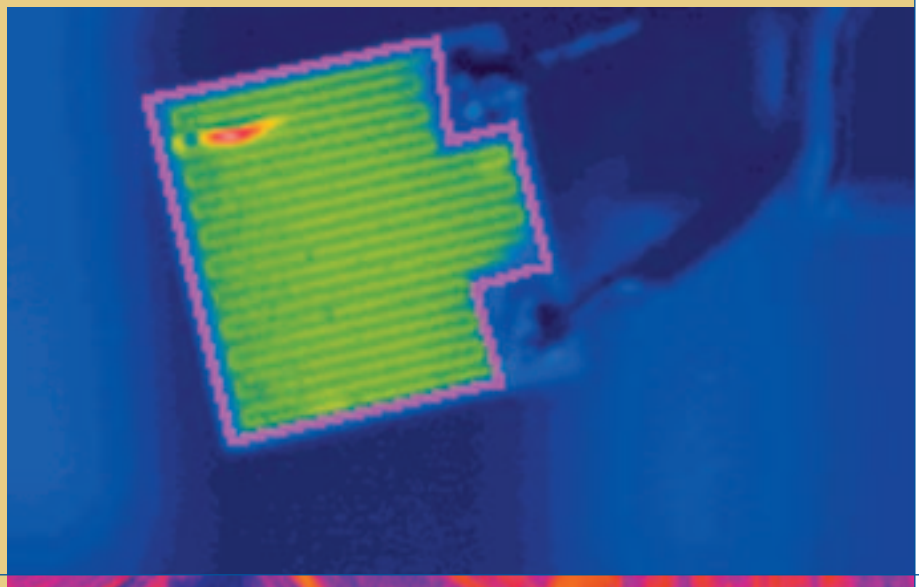
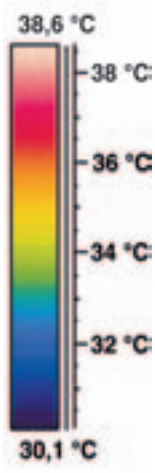
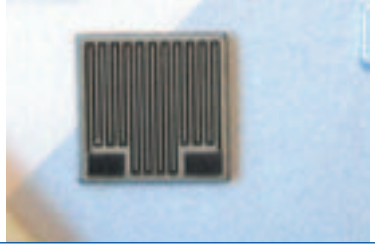
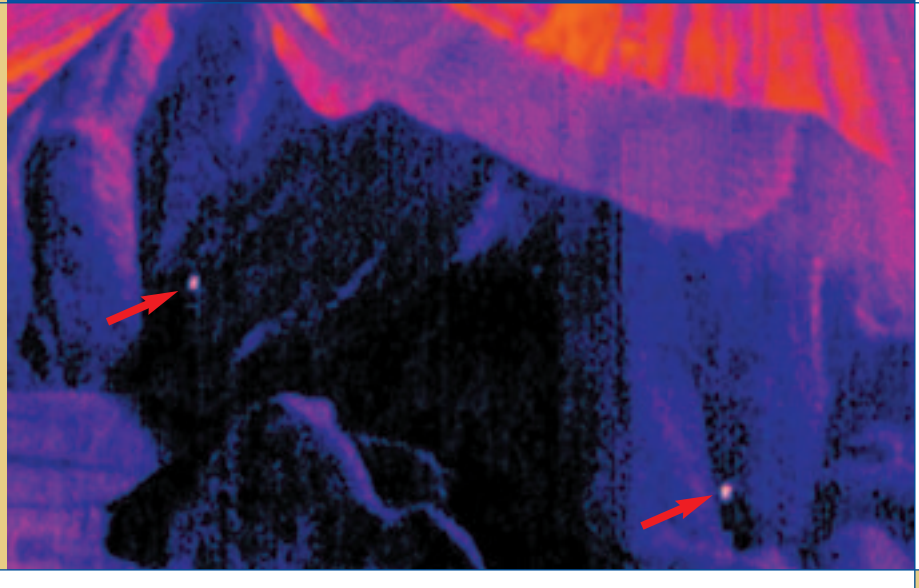
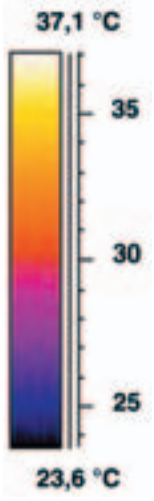
Applications for fixed mounted infrared camera systems

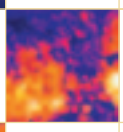


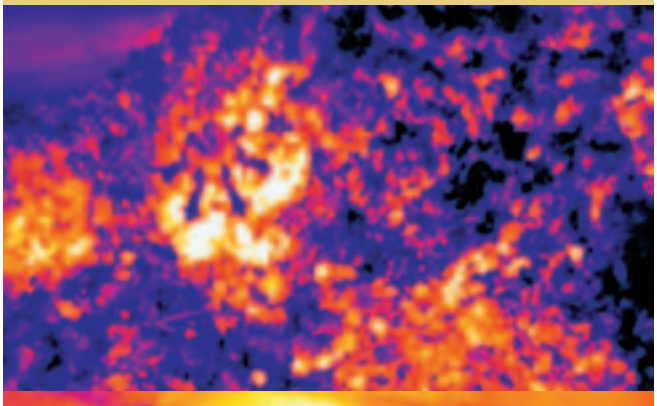
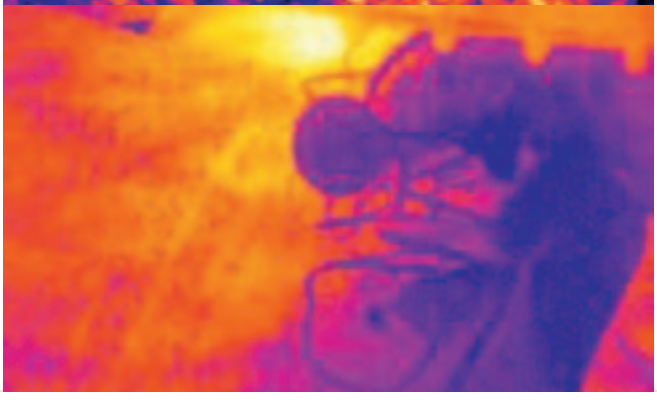








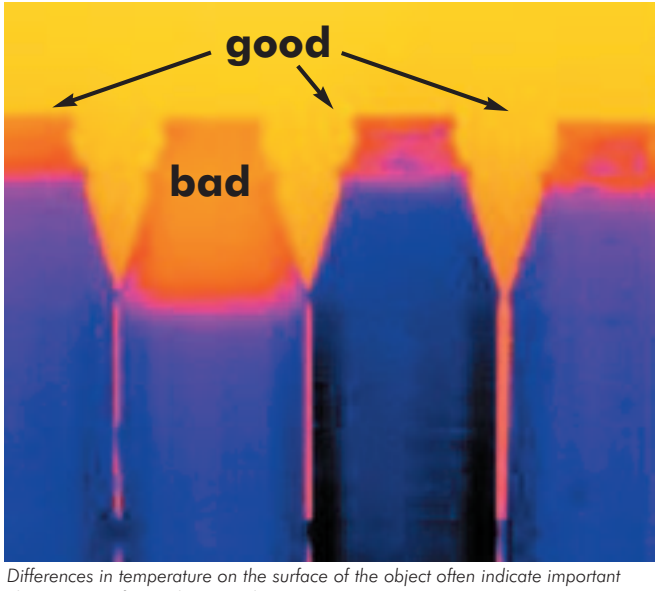



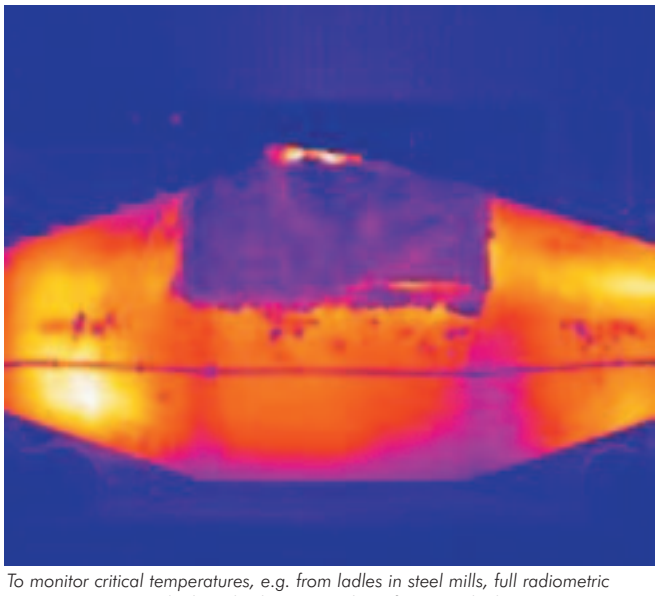
On-line thermal imaging

Infrared camera systems that pay for themselves

Today, the use of infrared camera's for on-line thermal imaging, process monitoring and infrared machine vision has become widespread. Users have recognized the advantages of being able to "see" thermal patterns in real time and to use the infrared video and the associated temperature measurement data to trigger alarms or to steer processes.



Differences in temperature on the surface of the object often indicate important characteristics for quality control.



To monitor critical temperatures, e.g. from ladles in steel mills, full radiometric IR cameras, are used. They check pre-set values, for example the maximum temperature, and trigger an alarm if necessary.

The technology to assess and monitor production processes has been around for years. However in the past 5 years the infrared camera industry has undergone massive changes that have resulted in huge leaps forward in instrument design and specification. Yet, some companies are still willing to risk huge financial penalties, extended periods of downtime and even health and safety violations by failing to adopt a proactive mentality towards on-line process monitoring utilizing infra-red camera's.

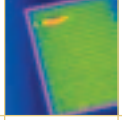
The initial investment involved in installing infrared camera's is so minute in comparison to the losses accrued through decreased production efficiency and loss of quality that more and more industries are discovering the benefits of infrared. For instance, suppliers of components to the automotive industry report that the cost involved in recall campaigns can run into the millions.

Infrared is not only used to improve production efficiencies or to optimize quality control, it also plays a critical role in the early detection of fires, to see through smoke or in security and monitoring applications.

The effects of fire are often underestimated. In addition to the destruction of goods and machinery, the immense costs of production loss, the water damage and even the loss of life are impossible to estimate. Infrared camera's are able to detect fires in the very early stages so that an alarm can be generated and the fire extinguished before massive damage has occurred.

The advantages of infrared thermography at a glance!

- Sees the heat produced
- Can trigger alarms
- Is contactless, quick and easy to use
- Performs inspections when systems are in production
- Identifies and locates the problem
- Measures the temperature
- Stores the information
- Saves you valuable time and money



Application: Automated quality control of precision resistors

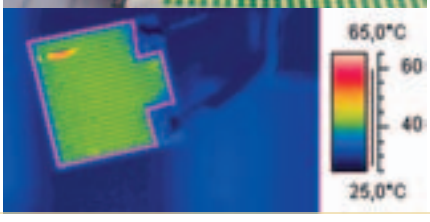
Industry: Automobile components suppliers

Principle: Precision resistors are used by the automobile industry in fuel injection systems and other electronic control units. Weak points in the resistors may occur during the manufacturing process and can later result in faulty electronic devices. An infrared camera can inspect each resistor automatically. Within 1 second, the system makes an infrared image. Because the faulty component has a higher surface temperature, a defect is shown as a hot spot in the image. When a hot spot is detected, a trigger signal is automatically generated and the faulty component is removed from the production line.

Benefits:
- Fully automated quality control
- 24-hour operation without an operator
- 100% quality control of every component

Fully automated quality control with FLIR Systems camera

Each component can individually be inspected by an infrared camera



Infrared image of a flawed resistor

Application: See through steam and smoke

Industry: Wood industry

Principle: To insure logs are properly softened in the plywood and veneer manufacturing process they are bathed in outdoor troughs filled with a caustic hot-water solution. Once they are sufficiently softened, they are removed from these vats, loaded on conveyor belts and transported into the plant for peeling. Logs frequently jam in the vats. A crane operator unclogs the jams and makes sure the logs keep moving on the output conveyor. His view is however blocked by the steam created by the combination of the hot water bath and, especially in winter months, the cold outdoor temperatures. By using an infrared camera the operator can see through the smoke and perform his task fast, safely and accurately.

Benefits:
- Continuous production. (without the IR camera production was not possible from November through March)
- Avoid production stops due to blocked vats
- Safer working environment

Visual: Steam obscures view

Infrared: See log vats clearly

Application: Outdoor fire detection

Industry: Coal

Principle: After coal has been mined the various product grades are homogenised on different storage areas. As spontaneous combustion, due to an increase in temperature, cannot be excluded, the storage tips are monitored continuously for hot spots, so that an early fire alarm may be triggered and fires can be avoided.

Benefits:
- Permanent, outdoor fire watching
- Automatic alarm triggered when a pre-set temperature is reached
- Prevention of spontaneous fires and material loss

Fire packets identified in a coal tip

Continuous depot monitoring with ThermoVision™

Application: Fire detection in waste bunkers

Industry: Waste processing and recycling

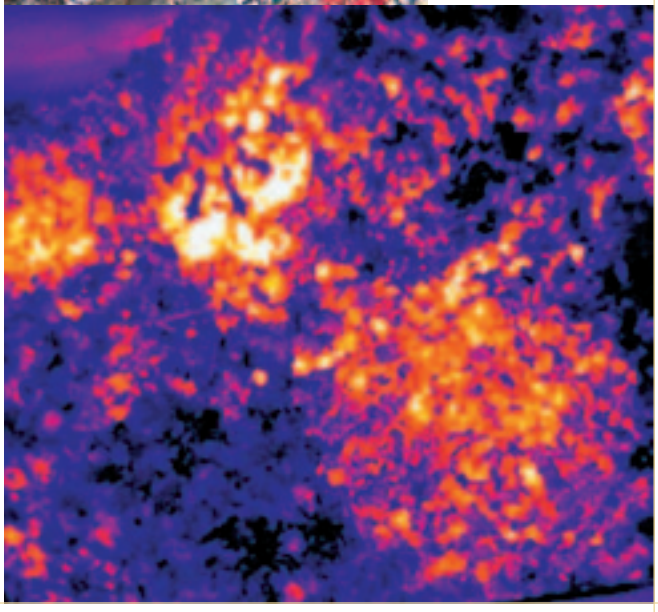
Principle: In vast storage warehouses of waste incineration plants, many very different materials are collected. Spontaneous fires can be caused by the composting processes. Also the inclusion of highly combustible objects is a fire hazard.

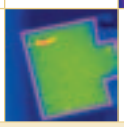
An infrared camera prevents spontaneous fires by identifying fire pockets in an early stage so that a fire alarm can be triggered. If one of the fire pockets should start to burn and to produce smoke, an operator can locate the fire source immediately since the infrared camera sees through the smoke. The fire can be extinguished instantly.

Benefits:
- Early identification of fire pockets and prevention of fires
- Automatic alarm triggered when a preset temperature is reached
- Rapid control of the source of the fire in spite of smoke-filled bunker warehouse since the infrared camera sees through smoke

Detailed view from above of a waste bunker with transport crane

Infrared image of the waste. Hotter regions can be clearly recognized and these can be taken for incineration first



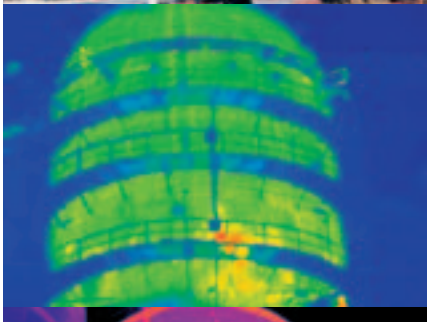

Application: **General fire prevention in critical vessels**

Industry: **Chemical, steel, nuclear power stations, etc.**

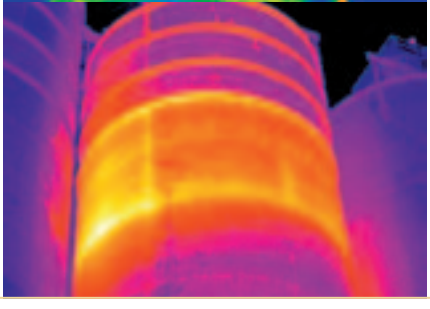
Principle: Many vessels, such as chemical and bio-chemical reactors and storage tanks often contain critical materials and finished products, which must be safeguarded. Furthermore, during certain production processes it needs to be closely monitored that the temperature does not exceed certain values. Early detection of a fire, possibly caused by lightning or overheating of the production process, can save enormous investments and lives.

Benefits:
- Avoidance of fires or explosions
- Trigger alarms when detecting an unusual temperature rise
- Monitor and protect critical steps in the production process
- Increased safety for people and materials

Early identification of fire sources is necessary for all industries



Chemical reactors are monitored for dangerous temperature developments



Continuous temperature monitoring in critical storage tanks and vessels

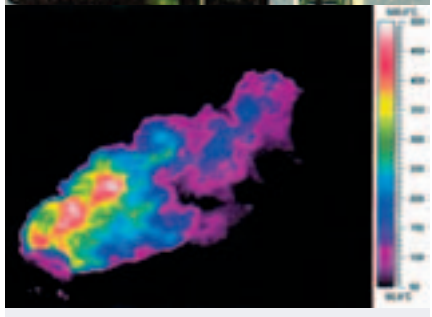
Application: **Flare detection**

Industry: **Steel**

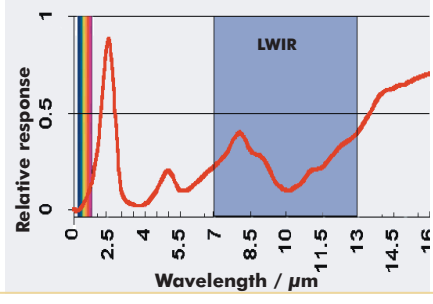
Principle: When smelting steel, various materials are fed into the blast furnace together with the pig iron. The gases, which are formed during this process, are generally used for power generation. In the event of faults in the turbine or over-production, the generated gases are burned off on special flares. Like hydrogen flames, the flames generated by these gases are invisible to the human eye. They can however easily be detected by infrared cameras.

Benefits:
- Reliable flare detection
- Automatic alarm if flare stack tip fails
- Increased environmental safety

Visual: Steam obscures view



Infrared image of a flair in daylight



Relative signal, e.g. of hydrogen flames

Application: **Inspection of car seat skeletons**

Industry: **Automobile components suppliers**

Principle: Modern car seats are made up from different materials. The basis for the production of these seats is a skeleton in steel struts, which at a later production stage is filled with foamed plastic. The configuration of these components varies from one seat model to another. Because of the small material contrast between the glossy moulding material and the matt struts, the traditional video image processing cannot inspect the moulding process. The use of an IR video camera produces however excellent contrasts between the seat mould to be filled with foam and the steel struts.

Benefits: Fully automatic inspection of assembly according to seat model, including:

- Check for presence of elements
- Position check for strut elements
- Inspection of element placement independently of operator

Glossy mould with struts before foaming. The struts are difficult to detect

Mould and struts seen in the infrared spectrum. The struts can be clearly identified thanks to the difference in emissivity

Finished seat, including seat heating, assessed with the aid of a thermography camera.

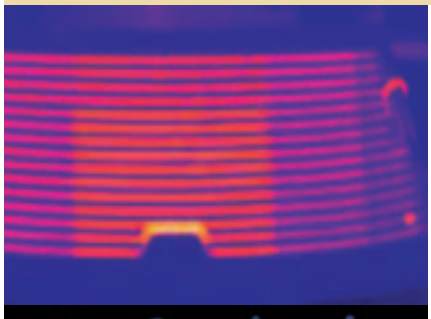
Application: **Function test and quality assessment of car windows**

Industry: **Automobile components suppliers**

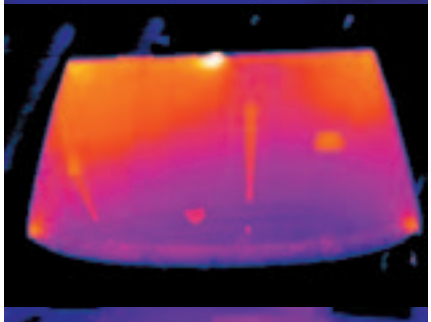
Principle: Due to the high demands of the automobile industry the quality of all front and rear windows has been improved steadily over recent years. In addition to the traditional presence check and the search for weak points in the material on the heating wires in the rear windows, the product quality of a heated front window is also monitored continuously. Furthermore infrared cameras are used for air conditioning test benches in order to acquire valuable temperature data.

Benefits:

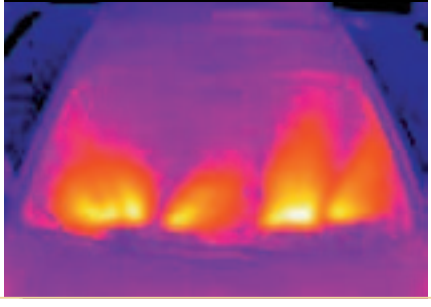
- Presence check on heating wires (rear window)
- Detection of weak places as hot spots on the heating wires (rear window)
- Detection of defects, shown as hot spot, on heated front windows
- Parameter optimization in window de-icing



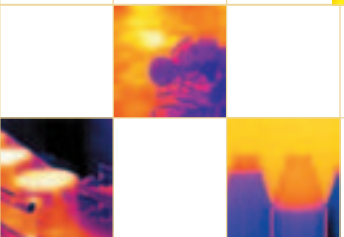
A rear car window with heating wire



A heated car front window with weak point in the power feed



Inclusion of thermography cameras in fully automatic air conditioning test chambers



Application: **Quality control on refrigeration systems and refrigerators**

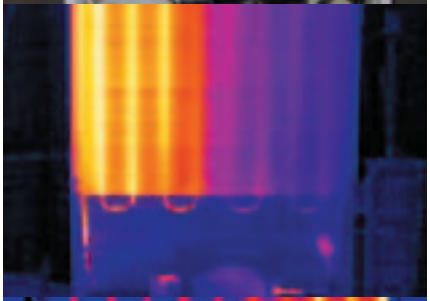
Industry: **General household appliance manufacturing**

Principle: Refrigerators need to operate continuously for many years. To guarantee the quality of their products, reputable manufacturers are relying on infrared cameras for total quality control. The infrared camera gives a total images of the situation and thanks to its many temperature measuring points it is easily possible to obtain a rapid but perfect assessment of the components being inspected. Defects such as faulty coolant volumes, clogging of hoses or leaking pipes are immediately detectable.

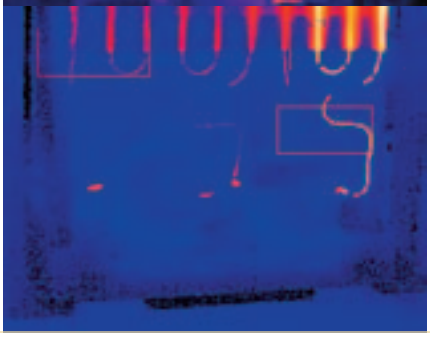
Benefits:

- Fully automatic quality control
- Significant saving of time and thus production costs thanks to shorter test times
- Detection of clogged hoses, leaks and bad connections

A refrigerator. At first sight everything seems normal



The heat distribution from the cooling coils is an indicator of the quality of the cooling process



The refrigeration unit in a refrigerator. If it malfunctions, some places may be too hot or too cold

Application: **Temperature monitoring in glass fibre production**

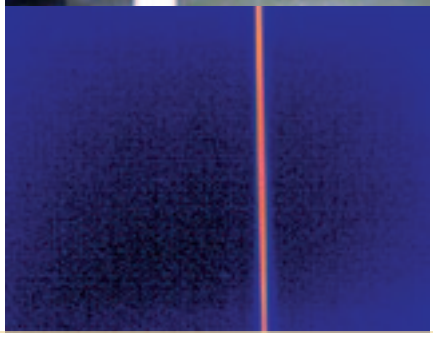
Industry: **Semi-conductors**

Principle: In the production of modern glass fibres, different temperature zones are needed to optimize the optical and mechanical properties of the fibres. The fibres are heated or cooled in various steps in a drop tower, which may be as high as 25 m. An infrared camera can continuously monitor temperatures at every height and guarantee the material properties.

Benefits:

- Continuous temperature monitoring at critical heating and cooling zones
- Regulation of connected cooling and heating equipment
- Optimization of fibre production

Visible light image of a glass fibre



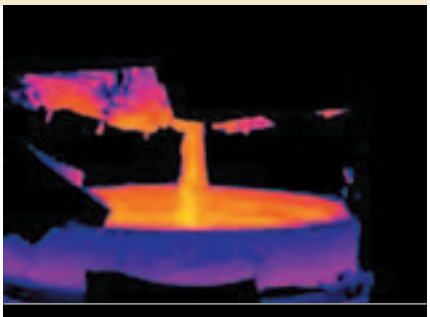
An infrared camera can continously monitor the temperature of the fibre and guarantee materials properties

APPLICATION: AUTOMATIC SLAG DETECTION

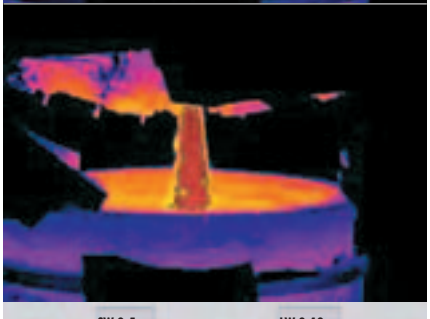
INDUSTRY: STEEL

PRINCIPLE: In steel production it is impossible to prevent the occurrence of slag. However, this by-product may only be carried through to the following processing steps in a strictly defined percentage. Otherwise the steel is loosing its quality. An IR camera can distinctly identify the slag during casting of the crude steel, due to its higher emissivity, and give a control signal to interrupt the casting process.

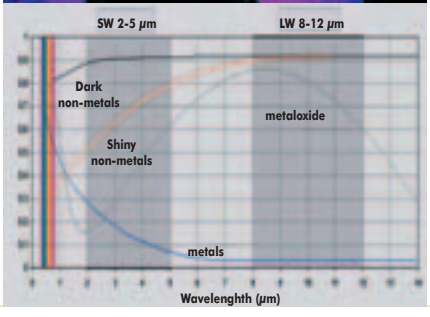
BENEFITS:
- Reliable slag detection in crude steel during the casting process
- Automatic triggering of alarm, independently of machine controller or operator
- Clearly improved steel quality and product quality
- Cost saving for replacement materials, such as slag stoppers, etc.



Crude steel without slag



Crude steel with slag



Emissivity comparison between crude steel and slag (metal oxide)

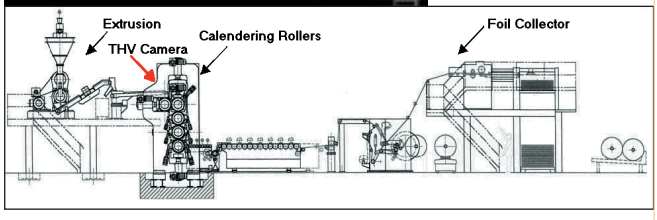
APPLICATION: PROCESS CONTROL ON CALENDARING MACHINES

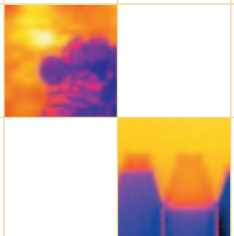
INDUSTRY: PLASTICS INDUSTRY

PRINCIPLE: Plastic sheeting is produced in a lengthy calendering process. The pre-heated raw material, e.g. in the form of balls or as a continuous extruded mass, is fed in between the rollers. An IR camera can provide valuable information to guarantee the optimum distribution, and thus also the desired thickness, of the plastic sheeting. The IR image shows a clear distinction of the plastic balls from the glossy calendaring rollers, regardless of the colour of the plastic or even when the balls are completely transparent.

BENEFITS:
- Automatic distribution of the raw material feed
- Product identification regardless of the material color
- Identification of transparent plastics
- Higher material throughput and production volume
- Reliable material feed 24 hours a day, 7 days a week

IR image of the material feed. The material distribution between the first rollers can be clearly recognized





Application: **Car shredder installations**

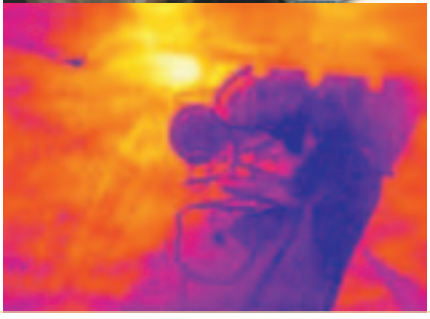
Industry: **Waste processing and recycling**

Principle: Throughout the world vehicles of all kinds are being crushed in shredder installations as the first step in the recycling process. Due to the high friction that occurs during the fragmentation process a lot of dust, but also a great deal of heat is generated. Water is sprayed on to the crusher for reducing the dust, however causing steam to develop. The processing of some materials can also produce smoke. Steam and smoke restrict the visibility of the shredder charging, which a machine operator has to supervise continuously for possible material jams. An IR camera can distinctly identify the conveyor roller and exactly locate the position of any material jam through this mist.

Benefits:
- Continuous supervision of the installation, in spite of steam and smoke
- Rapid detection of jams using IR video image
- Fewer downtimes and thus higher productivity and profits

Outline sketch of a car shredder

Machine operator supervising the installation



IR video image of a jam on the right-hand conveyor roller side

Application: **Safety of buildings, sea rescue, fire rescue, etc.**

Industry: **Miscellaneous**

Principle: As well as night vision instruments, which work on the principle of light amplification, "real" infrared cameras are being used increasingly in the non-military sector. The decisive factor here is that the actual scene can be completely dark, as the IR camera records the object's own temperature radiation.

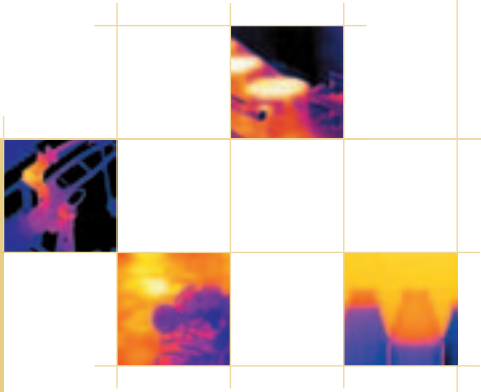
As infrared cameras can also "see" through fog or smoke, this often gives a unique advantage to helpers on land or even on the high seas for the detection of people. Fire brigades and sea rescue forces have already been able to save innumerable lives thanks to the use of IR cameras.

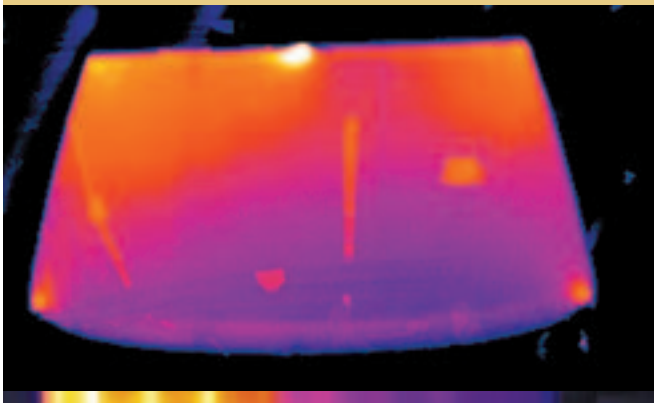
Benefits:
- Detects objects or people, even in total darkness
- "Seeing" without illuminating the scene and thus alerting the intruder
- Detection also in thick fog and smoke, both on land and at sea

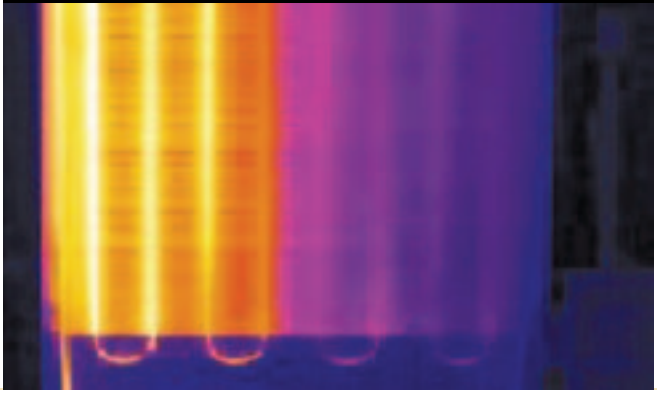
Detection of persons and scenes

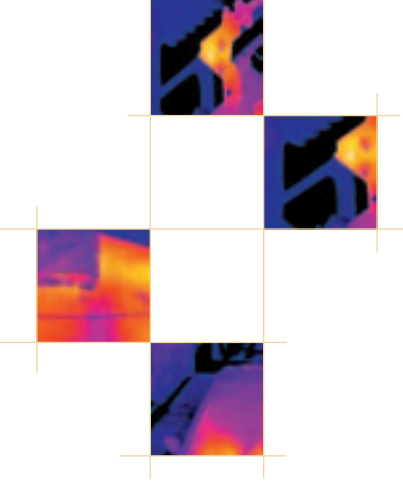
Reliable supervision of important areas

Rescue of ship-wrecked people, even in total darkness and thick fog









FLIR SYSTEMS

www.flir.com

FLIR Systems AB
World Wide Thermography Center
Rinkebyvägen 19
PO Box 3
SE-182 11 Danderyd
Sweden
Tel.: +46 (0)8 753 25 00
Fax: +46 (0)8 753 23 64
e-mail: sales@flir.se
www.flir.com

FLIR Systems Inc.
Corporate Headquarters
16505 SW 72nd Avenue
Portland, OR 97224
USA
Tel.: +1 503 684 3731
Fax: +1 503 684 5452
www.flir.com

FLIR Systems France
18 rue Hoche
F-92130 Issy les Moulineaux
France
Tel.: +33 (0)1 41 33 97 97
Fax: +33 (0)1 47 36 18 32
e-mail: info@flir.fr
www.flir.fr

FLIR Systems GmbH
Berner Strasse 81
D-60437 Frankfurt am Main
Germany
Tel.: +49 (0)69 95 00 900
Fax: +49 (0)69 95 00 9040
e-mail: info@flir.de
www.flir.de

FLIR Systems Ltd.
2 Kings Hill Avenue - Kings Hill
West Malling
Kent
ME19 4AQ
United Kingdom
Tel.: +44 (0)1732 220 011
Fax: +44 (0)1732 843 707
e-mail: sales@flir.uk.com
www.flir.com

FLIR Systems S.r.l.
Via L. Manara, 2
20051 Limbiate (MI)
Italia
Tel.: +39 02 99 45 10 01
Fax: +39 02 99 69 24 08
e-mail: info@flir.it
www.flir.it

FLIR Systems Co. Ltd
Room 1613-15, Tower 2
Grand Central Plaza
138 Shatin Rural Committee Rd
Shatin, N.T. Hong Kong
Tel.: +852 27 92 89 55
Fax: +852 27 92 89 52
e-mail: flir@flir.com.hk
www.flir.com.hk

FLIR Systems AB
Uitbreidingstraat 60 - 62
B-2600 Berchem
Belgium
Tel.: +32 (0)3 287 87 10
Fax: +32 (0)3 287 87 29
e-mail: info@flir.be
www.flir.be

FLIR Systems Inc.
USA Thermography Center
16 Esquire Road
North Billerica, MA 01862
USA
Tel.: +1 978 901 8000
Fax: +1 978 901 8887
e-mail: marketing@flir.com
www.flir.com