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Experimental Investigation on Fatigue Behaviour of Solar Receiver Tube under Assymetrical Flux Condition

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Abstract : Fatigue stress is the design criterion when materials are operating under repeated or reversal loading conditions, loading may be mechanical for structural members and thermal for heat exchanging devices. In this paper the variable thermal fatigue loading of solar receiver tube is studied and the suitable geometrical design alternative is proposed. The tubes are heated asymmetrically throughout the day and cooled at the night (loading and unloading), cyclic in nature, since receiver tubes of solar concentrator collector exposed to asymmetrical nature of heat flux, thermal stresses are induced at the junction of uneven expansion. The induced thermal stress added with fatigue loading accelerates the failure due to stress reversal. The endurance limit of conventional linear tube decreases with prolonged exposure to sunlight, and the reduction rate is proportional to operating temperature. This present paper deals within the range of 300° and the comparison of endurance limit is made between straight tube and helical coiled tube receiver for 45 days of operation. The reduction is found to be decreased from 260 MPa to 190 MPa for straight tube and from 335 MPa to 296 MPa. **Keywords :** Thermal Fatigue, Endurance limit, Helical Coiled Receiver.

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