

Introduction

The development of 500KV saturated iron core superconductive fault current limite (SFCL) is succeed. The magnet consisting of 88 high temperature superconducting (HTS) double pancake coils with an inner diameter of 1940mm and outer diameter of 2040mm. Double pancake coil plays an important role in 500KV SFCL, the structure and winding process have great influence on current carrying capability and reliability of the coil.



Figure 1. 500KV saturated iron core superconductive fault current limiter (SFCL) In this poster, the key technology of winding process of the world's largest HTS coil was introduced, which included critical current measurement of HTS tapes under radial bending, insulating treatment of double pancake coil and the former, winding of the coil and welding of the joints. The study will not only provide important references for large HTS coils fabrication, but also accumulate experience and data for other simlar engineering practices.

Effect Of Bending Diameter On Properties Of Bi2223/Ag

As the winding radius has a significant influence on the current carrying capacity of ouble pancake coils. In order to optimize the winding process, the critical current density of Bi2223/Ag under different bending radius should be tested. Figure 2.and Figure 3. Shows the V-I curve of Bi-2223/Ag under different bending diameter and the relationship between critical current and bending diameter of Bi-2223/Ag, respecvely.



As can be seen from Figure 5, when the bending radius is greater than 70mm, the critical current of Bi2223/Ag short sample still showed good current carrying capacity

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and did not change a lot. When the bending radius is less than 70mm, with the decreasing of bending radius, the critical current of Bi2223/Ag decreased rapidly until the loss of superconducting properties.

Winding Technology And Experimental Study On Double-**Pancake Coil**

The winding process of Bi2223/Ag can be divided into two stages: the forward winding and the reverse winding. During the winding process, each coil is winded by two HTS tapes stacking together. Not only the winding speed but also the insulation of the tape should be controlled and concerned at all times. After finish winding the positive side, ribbon is used to fix the coil and a layer of G10 is placed on the side of the coil as the insulation sheet.



Figure 4. The winding process of double pancake coil

The critical current of HTS double pancake coil has been tested at 77K, self field, which is showed in Figure 6. Figure 7 shows the V-I curve of the double-pancake coil with the rising speed of 2A/min. The critical current of HTS coil is 153.12A. Compared with the critical current of Bi2223 short sample, which is 221.82A, the critical current of the pancake coil can reach 69% of the short sample.



Figure 6. Critical current test of Bi2223 double pancake

Study On Soldered Joint Between HTS Tapes

When the SFCL is running, theoretically there is no heat loss, the Joule heat generated by the joints become the main heat source. The low resistance between the double pancake coils can decrease the generation of Joule heat, which can higher



Figure 5. Bi2223 double pancake coil.





Figure 10 shows the welding equipment for HTS tapes, different contact length of soldering zone were subjected to the HTS tapes ranging from 2cm to 4cm. The experiment results were showed below:

Type	Contact Leng
	L/cm
Bi2223/Ag	2
	2.5
	3
	3.5
	4

There is an inverse relationship between the contact length of the soldering zone and joint resistance. When the contact length of soldering zone is between 2cm to 4cm, the joint resistances of the Bi2223 /Ag high temperature superconducting tapes are controlled at the level of $10^{-9} \Omega$, which can meet the requirements of stable operation of superconducting devices.

The world's first superconducting magnet for 500KV saturated iron core superconductive fault current limiter has been successful made by Xi'an Superconducting Magnet Technologies Co., Ltd. The test results indicates that the HTS superconducting magnet works really well and most of the technical index is better than the design value. The study will provide important references for large HTS coils fabrication and accumulate experience and data for other similar engineering practices. Also, references will be presented for the development of HTS magnet on Power industry.

the HTS magnet stability and lower the cooling cost. The effect of the contact length on joint resistance were theoretical analyzed.

Figure 10



Figure 10. The relationship between the contact length and the joint resistance

Conclusion