

# RECTIFICATION AND UPGRADING OF MECHANICAL AND ELECTRICAL WORKS AT PJA 229, BANDAR SRI DAMANSARA, SELANGOR DARUL EHSAN

## INTRODUCTION

PJA 229, Bandar Sri Damansara is an EAPS(Extended Aeration Pumping Station) plant located in the vicinity of Bandar Sri Damansara fronting the Sungai Buloh Expressway. It is a sizable plant with a PE of ?20,000. The client IWK (Indah Water Konsortium Sdn. Bhd.) had conducted a tender exercise which was eventually awarded to Ziphron Sdn. Bhd.

## PROBLEMS

### ELECTRICAL

Prior to taking over the plant, the plant was inactive due to a damaged control panel as shown in Fig. 1.



Fig. 1 Existing MCC panel



Fig. 2 Damaged MCC panel

The incoming power supply is 300A and utilized an ACB (Air Circuit Breaker). The panel on the right (shown with arrow) is the incoming panel for PJA 242 and is not included in the scope of works.

The panel condition has deteriorated and there are signs of burning as can be seen in the photo on the right.

The existing equipments are as follows;

No	Equipment	Nos	kW
1	Raw Sewage Pumps	2	43
2	Surface Aerators	8	22
3	Sludge Pumps	3	7.5
4	Foam Pump	2	7.5
5	Clarifier Scrapper	1	1.1

The recommended starter type was auto-transformer starters with the exception of the clarifier scrapper which was specified to be a

Direct-On-Line(DOL) to its small capacity.

The scope of works also include the replacement of lighting and switch socket outlets for the control room and a separate distribution board. The installation of floodlights to illuminate the front of the room and also the aeration tank located behind it.

Other minor electrical scope of works included the installation of isolator junction boxes for all the raw sewage pumps, surface aerators and the sludge pumps.

## MECHANICAL

The major problem in the mechanical scope of works was the condition of the clarifier. This is clearly shown in the photographs below.



Fig. 3 Clarifier prior to starting work



Fig. 4 Corroded clarifier arm struts



Fig. 5 Sludge in clarifier

and this too was included in the scope of works.

The other mechanical works are somewhat minor and includes replacement hinged gratings for the raw sewage pump sump and for the sludge pump sump and foam pump sump which were initially covered with concrete slabs which were unwieldy especially for the operation and maintenance of the plant itself. The guide rails for the raw sewage pumps too had been removed from its place and the level control switches were either missing or required replacement, the control panel room too required a fresh new coat of paint as well as a sheet metal door. This items were included in the scope of works.

Clarifier had been inactive for quite a considerable time and due to that, there had been severe corrosion in the strut bars supporting the scrapper. The corrosion is evident at the water-line.

Another effect of the clarifier being inactive was the accumulation of sludge in the clarifier, the actual depth of sludge was about 3 meters. Although desludging was not in the scope of works, it would be possible to proceed without it. So the decision, after discussions with the client, was to pump the sludge into the drying tank located on the side of the clarifier tank.

In our pre-mobilisation investigation we had discovered that the motor for the clarifier scrapper was still in good condition, however the seals for the SUMITOMO CYCLODRIVE® gearbox was damaged and had leaked the gear-oil. (Further investigation by Sumitomo had discovered the bearings and \_\_\_\_\_ to be damaged). The deterioration in the gearbox was more to disuse than to wear and tear due to the running of the gearbox itself. As the gearbox was fitted with a torque limiter, there was sufficient confidence that the gearbox would not be severely damaged if at all.

The pre-mobilisation investigation also ascertained that 1 nos. of Raw Sewage Pump and 2 nos. of Sludge Pumps was shorting to earth. This information was conveyed to the client immediately.

The raw sewage pump wafer check valves or gate valves were found to be defective

## COMPLETION

### ELECTRICAL

The new MCC panel was completed after ? 2 months and the major difference was the individual compartments that included all the existing equipments less the foam pumps which, in discussions with the client, were determined not to be severely detrimental to the effluent compliancy of the plant itself.



**Fig. 6 New Motor Control Centre**

Due to the increased size, mainly the individual compartments, the toilet in the control panel room had to be demolished. The clearance of the control panel from the ground was also increased due to probability of flooding in the room, the height was ascertained by the water line mark which was visible prior to the painting.

The MCC was constructed in two parts to facilitate its positioning in the control room

No	Equipment	Nos	Starter Type	kW
1	Raw Sewage Pumps	2	A/T	43
2	Surface Aerators	8	A/T	22
3	Sludge Pumps	3	A/T	7.5
5	Clarifier Scrapper	1	DOL	1.1

\* A/T = Auto-transformer starter  
DOL = Direct On-Line

The incoming was again as before isolated with the use of an ACB of a withdrawable type (Larsen & Toubro) which was flush with the panel which on the other hand improved its aesthetic value. A capacitor bank was installed to maintain the ideal power factor which through observance of the Power Factor Meter was seen to be between 0.9 and unity. An EFR/OC (Earth Fault and Over Current Protection Relay) was installed and calibrated by Ziphron.

Individual compartment were installed with individual MCCBs (Moulded Case Circuit Breakers) complete with lockable handles (TERASAKI). Contactors utilized were manufactured by FUJI.

A separate compartment was utilized for easy evaluation of the level control switches of which there were four that corresponded to the individual float (SARLIN) levels. Ref to fig 7



**Fig 7 Level Control Switches Compartment**

## **PROBLEMS**

The MCC control panel did not in itself cause any problems, however during the running of the equipments especially the raw sewage pumps, the incoming cables especially the yellow phase was seen to be heating up. This was considered to be abnormal and through our liaison with TNB, it was discovered that the cable was damaged and required the termination of the damaged cable and rejoining back of a new cable to replace the damaged cable. The contacts at the TNB Sub-station was also retightened.

After these works the incidence of the cables heating up did not occur.

\* The MCC panel delivered is inclusive of a 6 months warranty

## MECHANICAL

To complete the work on the clarifier all the sludge had to be pumped out, this took the better part of 1 1/2 week which was continuously hampered by the pumps being blocked by rubbish (as the pumps were not activated, rubbish had already bypassed the screen. The final clarifier after desludging can be seen in Fig 8 below.



Fig. 8 De-sludged Clarifier

The struts too were repaired by removing the corroded struts and rejoining it with mild steel pipes of the same thickness and welded on site. Ref. Fig. 9

The clarifier and motor after replacement of damaged parts were returned and later installed as seen in Fig. 10.

The wheel after determining that it was not damaged was replaced in the scope works by the installation of metal plates of 2mm thickness bolted to the concrete wall that would function as a more even track for the movement of the wheel.

The hinged gratings were installed subsequently as shown in Figs. 11 and 12



Fig. 9 Repaired clarifier arm struts



Fig.11 Hinged Gratings



Fig. 10 Clarifier motor and gearbox



Fig. 12 Hinged Gratings

## PROBLEMS

The major problem encountered happened during the testing of the clarifier scrapper. The wheel jumped track and dislodged. Under inspection, it was discovered that a pipe that acted as a guide for the clarifier had corroded and the stress caused the pipe to break up as shown in Fig. 13.



Fig. 13 Clarifier damaged pipe guide

As a solution, a pipe was used of a higher thickness to offset the long term effects of corrosion.

To proceed with the work a 20-tonne crane was employed Fig. 14 in lifting up the entire scrapper arm and the new pipe was installed in place. Fig. 15.

The surrounding area around the pipe was also cleared from debris and metal shavings, the ball bearings was greased and reinstalled.

After this works the clarifier worked well.\*



Fig. 14 Lifting of clarifier arm



Fig. 15 Repaired pipe guide & ball bearings

\* The mechanical works comes with an inclusive 6 months warranty against defects.