**THERMAL PROCESSING – Basics and Beyond**

**Recent Technology of Temperature Indicating Devices**

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**Validated Systems**

- Validated Systems – ISO 9001 Certified
  - The design of our systems complies with requirements and guidelines in relevant elements of external references
  - FDA Regulations
  - EN-Regulations
  - CE Approvals
  - HTM 2010 - UK guidelines
  - ISO/IEC 12207 Software life cycle processes
  - Measured results are approved and accepted by USFDA, EEC and other Regulatory Authorities worldwide
  - ATEX certification for EtO and other intrinsically processes
  - IFTPS Guidelines (Institute for Thermal Process Specialists)
  - GAMP Guide for Validation of Automated Systems

**Validation Master Plan**

- Framework for validation using GAMP

**International Calibration Hierarchy**

**Test Equipment for Heat Distribution & Penetration Studies**

- IFTPS Guidelines
  - The calibrated system should be equipped with sufficient channels to accurately monitor and record temperature/pressure within the process delivery system.
  - Use thermocouples or other devices of sufficient accuracy in sufficient quantity to adequately monitor the process water temperatures within the retort.
Test Equipment for Heat Distribution & Penetration Studies

**IFTPS Guidelines**
- The retort MIG/RTD must conform to applicable regulations and shall have been checked for accuracy against a certified TMD within the past year, preferably more recently.
- The datalogger should record the temperatures of each sensor at sufficient intervals, not to exceed one minute, throughout the test.
- Prior to the actual temperature distribution study, standardization or calibration should be performed in the test retort.

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Choosing the System

**Real-Time Thermocouple Wired Systems**
- **Advantages**
  - Real-Time data on Module and PC
  - Very thin electrodes with very fast response time
  - Deflection data for flexible and semi-flexible packaging
  - Large systems less expensive
- **Limitations**
  - Installation is time consuming
  - Risk for damaging cables during loading and unloading
  - Cannot be used in continuous processing

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Choosing the System

**Wireless Data Logger Systems**
- **Advantages**
  - Very fast and easy installation
  - No risk of damaging cables
  - Can be used for batch & continuous processing
  - Easy daily routine control
- **Limitations**
  - "Historical" data collection
  - Heat conduction concerns
  - Larger systems more expensive than thermocouples

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Choosing the System

**RF - Wireless Data Logger Systems**
- **Advantages**
  - Real-Time data on PC
  - Very fast and easy installation
  - No risk of damaging cables
  - Easy daily routine control
- **Limitations**
  - Cannot be used in all processes (Faradays cage)
  - Heat conduction concerns
  - Larger systems more expensive than thermocouples

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ELLAB Solutions

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**E-Val Flex Thermocouple System**

- E-Val Flex is designed for validation applications that require compliance with FDA & EEC Guidelines and International GMP standards.
- Real-time monitoring of:
  - Temperature
  - Pressure
  - Rotation
  - Deflection
  - Relative humidity
  - Time
  - Fo-Calculations

- Operating temperature:
  - Operating range: +5 to +50°C
  - Resolution: 0.01°C and +/-1 mbar

- Measuring ranges:
  - -200 to +400 C
  - 0 to 7 bar (absolute)
  - 0 to 8 mm
  - 0 to 100 %

- Capacity:
  - Modules for 4, 8 and 16 temperature channels
  - RS485 Input for up to 4 Pressure, Deflection and/or Rpm channels
  - Maximum 128 channels

- Accuracy:
  - Module: ±0.05 ºC
  - Factory calibrated thermocouples: ±0.05 ºC
  - Total system: ±0.1 ºC
  - Digital pressure sensor: 0.15 % full scale (±6 mbar)

- Key Advantages:
  - Individual cold junction compensation
  - Highest Accuracy
  - Direct interchangeable probes
  - Stand-alone → Runs without PC, adds flexibility
  - LCD display → View real-time data without PC
  - Battery power → Backup in case of power failure
  - Weight: 1.9 Kg → Easy handling and portability
  - 2-years warranty → Building Confidence

- Watertight connectors:
The male connector is watertight and completely prevents water/humidity dripping through the thermocouple cable into the E-Val Flex module.

- Smart Temperature Probes:
  - EU A premium grade 7 stranded thermocouple probe with electronic ID embedded in male connector for easy identification of position of probes.

- Factory Calibration:
  - Factory calibrated thermocouples with an accuracy of ± 0.05 C.

- Interchangeable TC’s:
The smart thermocouple probes are direct interchangeble without calibration.

- Digital piezoresistive pressure sensor
- Retort & Container Pressure
- Range 0-7 bar
- Deflection Sensor Device
- The pressure differential will result in a movement of the surface of the container, easily detected by the deflection device
- Range: from –8 to +8 mm x 0.01 mm
- Easy connection of Pressure and Deflection to the E-Val Flex module through the RS485
E-Val Flex Rotation

- A Slipring Contact can be used for thermocouple probes in rotary processes.
- The rotation sensor on the slipring is connected to the E-Val Flex module through the RS485 and the R-Flex Module.
- It is possible to measure Temperature, Pressure and Deflection inside a Rotating Autoclave.
- Capacity from 4 to 16 channels.
- Range: 0-40 x 1 Rpm.

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TrackSense Pro Wireless Solutions

- Temperature
  - Accuracy: 0.05 C
- Pressure
  - Accuracy: 0.25% full scale
- Relative Humidity
  - Accuracy: 2%
- Conductivity Measurements
  - Accuracy: ± 1 µS/cm
- Fittings for all Applications

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TrackSense Pro Wireless - General

- New Reader station allows up to 16 loggers simultaneously.
- Improved transmission speed - 12 sec to read 1 to 16 loggers with new Parallel Transmission.
- Stainless steel logger housing which can tolerate temperatures from -80 C to +150 C and with a thermal barrier from -196 C to +400 C.
- Pressure up to 10 Bar.
- User replaceable battery with a lifetime of up to 1,000 hours of operation at 121.1 C.
- Large memory with up to 60,000 data points.
- Greater flexibility with interchangeable sensors for temperature, pressure, humidity and conductivity measurements.

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TSPRO Temperature

- Interchangeable Temperature Sensors
  - Standard range from -80 to +150 C.
  - High temperatures from 0 C to +400 C.
  - Low temperatures from -196 C to +400 C.
  - High Accuracy from 0.05 C.
  - 2mmØ rigid stainless steel sensors.
  - Smart-Flex Sensors.
  - Semi-flexible Stainless Steel Sensors.
  - Single Sensors.
  - Double Sensors.
  - Quadruple Sensors.
  - Combined Temperature & Pressure Sensors.

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TrackSense® Pro Sky

- Introducing Real-Time RF Data Transmission.
- Operational temperature -85°C to +140°C.
- Transmission range approximately 15 m.
- Save time between studies and setup.
- View data in real-time.
  - Temperature.
  - Pressure.
  - Relative Humidity.
  - Lethality Calculations.
  - Minimum/Maximum Values.

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SKY Target Applications

- Cooking Chambers
- Smothing Chambers
- Freezers
- Pasteurization Tunnels
- Warehouses
- Autoclaves
  - Water Spray/Cascade
  - Steam-Air
    - Depending of Retort, Baskets and Load of product containers in most cases real-time transmission is possible
  - NOT in Full Water Immersion Autoclaves

TSP Compact Wireless Loggers

- NEW Cost Effective Integrated Logger & Sensor
  - Temperature loggers (-30 to +140°C)
    - 35, 50, 75, or 100 mm Single Sensors
    - SmartFlex Single Sensors
    - Semi-Flexible Single Sensors
    - 14,500 data points
  - Pressure logger (10 mBar - 6 Bar abs)
    - 7,200 data points
  - Pressure/Temperature Combi logger
    - 10,000 data points
  - User replaceable battery: 1000 working hours
  - VaSuite PRO, Plus, Basic Software 2.8 upwards

Ellab Temperature Indicator ETI

- Alternative replacement to MIG’s
- Complies with FDA 21CFR Part 113
- ETI Temperature Probes
  - Intelligent ø6mm stainless steel probe with dual independent sensors and A/D converters
  - Difference of 0.3°C results in error message and alarm
  - Calibrated temperature range 0-140°C with certificate
  - Display shows remaining time 28-0 days
  - Accuracy +/-0.1°C full scale
- ETI Digital Pressure Sensor
- ETI Suite Software with Calibration Facilities

Heat Penetration Tests

- High Accuracy and Reliability of Equipment
- It is important to bear in mind that a systemic error of 1°C of the temperature measurements corresponds to an inaccuracy of 26% in the Fo-Value at 121.1°C
- We have therefore developed a large selection of probes, sensors, packing glands and tools for correct mounting in all kinds of containers, and we are steadily developing new fittings for improving the Heat Penetration Measurements taken the following parameters into consideration
- IFTPS Guidelines

Food Accessories & Fittings

- Normal Cans
- Vacuum Sealed Cans
- Glass Jars
Food Accessories & Fittings

- Aluminum Trays
- Plastic Containers
- Unfilled Small Containers

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Food Accessories & Fittings

- Flat Plastic & Aluminium Pouches
- Stand-Up Pouches (Doy-Packs)

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Food Accessories & Fittings

- Filled Metal Containers
- Retortable Cartons

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Food Accessories & Fittings

- Glass Bottles
- Plastic Bottles

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Food Accessories & Fittings

- Sausages (Hot Dogs)
- Shrimps

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Food Accessories & Fittings

- Internal Mounting in Cans, Jars, Bottles, Pouches, Trays and other Containers

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ValSuite™ Software 3.0

- The ValSuite Software Packages are working on a SQL database platform and therefore securing highest security and compliance to FDA 21 CFR part 11
- Validation Report & Guide with IQ, OQ Protocols available
- Easy data collection for both real-time and wireless systems in the same sessions
  - Temperature
  - Pressure
  - Deflection
  - Relative Humidity (RH%)
  - Conductivity
  - Lethal Calculations
  - Time
  - Min/Max Values simultaneously

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ValSuite Documentation

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ValSuite Reports

- Comments
  - Specifications and photos of test equipment
  - Positioning of sensors in “cold spot”
  - Retort Specifications etc.
- Limit Report
  - Temperature, Pressure, Fo-Values
- Time Event Markers
  - CUT, Equilibration, Holding, Cooling

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ValSuite Reports

- Advanced Validation Report
  - Temperature, Pressure, Fo-Value evaluation of the whole process pass criteria with pass/fail indications
- Statistic Reports
  - Min, Max, Average, Delta of all parameters
- Heat Penetration
  - Ball Calculations
  - Process simulations
- Unit – Positioning of Sensors
- Word Documents
- Print in hard copies and PDF

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Food Industry Applications

- Food Industry
  - Steam Still Autoclaves
  - Water Cascade Retorts
  - Cooking/Smoking Chambers
  - Rotary Cooker/Cookers
  - Hydrostatic Retorts
  - Crateless Retorts
  - Pasteurization Tunnels
  - Baking Ovens
  - Freezers and Chillers
  - Heat Penetration Tests

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- Please visit our table top exhibition and see our solutions to your challenges

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