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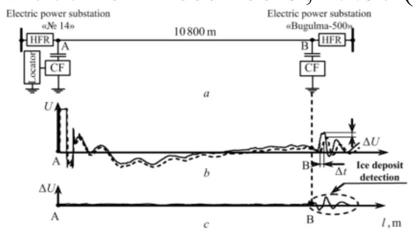
A. Borschevskiy, chief designer

The new way for detection of ice deposits on 35-220 kW power lines is proposed.

The pulsed signal location probing of power lines is used. With ice deposits formation on the power lines, the Δ*t* delay increases and the *U* amplitude decreases.

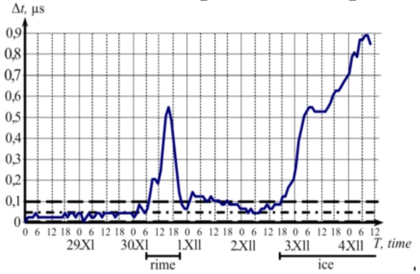
The continuous round-the clock location monitoring of 10800m of the 110kW power line has been carried out to detect the ice deposits formation between substations N14 and Bugulma-500 from December 9, 2009. (Pic. 1, *a*).



Pic.1. The regime of ice deposits detection on 10800m of the 110kW power line between substations N14 and Bugulma-500

The picture 1,b gives an example of registration of reflectogramms by probing the power line without ice deposits on wires (continuous line) and with ice deposits (dashed line). Difference between these reflecogramms is shown on Pic.1, *c*, where in the point B in the end of the line one can see clearly detectable difference signal caused by formation of ice deposits on wires.

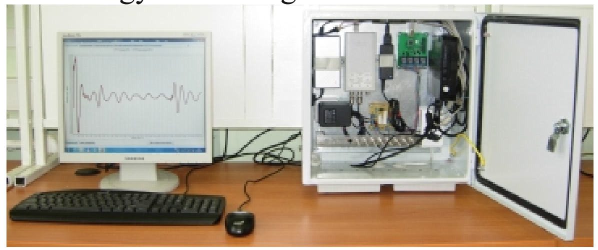
Results of measurements of Δ*t* delay for 6 days period are shown in Pic. 2. In the absence of ice deposits the average meaning of Δt=0,05µs. Any value of Δ*t*, exceeding the threshold (dashed line), is considered a detection signal about spotting ice deposits.



Pic.2. Detection of ice and rime deposits by the reflected impulse delay on 110kW power line between substations N14 and Bugulma 500 depending on monitoring time

Picture 2 clearly shows the dynamics of ice-deposits increase starting from 18 o'clock on December 2, 2009 for the period of 38 hours. The weigh to ice-deposits on the power line did not reach the critical value at this period of time and there was need to melt it. The deposits thickness was within the limits of 1–2 mm which was less than the norm (44 mm).

Given examples demonstrate possibilities of the location method of power-line ice-deposits detection and confirm its high sensitivity providing early ice-deposits detection. The location method proves to be reliable for monitoring the wires ice deposits formation dynamics and for defining the exact time to start the necessary ice melting. The method makes it possible to monitor the ice melting efficiency and to define the moment to stop it when the threat of line destruction and wire breakage disappears. Optimization of the ice deposits melting regime will promote energy savings and decreasing significant financial spending as ice-deposits melting is rather energy consuming.



Workers of the Kazan State Power Engineering University and the scientific-industrial enterprise Radioelektronika named after V.I. Shimko have developed and manufactured an industrial sample of the device for detection of ice-deposits on power lines. The device can control 16 power lines coming off the substation and have high-frequency processing. Measurements data are automatically transmitted to the dispatch to take decisions about starting ice melting. All power line of the network can be equipped with such devices for detection of ice-deposits on their wires.

The invention has been issued the patent № 2287883, registered in the State Inventions Registry of Russian Federation on 15 April 2005.

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Location method of power-line ice deposits detection

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