

INSPECT *pro control* 3

Video-based Optimization of Flue Burnout

Using high-performance image processing, INSPECT can also monitor and control in real time rapidly changing processes of flue gas burnout during technical combustion processes. This type of monitoring complements the already demonstrated camera-based INSPECT applications, such as infrared thermography and video-based solid burnout control.

Introduction

In technical combustion processes, it is aimed at conducting the process such that a low pollutant concentration results, energy efficiency is ensured, and maximum plant service lives are guaranteed. When using heterogeneous fuels, e.g. domestic waste, local combustion states may vary considerably. Compliance with legal regulations concerning the emission of incomplete combustion products (e.g. carbon monoxide and hydrocarbons) must be ensured.

In the gas burnout zone, flue gases exhibit significant local variations of the calorific value and O₂ concentration over the cross section of a flue (strand formation). Globally controlled and homogeneously supplied secondary air requires relatively large combustion volumes for sufficient mixing to ensure efficient gas burnout.

By a camera-based online acquisition of gas burnout over the complete cross section and innovative image processing, the combustion state can be measured and locally varying concentrations can be determined and described by specific characteristics. These characteristics are used for the rapid control of local need-oriented secondary air supply.

In this way, optimum gas burnout is achieved also in relatively small combustion chambers with a short residence time. The formation of incompletely burnt flue gas strands during unstationary combustion states can be avoided largely. CO peaks and increased soot particle concentrations are reduced efficiently. At low concentrations of soot particles in the ash deposits on the boiler surface, PCDD/F formation is reduced considerably.

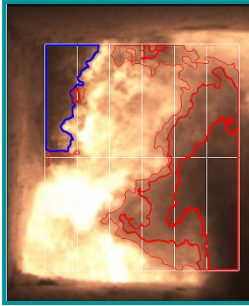


Figure 1: Qualitative classification of gas burnout in real time (red: incomplete gas burnout, blue: excess of oxygen)

Use of Camera-based Information in Control

If a video camera is used to acquire gas burnout in the flue on the level of secondary air injection, the combustion situation in the gas phase can be measured closely to real time. The characteristics determined include e.g.

- Zones of high soot concentrations and strong strands
- Zones of low combustion and small flames
- Zones of strong flame development.

Every characteristic represents a physico-chemical background (cause) and can be used directly for optimizing the combustion situation (effect). Control can be accomplished by superposed fuzzy controls or adaptive PID controls that fix target values of subordinate control circuits.

The INSPECT pro control® Software Tool

The methods for optimizing exhaust gas burnout are integrated in the INSPECT pro control® software tool. INSPECT can be connected to any IR or video camera. The results of the processing steps are transmitted cyclically to the process control system via pre-fabricated interfaces. INSPECT can also archive all process data in a database and visualize them via Ethernet-coupled graphical user interfaces (e.g. in the control room). Since 2000, INSPECT has already been in use at several industrial facilities worldwide.

If you wish to obtain further information or an offer, contact us directly.

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