The Jiajiang tunnel of the Fifth Nanjing Yangtze River Bridge, with a total length of 1755m, is the largest diameter shield tunnel in China at present, including the Meizizhou open excavation tunnel, the shield tunnel and the Jiangnan shield receiving well. The Meizizhou open excavation tunnel will be constructed by direct excavation-shoring method, with the length of 560m, the deepest of 25.6m and the widest of 66m. The length of the shield tunnel is 1159m. And the Jiangnan shield receiving well, with the length of 36m and the depth of 38.9m, is located in the Nanjing Youth Olympic Culture Park, less than 100m apart from the Jiajiang river, close to the Nanjing Eye Footbridge, Nanjing Youth Olympic Centre and Nanjing ChengNan Waterworks, and next to the built Youth Olympic Axis Tunnel.

The sketch map of the project

The effect picture of the double-line shield tunnel

The shield tunnel engineering is currently the biggest shield road tunnel project, which will be built by “9+1” block pattern mode. The external diameter of the shield tunnel segment is 15m and the ring width is 2m. The Herrenknecht slurry balance shield machine, with the cutter diameter of 15.46m, the overall length of 140m and the total weight of 2500t, is used for the engineering construction. And the major problems including the difficult control of settlement and tunnel face stability, the serious wear damage of cutter and mud cake on the cutter are well considered in the manufacturing process of the shield machine.
The structural style of the cutter

Schwing pump

The profile map of the shield tunnel geological conditions

The surrounding environment of the Jiangnan shield receiving well

The features, emphasis and difficulty of the project:

1. In the construction process for open cutting, the difficulty works are the grooving in the 59m-deep rock-socketed wall, the excavation and dewatering of the ultradeep foundation pit.
2. The initial soil layer of the shield tunnel is shallow burial soil, with the covering thickness of 7.1m, less than 0.5D. And the soil compositions are muddy silty clay and silty sand stratum on the top of the shield tunnel. The phenomenons of water leaking, quick sand, collapse and piping easily occur in the initial soil layer of the shield tunnel.

3. The construction environments of the shield tunnel that cross the Jiajiang section of the Yangtze river, are very poor such as the shallow burial soil, the worse geology condition and the high water pressure. Because of the complicated environments, the risks of the instability of shield-tunneling face, the mud spillover of river bottom, the gushing water and sand and the collapse of tunnel are produced in the construction process.

4. A series of problems, such as the high protection requirements of the surrounding buildings and the Yangtze river levee, the strict environmental targets of the drinking water sources, will produce the rare high-risk.

5. The shield receiving well is located in the Nanjing Youth Olympic Culture Park with many high building and narrow roads. Consider the integrated construction period, the second originating scheme is executed by taking the shield machine back from the completed right line to the left line.

6. To satisfy the environment protection requirements, the scheme of ‘slurry separation plant, plate-and-frame filter press and waste water treatment equipment’ is used to dispose the waste slurry. And the waste-slurry zero discharge will be realized. The wastewater reaches discharge standard, and the pressure filter residue soils are used to the subgrade construction, the foundation pit backfill and the park construction.

Add: The pictures of engineering field
Note: The project is in the installation stage of shield machine at present, and the starting-time predicts at October.