SCAN TRONIC
COMBUSTION OPTIMIZING
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Oxygen Trim Control - a disregarded option.

The possability to correct and continuous optimize the ration between fuel Oxygen Trim Control - a disregarded option, and combustion air have ended up as a stepchild in the devellopment towards greater and greater degree of automation.
Within the energy field (here is thought of the combustion of fossile fuels mainly gas and oil) there are naturally the same technologigal devellopment as in other areas. this is resulting in devellopment of new boiler- and burnertypes - having higher and higher efficiency and lower figures on emission of unwanted pollutants (here NOx is the common subject).

However there are two connected and radical problems that no new tecnical ideas cannot solve:

1) Energy production and heating plants have very low economical priority.
2) Oil- and gasburner installations have a typical life of 20 - 30 years - or even longer.

This means that complete industrial plants are renewed and refurbished - installing CTR systems collecting al data on the installation enabling the complete control and surveilance from one cental control room - without changes towards fuel savings to the energy production unit.
A number of sensors are installed on water/or steam tubes and remote controlable valves are installed enabling changeover from boiler to boiler and great efford is done not to use more energy than needed in the production.

Often the project making company are using effords to find a supplier capable of supplying and installing more automatic equipment on the burner itself - but they seldom succed in a degree that updates the the performance of the burner - but have to resignate and refurbishe the burner mecannically and install new and safer timing automatic.
Components radical reducing the amount of fuel used pr produced heat unit (to install on old burners) are rare.
This is due to history where a big boom of small burner producers were founded in the fifties and sixties and then stopped by first the oil crises in the seventies and the recession in the eighties. The result is a large number of burners left by the producer and serviced by a number of small companies in hard competition and individually not large enough to devellop new components on their own.

To bridge this problem a smaller danish producer have now for a couple of years worked on this problem.
They have today a range of references spread over most of the european countries.

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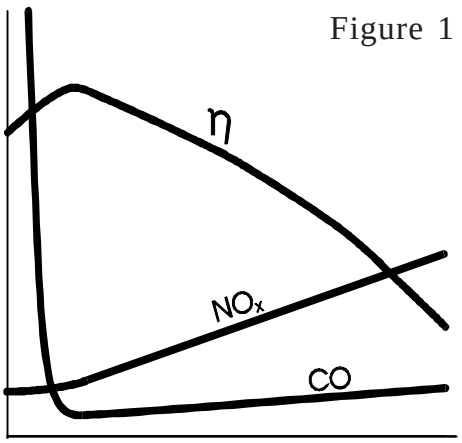
The basic idea of the company are - in close cooperation with burner maintenance companies - to collect the general and specific knowledge around all the various burners from as many sources as possible and then concentrate on one subject only namely combustion optimizing.
This company - by the name ScanTronic have today a bank of information which increases from every added installation.
The goal is to have a flexible range of actuators and combine these with ScanTronic fitting knowlege specific for any burner using the motto "problems are not ment to annoy you but as challenge for you to solve"

The key aspect on the efficiency on this kind of burners are to messure the excess air rate and then to compensate for the changing properties in fuel and combustion air supply. And then find a way to actuate on the burner to regulate air or fuel supply and keep stable and reproduceable values.

The correct and needed amount of excess air is established in a number of different ways depending on the fuel burned. Figure 1 illustrates a typical relationship betweenn efficiency and CO and NOx concentrations for gas or oil burners.
When the correct behaveure of a burner is known the actual excess air is messured messuring the remaining oxygen in the flue gas in the stack using a circonia oxygen cell. This signal is then compared to the setpoint (following the actual load of a modulating burner) and giving out regulator signals (analog or up/down)to a actuator or similar system on the burner.

Figure 1



The "gold plated" solution are a solution where the revolution speed of the combustion air fan are changed using an approved fail to safe system.
Cheaper systems modifies the linkage between air fan damper and fuel valve or changes the pressure of the fuel pressure.

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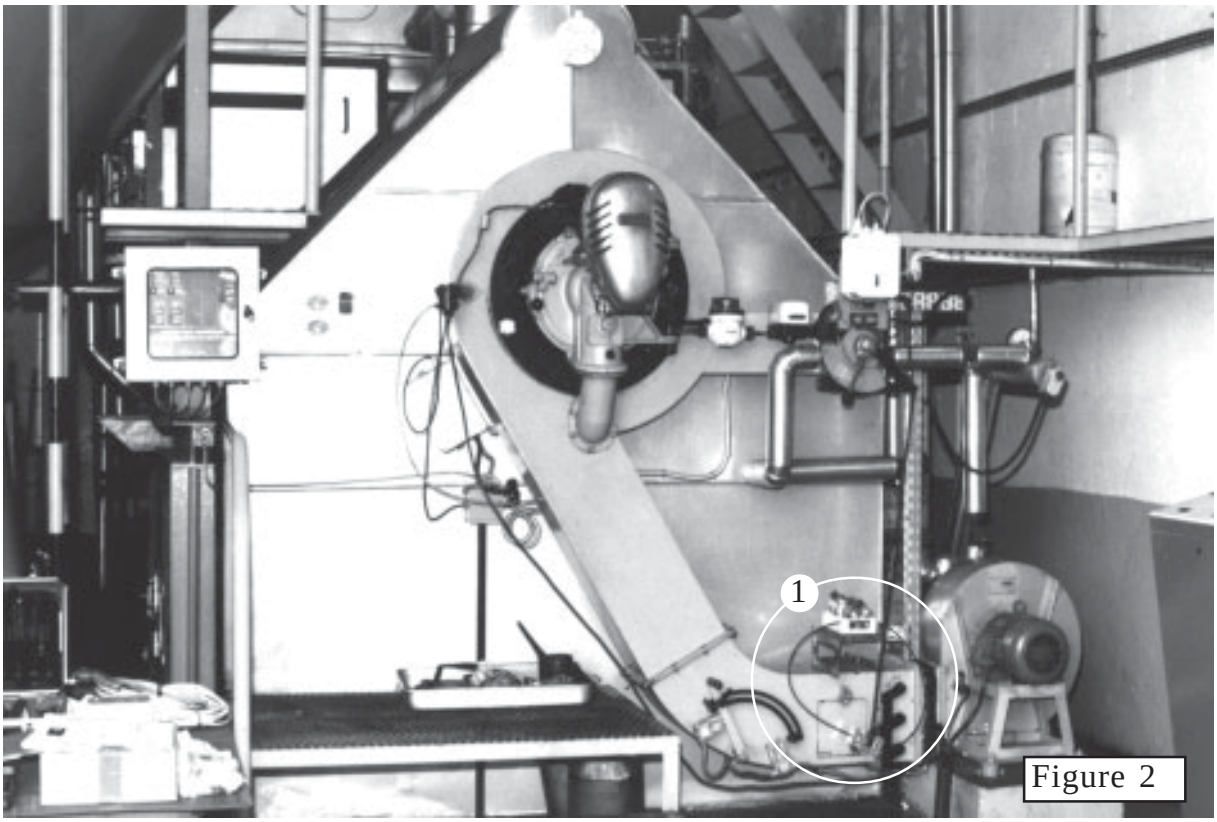

Figure 2

Figure 2 is a picture taken at the fitting of a trim system on a rotational burner in an industrial plant in Lisbon in Portugal.

At the installation the trim action is introdused using a flexible air damper actuator(l) on a 12 ton/hour steam boiler heated by heavy oil.
This oil is burned by a a Saake burner from Germany (this is a typical and very common burner develloped in the early sixtiees and still produced with only neglectibel changes.

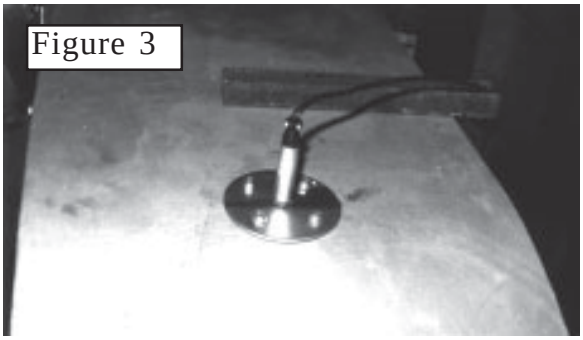
Figure 3

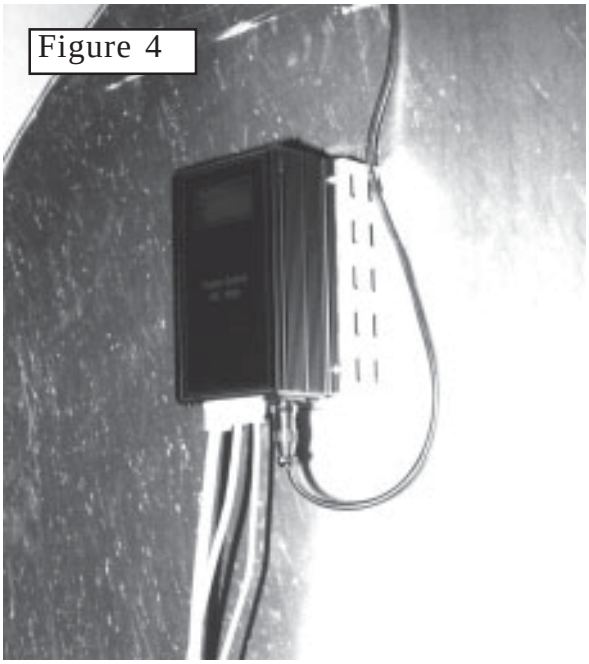
Figure 4

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The complete system consists of a
OS 2000 oxygen sensor placed on top of the flue channel just leaving the boiler (Figure 3.).
A OC 2010 Signal Amplifier on the rear of the boiler (Figure 4.).
Trim controller on the wall behind the electrical panel (Figure 5.)
And the damper actuator (Figure 6.) fitted with the servomotor part (2) on top of the airchannel and a actuating part (3) following the movement of the damper arm with movement transferred by two cables (4). This way the system can easily be adjusted to modify the air rate ± 15 % all over the modulation range of the burner - giving a good safe regulation.

Figure 5

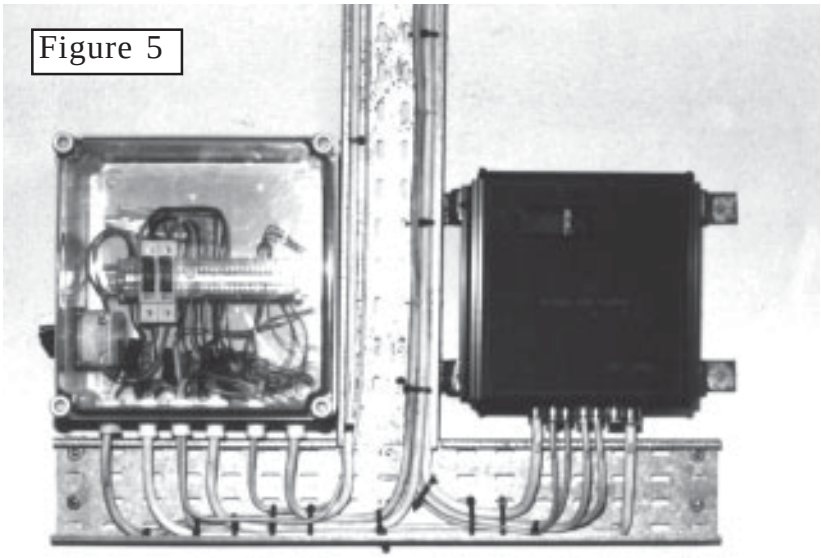
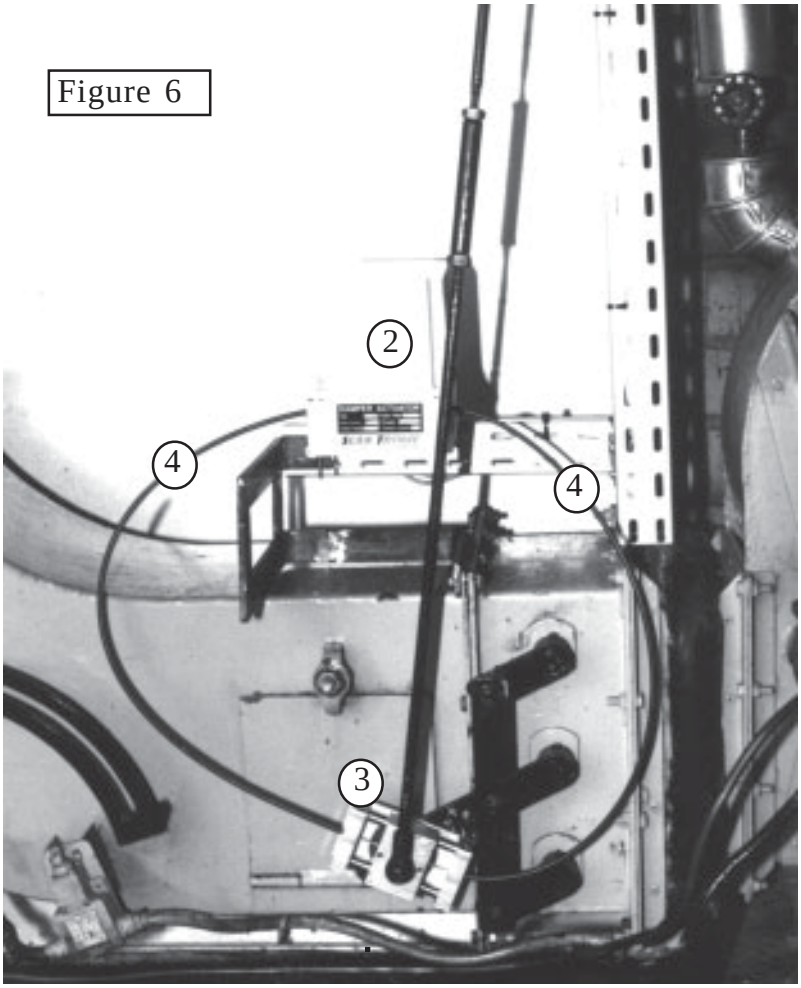


Figure 6



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The electronic parts were supplied as standart units from stock. The actuator was fitted with specific lenght of the rail system (travel lenght) based on, geometric information around the arm of the air damper. This information was gatered by the end supplier in Portugal based on instuctions from ScanTronic. The information took form of a couple of fotos and sketches of the arm with information on:

1) Travel distance
2) Travel angle
3) Diameter and distibution length of holes in the arm of the air damper.

Installation was performed by the end supplier and was on completion started up and commissioned by the customers regular burner service company.
This commissioning was suveiled by a person from ScanTronic - as a combination of inspection and training - that is offered (quoted) on the first installation of a new distributor.