

Software tools

A variety of software tools provide:

- Down Strip Temperature Profiles for any given spot position across the strip
- Down Strip Differential Temperature Profiles between two points for any position across the strip.
- Temperature distribution Profile for any given area of the strip
- Area uniformity measurement

Information from the host computer system is continually shown as PDI data together with the strip as it passes through the mill. The PDI strip width can be overlaid onto the dynamic thermal map to show the correlation between the process strip width and the observed "thermal" width as determined by the WinStrip automatic edge detection system. Values for the alloy or emissivity are obtained via the PDI from previously entered look up tables or from external input.

In order to correct for side to side movement of the strip on the mill, the thermal map as well as all measurements can be corrected for side walk (lateral movement from centre line) and displayed as corrected or uncorrected imagery. This facilitates down strip measurement and batch and process comparisons.

The instantaneous sideways movement can be shown relative to the mill centre line and plotted as a function of length along the strip. Graphs can also be displayed for:

- The speed of the strip as it passes through the mill.
- The actual strip width deduced from the thermal data.

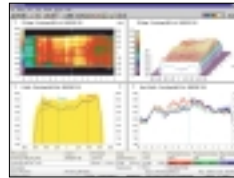
Multiple data sets can be displayed in each Strip window including 2D Maps and strip Profiles, Edge Drop Profiles, Strip Speeds and side walk. The arrangement of the data on the screen is completely configurable.

Data Storage

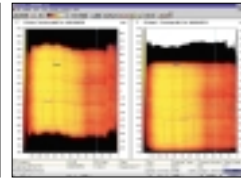
WinStrip automatically maintains a permanent record on mass storage devices of the temperature and process data from every strip. This ensures traceability for every strip and forms the basis for long term Quality Assurance and Quality Management systems.

The WinStrip File Manager displays and sorts strip data in date, ID or other selectable order (e.g. furnace number) for ease of recall.

Full temperature analyses can be made to compare intra and inter batch uniformity in conjunction with other process and metallurgical properties. *Traceability at your finger tips.*



Multiple Graphic Display Formats



Live sideways measurement and correction

WinStrip® Software features and benefits

WinStrip® Features

- High speed infrared temperature profiling
- Client - Server Network
- Real Time Temperature Measurement & Control
- Fully digital operation with parallel processor based Centurion scanner
- 50 cross strip scans per second, 1120 samples per scan
- Indexed strip long term storage
- Strip by strip traceability and on demand QA
- Easy to use
- On line context Help
- 2 mm ($1/16\text{th}$) spot size with high measurement accuracy
- Multiple sensors with minimal service
- Interactive graphical displays
- Integrated to host PLC/DCS
- Feedback control

System requirements

- Pentium PC with Windows '95 or later, 32 Mb Ram, 1 Gb hard disk space.

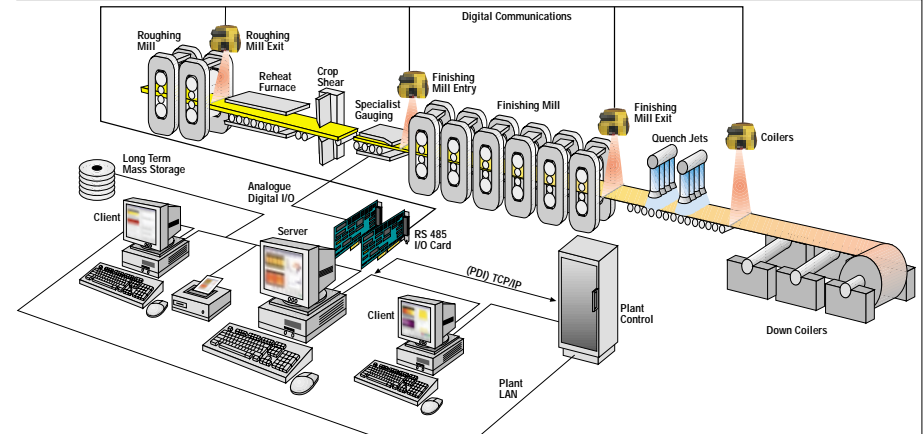
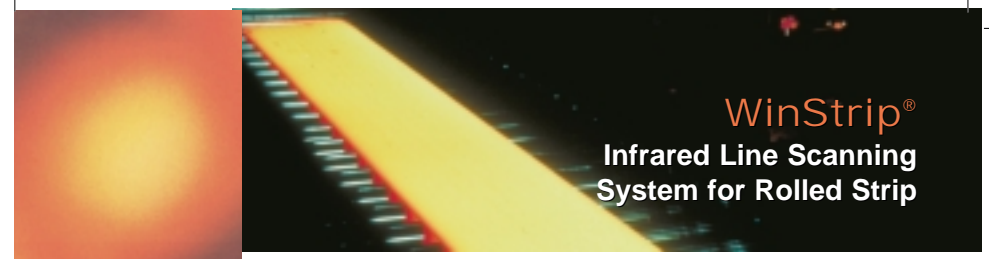
WinStrip® Benefits

- Immediate nozzle block identification
- Sideways movement measurement
- Uneven heating/cooling detection
- Temperature uniformity measurements
- Skid mark detection
- Roller damage effects
- Edge Heating/Cooling control
- Direct Alarm relay outputs
- Integral QA system
- Analog and digital inputs from on line process measurements
- Width, Velocity, Camber, Shape and more
- Long term Archival and Retrieval
- Fully configurable Analog outputs. Spot & Zone temperatures, Sideways movement, Width and more
- Digital and network interfacing by RS 232 and/or TCP/IP protocols
- Real time On-line and Off line measurements

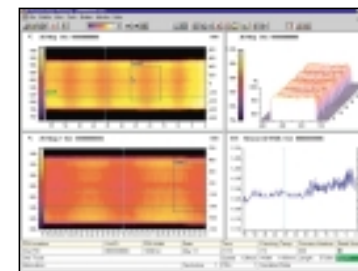


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STRIP MILL SYSTEM



System description

The Thermoteknix WinStrip® scanning system provides real time, client-server based, temperature profiling and integrated on line process measurement for all types of hot rolling and annealing mills. This two component system of self-contained digital Centurion scanner and RS 485 I/O board in the PC with WinStrip software, offers the most compact, reliable and efficient solution for accurate temperature profiling and long term strip Quality Assurance.

WinStrip® Benefits

- Spot nozzle block immediately
- Sideways movement measurement - levelling adjustment to improve camber
- Width measurement
- Uneven heating/cooling detection
- Temperature uniformity measurements
- Accurate edge heating control

WinStrip® Features

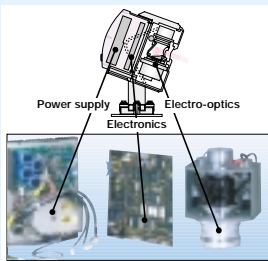
- High speed infrared temperature profiling
- Client - Server Network
- Real Time Temperature Measurement & Control
- Fully digital operation with parallel processor based Centurion scanner



The Thermoteknix Centurion TS50 and WinStrip®

Turnkey System

The Thermoteknix Centurion TS50 is a state-of-the-art, precision instrument specifically designed for strip product temperature scanning. Its one piece design contains the three essentials for stand alone operation.



- An electro-optics module contains an Indium Gallium Arsenide infrared detector with the latest in aspheric mirror optics, mounted on a high precision spindle and heavy duty brushless motor. Maintenance free and immune to temperature variations and the day to day vibration found in the plant, this optical assembly provides the smallest measurement spot size and highest measurement accuracy possible. With the Centurion mounted 2m above the strip, a spot size of 0.2 cm^2 is achieved.
- A single PCB contains parallel processing CPUs, memory and circuitry for real time data processing and control of all aspects of the scanner operation. With built-in diagnostics and software which is accessible directly whilst on line, this one board combines all and more of the functionality of the many electronics boards, processors and sub-assemblies found in other products.
- A heavy duty integral power supply is mounted on the rear heat sink to give reliable supply in varying local conditions.
- A water cooled stainless steel enclosure provides environmental protection. Two lasers are mounted adjacent to the front window to allow accurate and repeatable location above the strip.

WinStrip® Software

The WinStrip® software gives immediate, clear presentation of temperature data with a simple and intuitive user interface for Operators of all nationalities and abilities. Operating in the familiar Windows™ environment, button and icon tool selection with point and click operation ensures fast manipulation of data and screens. WinStrip data can easily be exported to other Windows applications and incorporated into printed reports. Multiple windows show live and historical data as well as graphical displays such as temperature trends. Status and caption bars show current strip and scanner information.

Access level passwords provide protection to Engineering levels, whilst routine functionality is available to Operators.

Fully documented and illustrated On-line Help is available within the program to give assistance or reference.

With up to 1120 cross strip samples, 50 scans per second, WinStrip high resolution can provide immediate identification of blocked cooling jets or uneven heating, cooling or non uniformity vital for consistent good quality steel manufacture.

Configurable analogue and digital outputs provide a ready means to control edge heaters, alarms or process variables with unparalleled accuracy directly from the WinStrip program.

Client - Server design

WinStrip has a Client-Server central architecture. Live temperature data from the Centurion scanners and system data are fed into the Server PC which controls the hardware components and manages all of the I/Os. A series of Client (Viewer) PCs access this processed data across the network (LAN). The WinStrip Server also collects, archives, integrates, interprets and distributes data from Centurions and other sensors whilst the WinStrip Clients are the operator stations for displaying and analysing live and archived data.

WinStrip Server and I/O Manager

The WinStrip Server is the hardware and software hub of the System. It sets and monitors alarm conditions on the analogue and digital inputs, as well as on the live temperature profile data. Strips are tracked through the mill using the PDI from the host computer interfaced by TCP/IP or proprietary RS 232 protocol. This references every strip's process, thermal and positional information, regardless of grade or furnace origin.

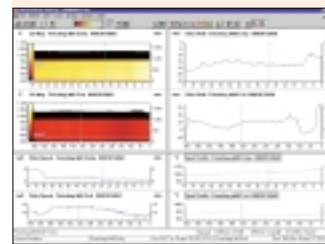
Optical or network drives are used for long term data storage and strip by strip traceability.

WinStrip® Inputs include:

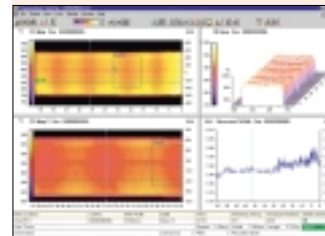
- Centurion ID and location
- Date and time, Strip type and ID
- Strip gauge, grade, strip width
- Emissivity or Alloy number
- Furnace number, Finishing temperature
- Velocity sensor
- Camber, Width gauge
- Emergency stop
- Analogue measurements

WinStrip® Outputs include:

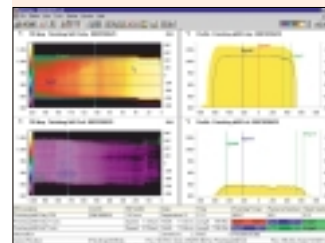
- Temperature data for thickness gauges
- Analogue (4-20mA)
- Digital (Switch relay, RS232, TCP/IP, Network)
- Down strip spot and zone temperatures
- Centre line/Edge relative measurements
- Reduced temperature profile data
- Temperature uniformity
- Sideways movement measurement
- Edge detected strip width



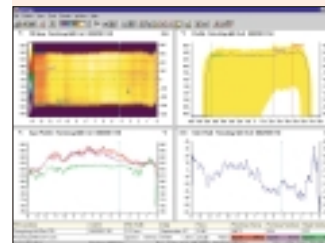
Built-in QA and Multiple Outputs



Integration of Process Measurements



Multi tasking display from Multiple Scanners



Hi resolution for Roller and Skid Marking

The LAN is used to provide the Server PC with PDI information for the strips as they pass through the mills. This enables factors such as the individual strip emissivity at any position in the mill to be fed automatically into the WinStrip program. WinStrip Clients in the Roughing Mill, Finishing Mill pulpits or Engineering office have direct access to live and recalled strip by strip data.

Each WinStrip Client runs a 32-bit, multi-threaded application taking full advantage of the Microsoft Windows™ 95/97 operating system. By devoting separate concurrent threads to different tasks within the software, the system achieves real time display and analysis of high resolution strip temperature profiles. WinStrip has a modular system, with flexible options, for upgrading and modification to suit hot rolling, plate mill and annealing applications.

On-line data from multiple Centurion scanners can be shown in one Strip window on the Client Viewer screen and several other Strip windows can be opened to display off-line data from previously archived strips for batch and process comparison.

Each Client Viewer runs its own program independently to best suit the location or process. A Client PC in the Roughing Mill pulpit can show live Centurion scans at the Roughing Mill Exit and Finishing Mill Exit whilst a Client PC in the Finishing Mill pulpit is showing live Centurion scans at the Finishing Mill Entry and Exit positions with side by side comparison to previous reference data. As soon as a strip has passed the Centurion, WinStrip automatically processes the data to display a map of the whole strip from head to tail. Detection of Start and Finish as well as Near and Far edges are done automatically by the WinStrip software. This enables position relative temperature measurements (edge or mill centre) to be carried out.

By using the factory wide LAN, Clients can be set up on PCs in remote locations outside the mill, for engineers to have plantwide access to live and recalled data.

