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Performance Evaluation of New Version of Sandwich Busduct by Temperature Rise Method

C Viswanatha[1] and Rakesh K G[2]

[1,2]Diagnostics Cables and Capacitors Division Central Power Research Institute Bangalore, INDIA
E-mail: [1]viswa@cpri.in, [2]rakeshkg@cpri.in

Abstract—*The recent trend in power sector has been the usage of sandwich type of Busduct for the advantage of saving the space and versatile compact design. However, the reports of failure of this sandwich Busducts are also reported in recent times in the literature. In this paper, it is essential to understand the functioning of conventional as well as sandwich Busducts. In this present work, the attempts are made in understanding heat distribution in the entire length of sandwich Busduct. The thermal mapping has been made at critical design, sensitive points such as terminals, joints and length of busbars. As the Busduct is filled with polymeric cast resin material, the heat distribution has an impact in the functioning of sandwich Busduct. The thermal performance of overall Busduct is studied using polymeric resin joints. This research paper discusses the results of polymeric resin joints in sandwich busduct.*

1. INTRODUCTION

The power is delivered through Busduct which has seen tremendous changes in the evolution of technology [1, 2].The bus ducts have several advantages over power cables in distribution network. They have advantage of compact in size and easy installation at lower cost. The main purpose of bus duct is to deliver the power (High Current) from one point to other point where power is need to be transported in electrical distribution network[5]. For instance, bus duct need to carry very high current between the generators and associated transformers in the power stations. Busbars contain Alluminium or Copper conductors of busbars enclosed in suitable enclosure. The enclosures are normally alluminium to reduce magnetic losses. There are two types of bus ducts namely Isolated phase bus duct and Segregated phase bus duct conventionally. In Isolated phase bus duct each phase conductor is enclosed by individual metal enclosure and is separated from adjacent phase. In the case of segregated phase bus duct all the three phase conductors are placed in a single metallic enclosure with a segregation between the phases either by installation or metallic barrier. This arrangement has advantage of reducing possible phase faults and promotes equal thermal distribution.

2. EXPERIMENTAL DETAILS

Diagram

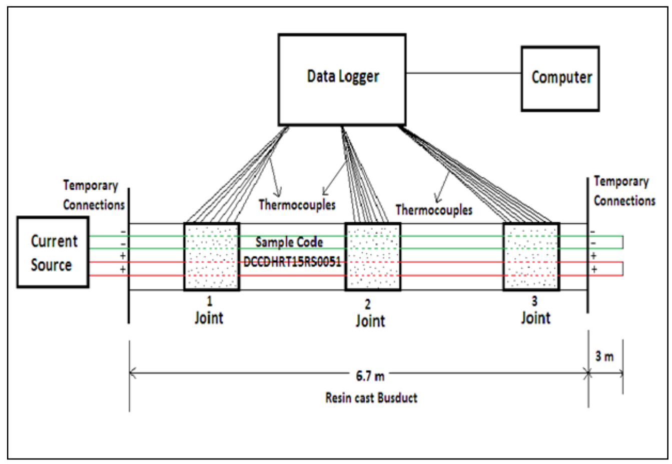

Fig. 1: Experimental arrangement for Heat Run Test on Resin cast Busduct

3. LEGENDS

1. Current source ; 3000Amps, 15 Volts
2. DC Resin cast busduct
3. Joint (Polymer resin filled)
4. Thermocouples (copper-constantan type)
5. Temporary connections (copper busbars)
6. Data logger(HIOKI, model: LR8401-20)
7. Busduct : 2500 Amps, DC busduct containing resin filled joints
   (Software- Logger utility)

4. SAMPLE PREPARATION AND ARRANGEMENT OF EXPERIMENT

The experiment consists of current source sample, temporary connections and data capturing arrangement.

The sample for the study is 6m length sandwich Busduct (polymeric resin). The sample is arranged at a height of 0.6meter above the ground level using sturdy stands spaced at regular distances along the length of sandwich Busduct [3]. There are three joints at predetermined distances along the length of the sample. The thermocouples are fixed at different points as shown in the Fig. 2. This is the arrangement of thermocouples at all joints. Similarly, the thermocouples are arranged at identified points as per International Standards IEC 61439[3,4]. The temperatures are measured at regular interval of time at identified points as discussed above until thermal equilibrium is obtained. The rise in temperature is validated and analyzed the data for complete sample.

Fig. 2: Mounting of the Sandwich Busduct on steel stands.

5. RESULTS AND ANALYSIS

The experiments are conducted to study terminals, joints and busbars for thermal performance. The data generated on the sandwich Busduct is analyzed.

The joints selected are three numbers in sandwich Busduct and are equally placed along the length. The temperature is monitored at each conductor of the joint and the general characteristic remains same for all the numbers of joints. A typical temperature rise variation with elapsed time for a conductor in joints is shown in Fig. 3. The temperature variation with elapsed time takes place, the temperature band out 65°C to 85°C. The steady state is obtained after time interval of 120mins in Fig. 3.

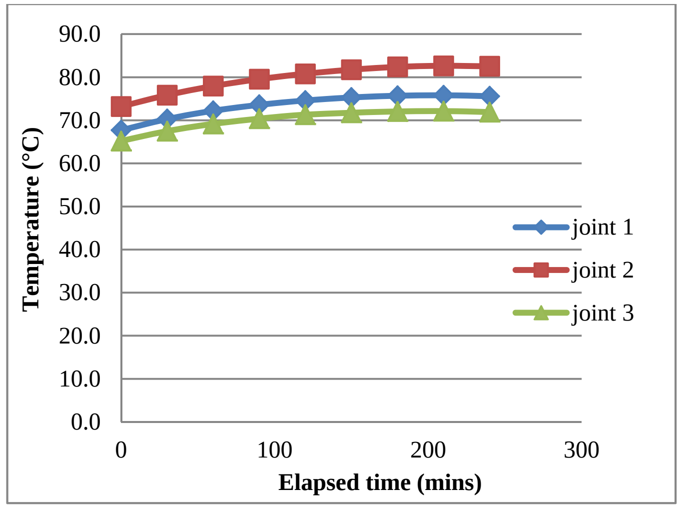

Fig. 3: Conductor 1 in the joints of sandwich Busduct.

The rate of rise of temperature is quite significant in conductor of joints although all the conductors showed similar pattern for rate of rise with respect to time. The typical pattern of rate of rise of temperature for conductor 1 is shown in Fig. 4. The characteristics shows a steep peak at the interval of 30mins, which means the rise of temperature occurs in this interval and there after the rise is gradual and stabilizes after 240mins. There is no increase of temperature beyond thermal steady state.

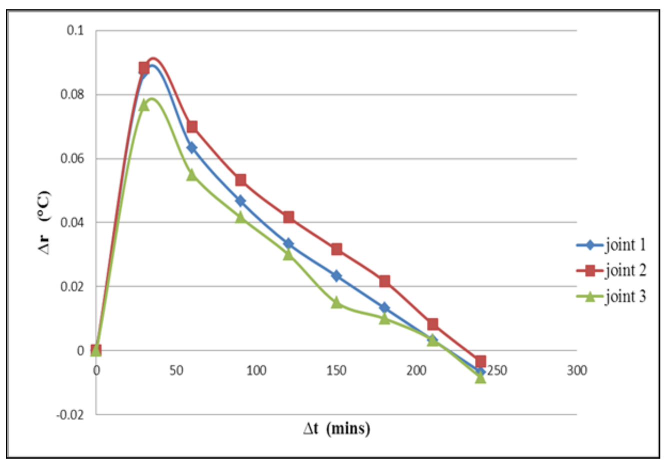

Fig. 4: Rate of Rise of temp in conductor in sandwich Busduct

6. CONCLUSION

On the basis of the above work the heat distribution in the joint place the vital role in thermal performance of joint & sandwich Busduct. The temperature at the joint is determined by the type of polymeric resin filled in the joint. The compound shall be such that heat dissipation takes place in proportion to heat generation. Proper selection of polymeric resin shall be judiciously selected and employed in sandwich Busduct such that, thermal performance of the sample meets the specification of International standards.

REFERENCES

[1] Y G Painthankar & S P Bhide, “ A book on fundamentals of Power system protection”

[2] Sunil S Rao, “ A book on Switchgear protection & Power systems”

[3] IEC 61439- part 6-2012: Low-voltage switchgear and controlgear assemblies- part 6: Busbar trucking systems (busways).

[4] IEC 61439-Part 1-2011; Low Voltage Switchgear and Controlgear assemblies-part1: General Rules

[5] Badriram & Viswakharma, “A book on Power System Protection & Switchgear