IMPACT OF NEW REGULATIONS ON THERMOMETRY

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OUTLINE

- Goal Statement
- History Of Processing Thermometry.
- The Alternatives.
- The Electronic Alternatives.
- Validation.

Thermometry Goal Statement

- #1 Food Safety-*Reduce food-borne illness!*
- #2 Production Quality- *Retain nutritional value!*
- #3 Palatability- *Don't cook the texture or taste out!*

21 CFR 113.40 PARAPHRASED

- The instrument must be readable to 1°F
- Calibrated/Validated on installation.
- Calibrated/Validated thereafter each year.
- Suggested points: 240°F, 250°F, 260°F.

Versions of the MiG

MiG Construction Features

- Precision, armored, mercury in glass.
- Mercury used as heat transfer media.
- Fiber insulated against shock and conducted process temperature.
- Brass or aluminum case + acrylic lens.

Favorable Features

- Speed of Response
- Accuracy
- Process Powered
- Self Diagnostic

Unfavorable Features

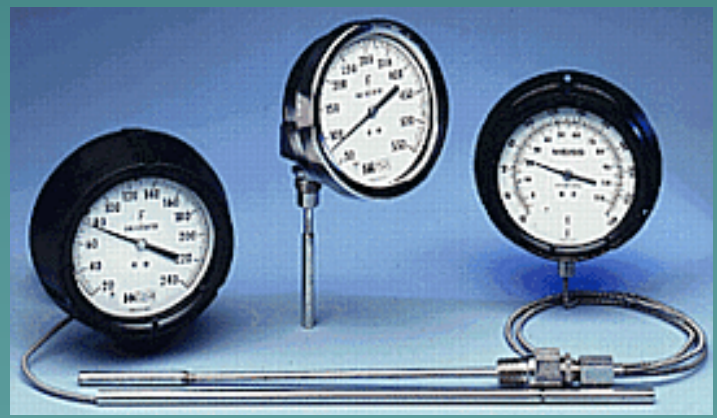
- Mercury is toxic and corrosive.
- Glass introduced into GMP environment.
- Mercury column subject to separation.
- Design intolerant of shock & vibration.
- Any indicator traversing a scale is subject to parallax.
- Should only be calibrated in the working fluid (Water/steam)

Parsing the Alternatives

BiMet- spiral element dial thermometer.

ALTERNATIVES

- Liquid? In glass.
- Bimetallic.
- Liquid, vapor filled system.
- Electronic.



Process Temperature Alternatives, 100-200^{O}C (212-392^{O}F)

Type	Acc.	% Lin.	% Rpt.	% Hyst.	Compensation. ?	Drift	Note
MiG	+/- 1^{O}F	Varies	+/- .1^{O}F	N.A.	NO	NO	
LiG	+/- 1^{O}F	Varies	+/- .1^{O}C	NA	NO	No	^
Bi-Met	+/- 1% Scale	+/- .1%	+/- .5%	+/-.1%	NO	Yes	
Filled	+/- 3-5% Scale	+/- 3-5% Scale *	+/-1% Scale	1% n Scale	Yes *	Yes	*
Thermistor	Varies*	+/- 3-5% **	+/- .1%	NA	Yes **	Yes**	**
Thermocouple	VARIES	Ok IN RANGE	+/- .1%	NA	YES	YES	***
RTD	+/- .5^{O}C	+/-.1^{O}C	+/- .1^{O}C	NA	NA	Yes	****

NOTES

- ^ Ester based fluids have long time (X100) constants, 63.2% of delta T.
- * Ideal gas law not ideal in range and capillaries add ambient offset.
- ** Thermistor non-linear with limited top end temperatures.
- *** “T” Std. limits of error 1.8^{O}F special 0.9^{O}F. Subj. to temp. aging.

NOTES 2

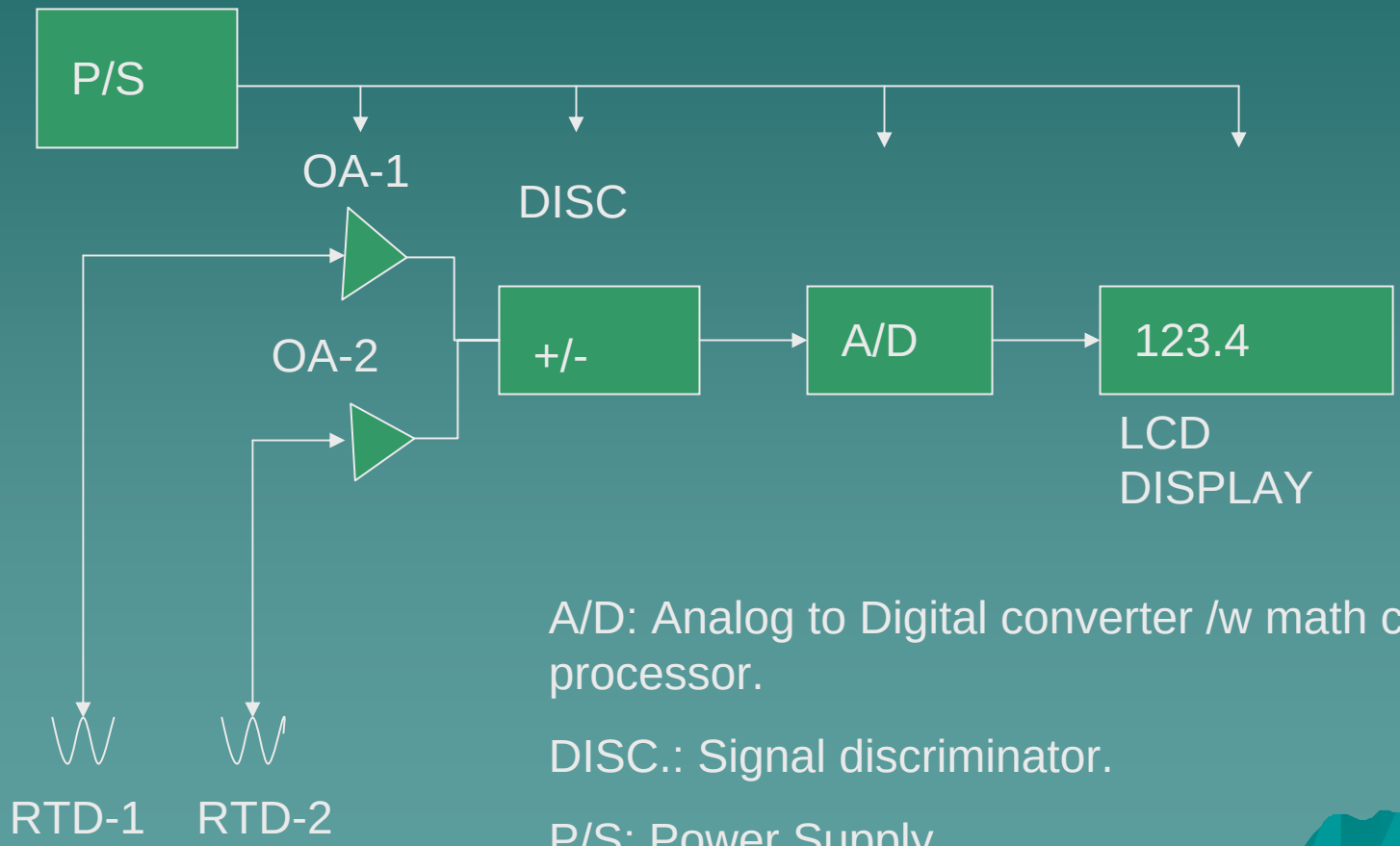
- RTD can be most linear and accurate choice.
- **** RTD must be noble (pure platinum) 0.00385 Ohm DIN standard
- RTD needs low power input.
- RTD needs protection from shock, contamination and vibration.

ELECTRONIC OPTIONS

- The food processor needs to vet the new device.
- Is it accurate?
- Is it stable?
- Has it fast response?
- Does it signal dysfunction?
- Can it survive the production floor?

Palmer Wahl Offering

DUAL RTD APPROACH



A/D: Analog to Digital converter /w math co-processor.

DISC.: Signal discriminator.

P/S: Power Supply

OA-1 &-2: Operational Amplifiers

Let's do Annual Certification

- Is the power supply output correct?
- Are the RTDs accurate and linear?
- Does a resistance standard generate correct reading?
- Does the discriminator trigger "off" or "alarm" at ½ ^{O}F equivalent differential?
- Is there any appreciable drift from last year?

Lets Do an Annual Certification 2

- Is the instrument immune from EMI-RFI?
- Can the readout be independently certified to show the actual probe temperature?

TO CONCLUDE

- The process authority must be able to demonstrate a proposed ATD to be as good or better than the MIG when used to:
- Eliminate food borne illness.
- Maintain food quality.
- Produce palatable product.