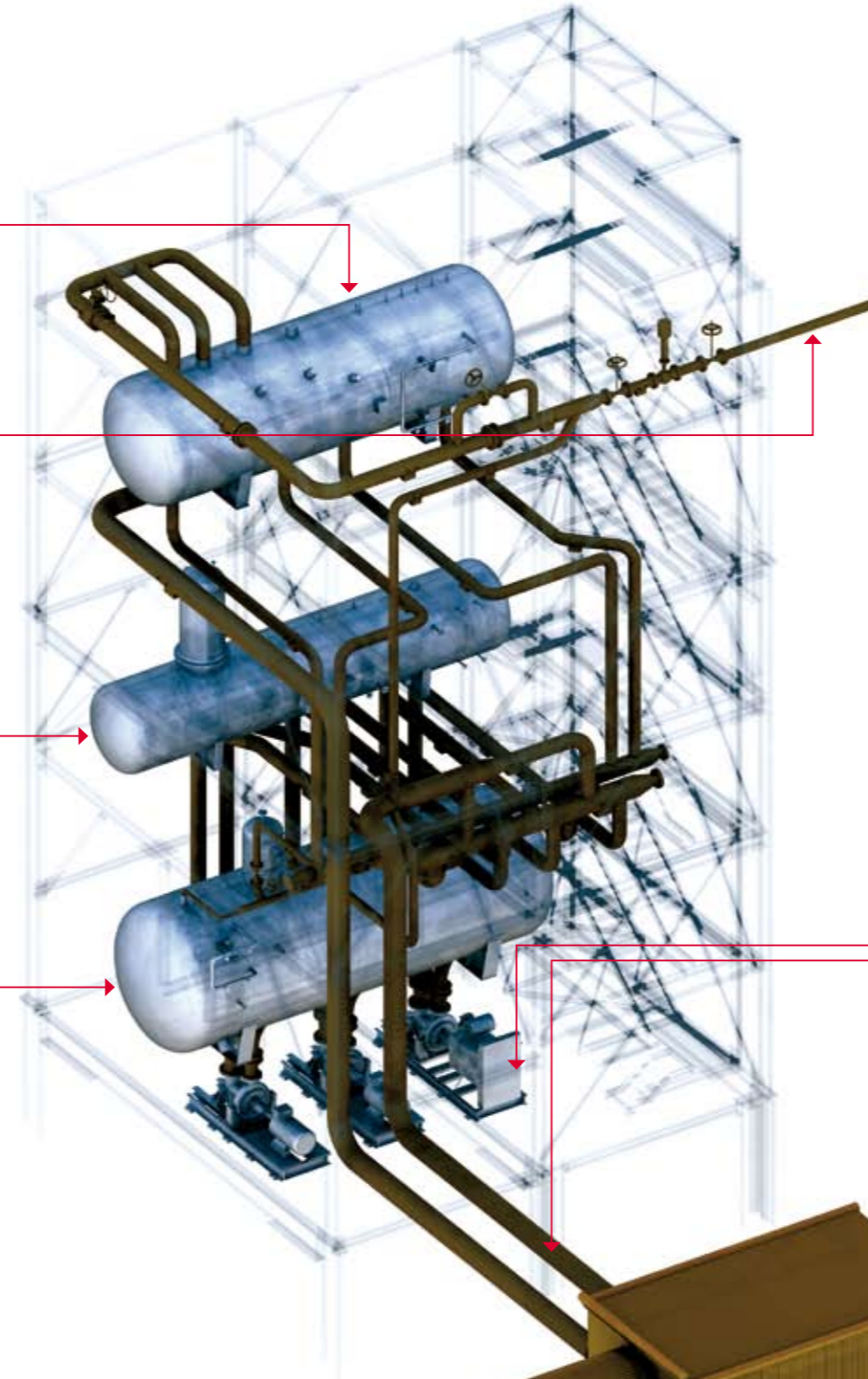
The mix of steam and water arrives at the steam drum where water and steam get separated.

The steam that is taken out from the steam drum can be used for a wide variety of purposes.

The feed water tank replaces the demand of steam consuming processes.

A Ruth steam buffer homogenizes the steam output during power-off time.

The heat gets removed through the physical process of evaporation.



USE OF STEAM



PROCESS STEAM

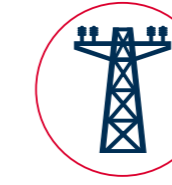
- Vacuum steel degassing
- DRI production
- Steel pickling
- Material or air preheating for other processes
- Oxygen production
- Compressor operation

HEATING/COOLING

- Building and plant heating
- Operation of absorption refrigerators



STEAM



STEAM SALES

- Local district heating and public services
- Industrial usages (tires, paper, chemical)
- Public services like sewage sludge drying or swimming halls
- Power stations

POWER GENERATION

- Steam turbines
- ORC turbines



Water gets pumped at temperatures bar pressures between 150°C/5 bar and 270°C/55 bar.

An additional heat transfer surface and dust removal optimizes the off gas cooling duct (optional).

