ESF II project of the University of West Bohemia in Pilsen

reg. number: CZ.02.2.69/0.0/0.0/18_056/0013239



EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education



ECONOMY AND MANAGEMENT IN POWER ENGINEERING

For practice of the 2nd lecture

Examples for practice

Ex. 1 ***(from mimeographed for E1 – 1. part)***

Calculate, what the cost of 1 kWh produced in power plant with installed capacity ***4 x 200 MW*** will, if the year utilization period at maximum capacity is T_m = ***6500 h/year***, available power is P_{max} = ***750 MW***, life time of plant is $T_ž$ = ***25 let*** and investment costs are N_i = ***8 billions CZK***. Efficiency is ***30 %*** .

In the plant is used coal with calorific value q_{pal} = ***12 000 kJ/kg***, which prize is c_{pal} = ***160 Kč/t*** and per one year there is expended M_{mz} = ***18 000 t*** of mazut with prize c_{mz} = ***1000 Kč/t*** and M_v = ***11.10^6 m^3*** of service water with prize c_v = ***0,5 Kč/m^3***.

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Examples for practice

Ex. 2 ***(from mimeographed for E1 – 1. part)***

Divide production and load of power system among three plants – base-load, semi-peak-load and peak-load so that resultant production costs in all plants will be minimal.

Equations of production costs in individual plants are:

$$N_1 = 800.P_1 + 0{,}135.W_1$$

$$N_2 = 300.P_2 + 0{,}150.W_2$$

$$N_3 = 100.P_3 + 0{,}250.W_3$$

In the system three load diagrams per year are taken into account, that are repeated in:

- winter period (months 12, 1, 2)
- transition period (months 3, 4, 5, 9, 10, 11)
- summer period (months 6, 7, 8)

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Examples for practice

Ex. 2 – continuation

Diagrams for individual periods have the next courses:

t	winter	P	summer	t	winter	P	summer	t	winter	P	summer
[h]	[MW]	[MW]	[MW]	[h]	[MW]	[MW]	[MW]	[h]	[MW]	[MW]	[MW]
0	40	30	15	8	95	80	75	16	90	75	65
1	40	25	15	9	95	75	65	17	95	85	70
2	35	30	15	10	85	70	65	18	110	95	65
3	35	30	15	11	80	75	65	19	105	90	65
4	40	35	20	12	90	80	60	20	95	80	60
5	50	40	20	13	85	70	60	21	90	60	30
6	80	65	40	14	75	70	55	22	65	55	20
7	100	90	80	15	80	70	60	23	60	30	15

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Examples for practice

Ex. 3 ***(from mimeographed for E1 – 2. part)***

On th base of consumption characteristics $Q = f(P)$, divide required power $P_c = 6$ MW between machines with nominal outputs $P_{n1} = 4$ MW and $P_{n2} = 6$ MW so that the operation will be the most economical.

Consumption characteristics are determined by the table of measured values:

P [MW]	0	1	2	3	4	5	6
Q_1 [MW]	2,26	4,08	6,34	9,44	13,38		
Q_2 [MW]	4	5,28	7,12	9,52	12,48	16	20,8

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Examples for practice

Ex. 4 ***(from mimeographed for E1 – 2. part)***

Divide the load of power system $P_c = 535\ MW$ among three parallel cooperate units, that have the next consumption characteristics:

$$Q_1 = 23,8 + 0,167\,P_1 + 7,62 \cdot 10^{-4}\,P_1^2$$

$$Q_2 = 26,5 + 0,095\,P_2 + 8,5 \cdot 10^{-4}\,P_2^2$$

$$Q_3 = 21,8 + 0,142\,P_3 + 7,5 \cdot 10^{-4}\,P_3^2$$

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