Business from technology

State of the art in ice detection
- a need for standards

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Petteri Antikainen
VTT Technical Research Centre of Finland

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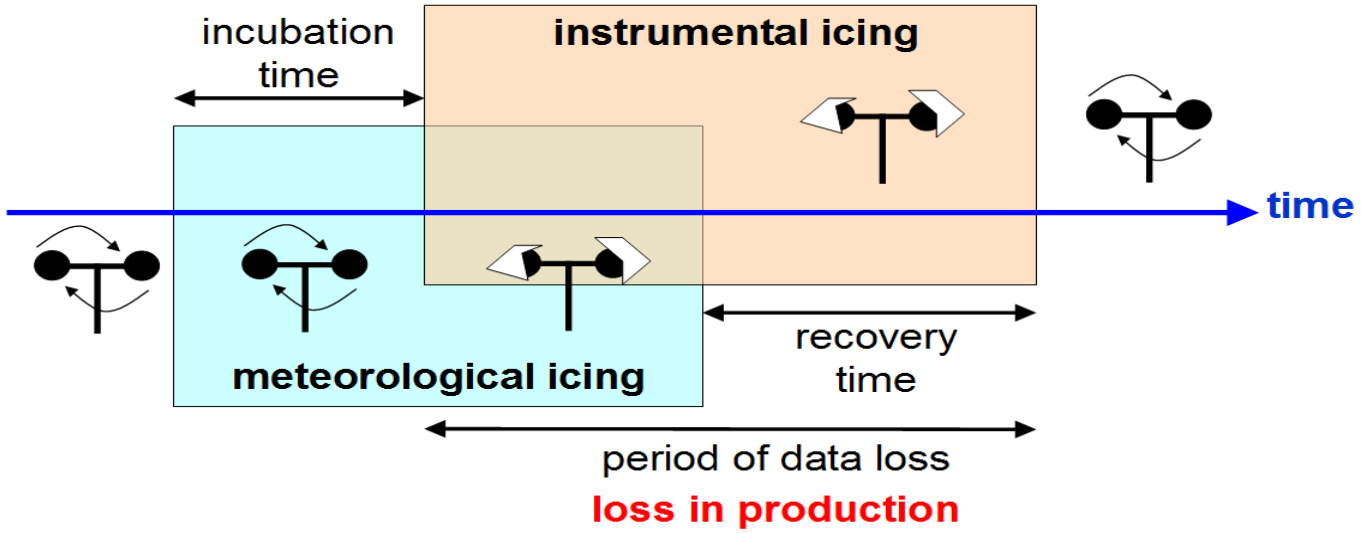
- Background/definitions
- Current detectors
- Proposal: Standard icing conditions
- Proposal: Classification for meteorological ice detectors

Photo by Manu Friman

Background: Definitions

- Cold climate: icing climate and/or low temperature
- Icing:
  - IEA Task 19:



Background and an example: Site classification

- IEA Task 19:

IEA Ice class	Met. icing	Instrumental icing	Production loss
	% of year	% of year	% of annual production
5	>10	>20	> 20
4	5-10	10-30	10-25
3	3-5	6-15	3-12
2	0.5-3	1-9	0.5-5
1	0-0.5	<1.5	0 - 0.5

Some existing detectors

- Commercial:
  - Labkotec - meteorological icing
  - Goodrich/Rosemount – freezing rain
  - Combitech – instrumental icing
- Commercial?
  - HoloOptics
- Rotor ice detection systems:
  - Bosch Rexroth (IGUS)
  - Moog (Insensys)
- Other:
  - 2…3-anemometers (cups/ sonics), vanes, temp+humidity???

Proposal for Standard icing conditions (for lab testing)

	Stationary	Blade conditions
Temperature	-5 °C	-5 °C
Wind speed	7 m/s	40 m/s
Water content	0,2 g/m^3	0,05 g/m^3
Droplet size MVD	20 µm	20 µm

- Wind speed of 40m/s for blade is calculated for modern variable speed pitch turbine at 2/3R when wind speed is 7m/s

Already another proposal for chancing definitions for classification criteria for meteorological ice detectors

	Stationary	More demanding for testing?
Temperature	-5 °C	-5 °C
Wind speed	7 m/s	7 m/s
Water content	0,2 g/m^3	1 g/m^3
Droplet size MVD	20 µm	20 µm

- Two criteria: detection speed and ability to recover
- ”Stationary conditions” are more common
- ”More demanding” is putting emphasis on ability to recover (and practicality for testing).

- The industry is not ready for a complicated classification method which shoud include a matrix of conditions, but a need to have common rules exists:

Proposal for Classification criteria for meteorological ice detectors in standard icing conditions

MID class	Detection time less than
Class 1	1 minute
Class 2	10 minutes
Class 3	60 minutes

Requirements:

- recovery for detection mode in 30 min
- 5 units to be tested

Photo by Manu Friman

”Proposal” for classification of instrumental icing detectors

- ?
  - Sensitivity to stationary conditions?
  - Robustness for harsh conditions?
  - Ability to rotate in any conditions?

In general there is a need for:

- Best practices, recommendations, rules and regulations, classifications, standards
- Not for ice detection only, the same applies to other instruments as well:
  - There is practically no classified anemometers for cold climate !
  - Turbines, loads etc…
- Bankability!

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