ASPECTS CONCERNING POWER LOSSES GENERATED BY MEDIUM VOLTAGE CONSUMERS WHICH ENTER THE CONFIGURATION OF OWN-USE SERVICES OF 330 MW ENERGY GROUPS

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ABSTRACT: The paper aims to highlight the influence of medium voltage consumers that enter the configuration of their own services related to a 330 MW energy group, on the power and energy losses quantified at the level of the entire energy group. The support of this topic is based on the relatively large impact that medium voltage electrical consumers have in the configuration of the technological flow scheme for the production of electricity by energy groups with a unitary power of 330 MW, respectively 388 MVA.

KEY WORDS: energy group, medium voltage, technological flow, energy losses, own services

1. INTRODUCTION

As stated in the abstract of the paper, the architecture of consumers that enter the configuration of the technological flow scheme for the production of electricity, by energy groups with a unitary power of 330 MW, respectively 388 MVA, has several levels, distributed both horizontally and vertically.

The distribution of electricity consumers within the technological flow scheme is consistent with the location of the mechanical equipment to be operated and with the level of their nominal supply voltage.

Depending on the level of the nominal supply voltage of the electricity consumers, which are included in the configuration of the technological flow scheme for the production of electricity, by the energy groups with a unit power of 330 MW, the following classification can be made:

- Medium Voltage (MV)electricity consumers,
- Low Voltage (LV) electricity consumers.

The category of medium voltage consumers includes all electric motors with a nominal supply voltage of 6 kV, whose functional role is to drive pumps and mechanical equipment within the technological flow scheme (fans, coal mills, water supply pumps for 1035 t/h boilers, bagger pumps, bagger washing pumps, etc.).

By referring to the technological flow diagram, it should be noted that the category of medium voltage consumers also includes electrostatic precipitators, which, in order to have a higher degree of efficiency, convert electrical energy to a voltage level of 110 kV through a 0.4 kV / 110 kV step-up transformer.

The category of low-voltage consumers includes all electric motors with a nominal supply voltage of 0.4 kV, whose functional role is to drive pumps and mechanical equipment within the technological flow scheme (semi-water pumps, vacuum pumps, oil pumps, cooling pumps, conveyor belts, etc.).

Figure no. 1 shows the electrical diagram for supplying the consumers of their own services that are part of the configuration of the technological flow diagram for the production of electricity, by the energy groups with a unitary power of 330 MW.

The basic electrical diagram presented in Figure no. 1 highlights the fact that the supply of electricity to consumers is carried out through a block-specific electrical transformer (TSPB) with a nominal power of 40 MVA, indirectly connected through a busbar system to the terminals of the windings of the 330 MW synchronous generator.

As can be seen from Figure no. 1, the distribution of electrical energy from the secondary windings of the block's own service transformer is carried out to a 6kV electrical substation, divided into two sections (section A and section B) for the purpose of balanced distribution of medium voltage consumers.

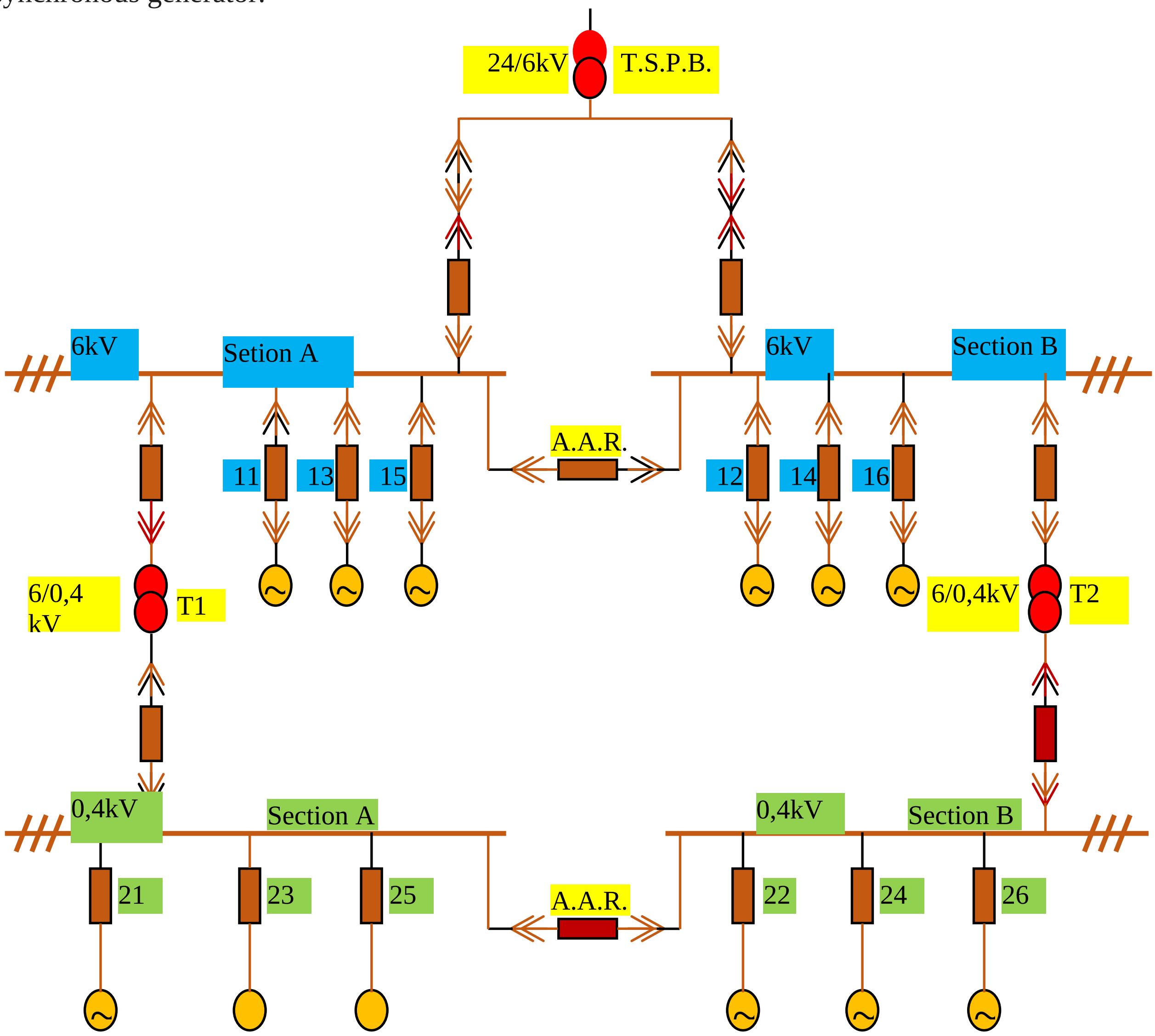


Figure no. 1. Electrical diagram of power supply of own service consumers

Similarly, the supply of low-voltage electricity consumers is carried out through a 0.4 kV electrical substation, divided into two sections (section A and section B) for the purpose of balanced distribution of medium-voltage consumers.

The electrical diagram presented in Figure 1 also highlights a very important aspect, which is that Automatic Reserve Switching (A.A.R.) systems are interconnected between the 6 kV and 0.4 kV substation sections.

These automatic drive systems monitor the presence of voltage on both sections and have the functional role of ensuring continuity in the supply of electricity to consumers, by operating a longitudinal coupling switch.

2. ASPECTS REGARDING THE VARIATION OF POWER AND ENERGY LOSSES DIFFERENT GENERATOR LOADS

Based on the operating parameters of the consumers of their own services, at different loads of a generator with a power of 330 MW, tables 1-3 were drawn up:

Table 1. Parameters of 6kV electricity consumers for 310 MW generator load

No. cur.	Consume	P_i [kW]	I_n [A]	I_{abs} [A]	P_{abs} [kW]	ΔP [kW]	ΔW [kWh]	W_{abs} [kWh]
1.	Own services MT Section "A"	23635	2809	761	6953	682	682	6953
2.	Own services MT Section "B"	23635	2733	972	8980	908	908	8980
Own services MT Grup 330 MW		47270	5542	1733	15933	1590	1590	15933

Table 2. Parameters of 6kV electricity consumers for 275 MW generator load

No. cur.	Consume	P_i [kW]	I_n [A]	I_{abs} [A]	P_{abs} [kW]	ΔP [kW]	ΔW [kWh]	W_{abs} [kWh]
1.	Own services MT Section "A"	23635	2809	732	6699	715	715	6699
2.	Own services MT Section "B"	23635	2733	825	7635	771	771	7635
Own services MT Grup 330 MW		47270	5542	1557	14334	1486	1486	14334

Table 3. Parameters of 6kV electricity consumers for 265 MW generator load

No. cur.	Consume	P_i [kW]	I_n [A]	I_{abs} [A]	P_{abs} [kW]	ΔP [kW]	ΔW [kWh]	W_{abs} [kWh]
1.	Own services MT Section "A"	23635	2809	644	6016	604	604	6016
2.	Own services MT Section "B"	23635	2733	575	5372	541	541	5372
Own services MT Grup 330 MW		47270	5542	1219	11388	1145	1145	11388

Based on the data in Tables 1-3, the variation characteristics presented in Figures 2-4 were drawn up:

Figure no. 2. Power loss variation characteristic for 310 MW generator load

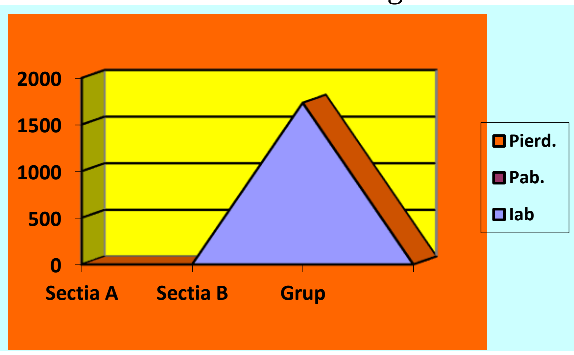
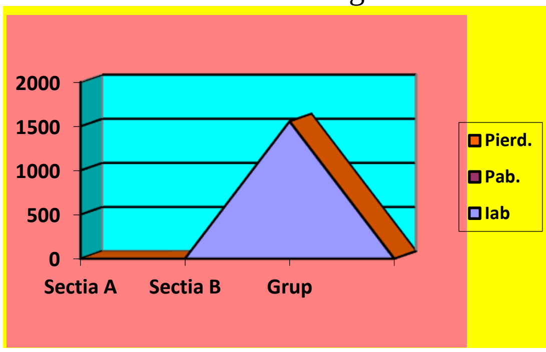


Figure no.3. Power loss variation characteristic for 275 MW generator load



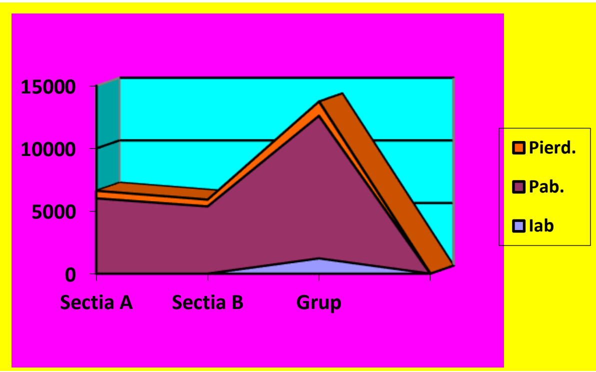


Figure no.4. Power loss variation characteristic for 265 MW generator load

3. CONCLUSION

From the tables presented, it can be seen that the power and energy losses allocated to the consumers of their own services connected to the busbars of the electrical station with a nominal voltage of 6 kV vary depending on the load of the synchronous generator, in the range of 0.43% ÷ 0.54%.

By referring to the fact that in the technological flow diagram, changes in operating conditions may also occur (for example, the calorific value of the fuel, the temperature of the cooling water, etc.), it can be appreciated that the value of these losses is relatively constant, in relation to the variation of the load of the synchronous generator with a unit power of 330 MW, respectively, 388 MVA.

The paper addressed a limited segment of consumers, who are part of the technological flow scheme of a 330 MW energy group.

Within the technological flow scheme, several consumers intervene (for example, those supplied from 0.4 kV stations), which amplify both the technological consumption itself and the power and energy losses.

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