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ROTARY DRUMS

REVISION OF COMPONENTS

EVALUATION OF ROTARY KILN STATE BY THE THERMO VISUAL EXAMINATION



INTRODUCTION

Thermo visual examinations consist in the measurement and visualization of infrared radiation emitted by the object being diagnosed. The value of radiation is function of the given surface temperature, when the radiation is higher then the temperature is higher too.

Energy received and registered by the camera's matrix unfortunately does not only depend on temperature, but is also a function of many additional factors including:

- emissivity of observed body,
- temperature and relative humidity of environment,
- distance between the object and camera.

The most important parameter from the listed above is **emissivity** of given body, or more precisely of its surface. Simplifying, the emissivity is nothing else like intensity of radiation emitted by the object in relation to the intensity of radiation emitted by the perfectly black body of the same temperature.

Materials of technical objects are characterized by the emissivity factor in range from 0,1 to 0,95, what is a big range and also the interpreting difficulty. Well polished (mirror like) surfaces possess factor close to 0,1. Oxidized or oil painted surfaces reach the value over 0,9.

Examined objects very often consist of elements of various emissivity factors of their surfaces. You should be conscious, that taking emissivity factor suitable for one of components, the measurement

of neighboring element – of different emissivity factor (of different surface characteristic) – will be evidently disturbed.

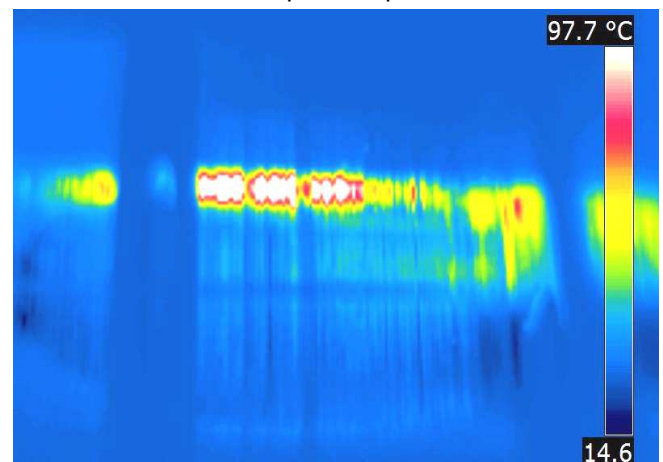
The key to the proper thermo visual evaluation is not only the class of camera or the ability to operate it, but the right interpretation of obtained thermo images.

Such an indispensable experience, supported by the top class measuring equipment, are in our engineers disposal, recommending and executing service of penetrating thermo visual inspection of industrial machinery, with specialty in scope of rotary machines like rotary kilns, in relation to which, subject to verification are elements of support system, shell and drive section as well.

VERIFICATION OF SUPPORT SYSTEM ELEMENTS' STATE

Verification of support system elements' state contains:

- in case of open (half sleeve) bearings – journals state revision, to find any spots of increased temperature – being a result of improper lubrication and/or uneven pressure distribution,
- in case of close (rolling or bushing) bearing – revision of housing state, with the purpose of catching the symptoms of increased temperature inside them,
- in case of support rollers with bearings' cooling system – mostly with forced water circuit – revision of circuit patency by the measurement and evaluation of the inlet and outlet port temperature.



VERIFICATION OF SHELL STATE

Verification of shell state is the most popular area of application of thermo vision in diagnostic of rotary kiln. Most of the kilns are equipped with their own temperature scanners, thanks to which we can obtain the distribution of infrared radiation on the kiln circumference in any section along the kiln axis.

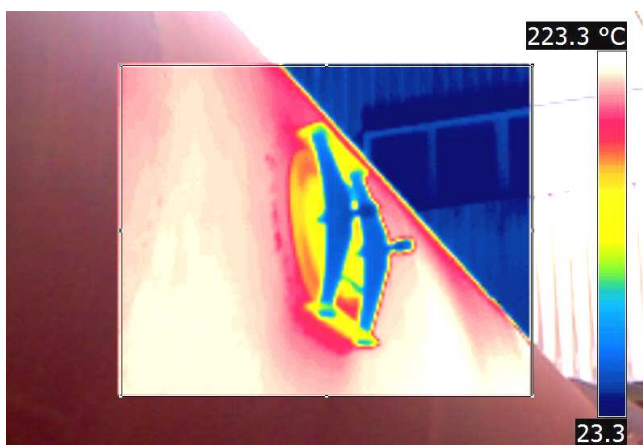
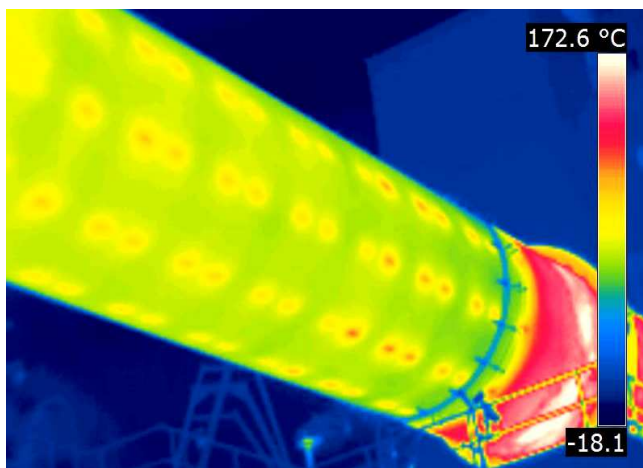
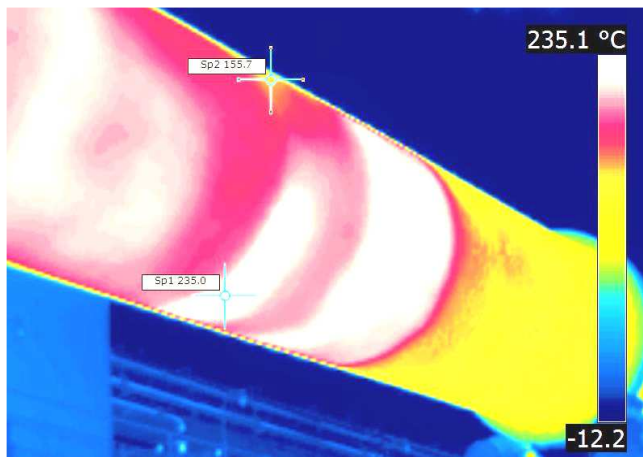
Because of the limitations in scope of scanner matrix resolution and from the reason of big distance between the camera installation point and the kiln, measurement of temperature distribution should be considered as a rough one.

To make diagnostic more detailed or to make it at all (in case of lack of scanner), Eurokiln recommends detailed revision of kiln shell from the close distances, so we would be able to discover:

- damages of thermal insulation (internal or external),
- losses or areas of excessive thickness accretion.

Both cases are specially dangerous if are causing the uneven temperature distribution on the kiln circumference, effecting in bend of shell geometrical axis and its deformations.

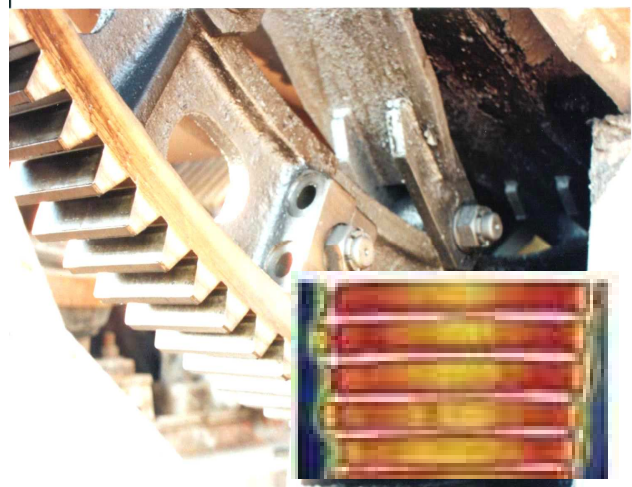
Additionally we can examine other details present on the shell or connected with the shell, detecting for example leakages on manholes, openings or even macro cracks of the material.



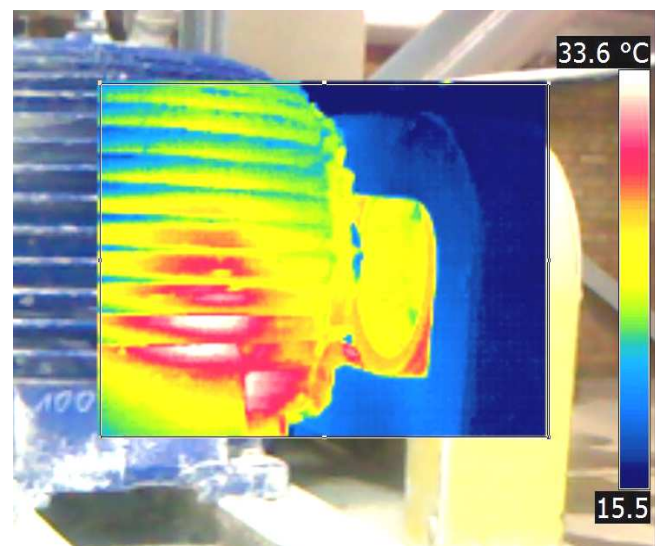
VERIFICATION OF DRIVE SECTION ELEMENTS

In that case service includes:

- evaluation of proper meshing of open gear teeth; thermo imaging of pinion teeth and/or gear rim may point to the increased thrust or increased slip; both cases are driving to the excessive wear of teeth because of adequately, excessive contact stresses or excessive wear off of the contact surfaces (notice: measurement quality and analysis effectiveness depends on state of surface (if oiled up), rotation speed and environment conditions during observation; so the measurement of that kind is recommended to be used during assembly of open gear – as verification – after final positioning of pinion and/or gear rim – the best during the start up phase and/or grinding in of co-acting parts – best without lubricating agent; measurements taken on the normal production should be considered as rough ones only,



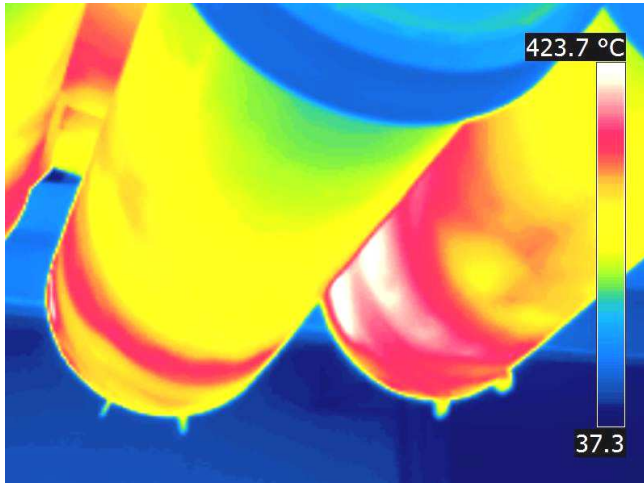
- evaluation of reducer, main motor and couplings state; thermal image analysis in that case is focused on the areas of: bearings, shaft seals and couplings; all areas of significantly increased temperature may point on the abnormalities like for example: bearing's failure and/or improper lubrication, improper functioning of the sealing and/or its improper lubrication, damages of coupling elements and/or improper exploitation conditions (like incorrect shafts alignment).



VERIFICATION OF OTHER ELEMENTS AND PERIPHERAL APPLIANCES STATE

During the thermo visual inspection our engineers accomplishes also penetrating revision of other, sometimes optional, elements of the kiln, like for example:

- thrust rollers,
- kiln inlet and outlet sealing,
- planetary coolers.



EQUIPMENT CAPACITIES, REPORTS

In our disposal are high class cameras of parameters like follows:

- resolution 180/280 pixels,
- ability to record thermal image on the background of real one with diffusion function,
- ability to export numerical value of each point of the matrix to the spreadsheet,
- ability to record movies with frequency of 60Hz.

As a standard the report presents areas of disclosed failures together with description of obtained images.

OUR CAPACITIES in other fields

Rotary machine diagnostic

evaluation of bearings' and sealing's state;
detection of friction and/or impact places;
evaluation of technical state of various kinds of gears, including friction gears, teeth or belt gears;
evaluation of cooling and lubricating circuits;
evaluation of insulation parameters of housings and thermal shields;

Building industry

determination of heat escape places and thermal bridges;
determination of improper insulation of cooling appliances;
preparation of energetic balances;
detection of defects including leakages of heating and water supply systems;

Power industry

transmitting lines, electrical installations, transformers stations examination;

Heat engineering

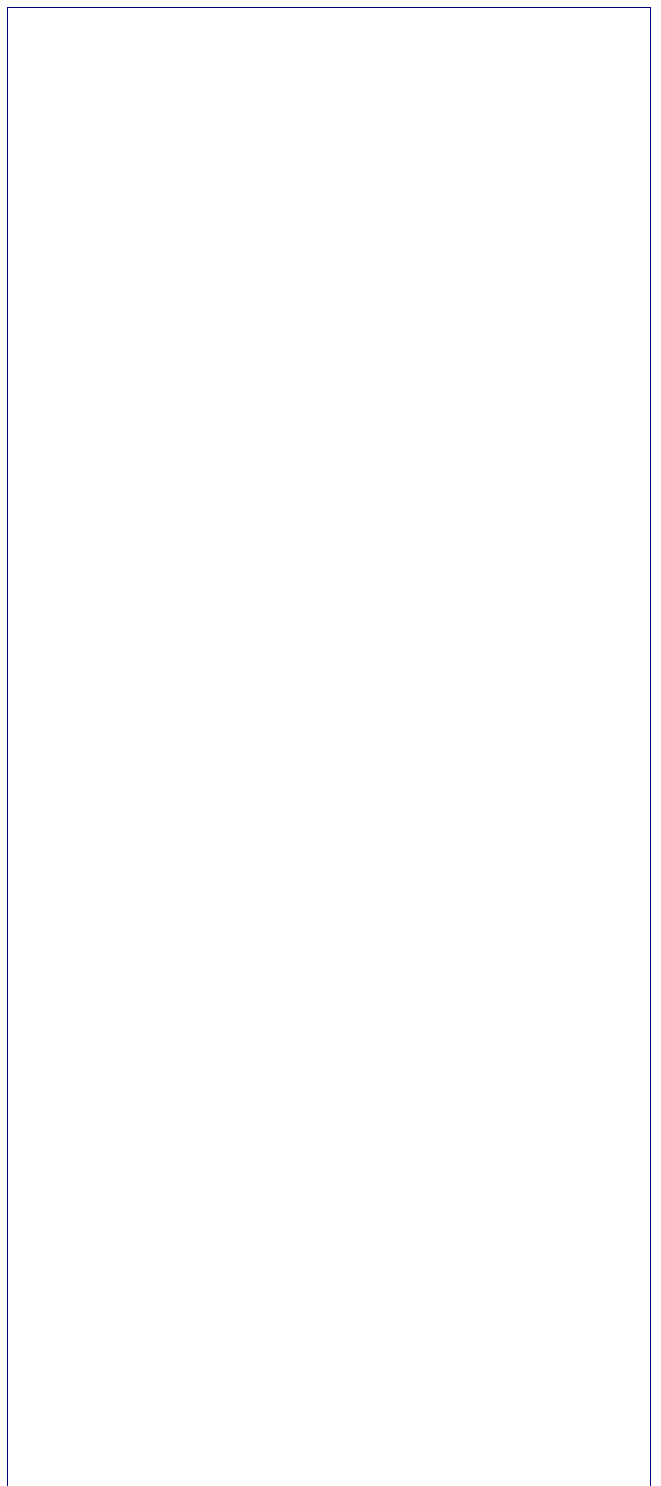
revision of thermal insulation of heat supply lines;
thermal bridges detection;
heat losses calculation;

Gas engineering

detection of leakages of high pressure installations, tanks and gas pipes;

Other industry branches

dedicated thermo vision surveys – according to the individual requirements and guidelines of the Client.





Additional information about Eurokiln is available on the corporate website at www.eurokiln.com.