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Infrared thermography based diagnosis of inter-turn fault and cooling system failure in three phase induction motor

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Abstract: Thermography has been widely used as a technique for anomaly detection in induction motors. International Electrical Testing Association (NETA) proposed guidelines for thermographic inspection of electrical systems and rotating equipment. These guidelines help in anomaly detection and estimating its severity. However, it focuses only on location of hotspot rather than diagnosing the fault. This paper addresses two such faults i.e. inter-turn fault and failure of cooling system. Both result in increase of stator temperature. In compliance with NETA standard the paper has proposed a thermal data analysis procedure consisting of two thermal profile indicators to address this issue. These indicators help in correctly diagnosing inter-turn fault and failure of cooling system. The work has been experimentally validated for healthy and with seeded faults scenarios of induction motors.

Keywords: Thermography; induction motor; inter-turn fault; failure of cooling system; pseudo-spectrum.

NOMENCLATURE:

ΔT_a	:	temperature difference between similar components under similar load
ΔT_b	:	temperature difference between object and ambient
[T]	:	thermal image temperature profile matrix
[Tx]	:	thermal image temperature profile in the form of a column matrix
T_{min}	:	minimum temperature or ambient temperature
Tx_{mean}	:	mean temperature
Tx_{std}	:	standard deviation of temperature profile
m x n	:	number of rows x number of column i.e. IRT image pixel size
T_3	:	temperature values ≥ 3 °C
count_3	:	number of pixels with temperature is greater than and equal to 3 °C
T_10	:	temperature values ≥ 10 °C
count_10	:	number of pixels with temperature is greater than and equal to 10 °C

1. INTRODUCTION:

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