

ESTIMATION OF ENERGY NOT SUPPLY

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Summary: Damages in industrial company are raising during electrical interruption of power supply. These damages have usually different character and financial damages are most usual. Value of damage is nearly pertinent to type of industrial branch and working load of production line. Total value of customer costs depends on time of interruption. The paper refers to cost calculation based on public sources for industrial company during interruption of electrical power supply.

1. INTRODUCTION

During electrical power supply outages are raising damages which are closely connected with these electrical power supply outage in industrial enterprise. Information about calculated outage costs is very important for management of industrial enterprise. There are a lot of outage aftereffects in industrial enterprise, for example production outage, decreasing of production quality, decreased quantity of production, decreased sales, losses of damaged machinery.

This paper deals with outage costs calculation in industrial enterprise during power supply outages using public data sources. There is a methodology of outage costs calculation and analysis of advantages and disadvantages described in this text. At the end of this paper there is shown a comparison of outage costs calculation results using two different methods (calculation using public sources and calculation using secret internal data).

2. ECONOMICAL VALUATION OF OUTAGE LOSSES IN INDUSTRIAL ENTERPRISE

Structure of outage costs in industry is quite various and it can be completely different in each industrial enterprise but we can find some common characters in some industrial branches. Main part of direct outage costs is composed from costs of damaged products, costs of waiting time of employers, costs of the restoration of production, costs arising from lost production, costs of penalty payment. It is possible that here rise some additional costs during power supply outages. Customer outage costs we can simplify that we will direct and indirect costs reduce to one variable function (duration of outage).

We can calculate outage costs using two methods; the first is calculation using public data sources and the second calculation using secret internal data.

2.1. Outage costs calculation using internal information sources

Outage costs calculation is based on detail analysis in enterprise studied. This analysis is very time consuming and of course technically sophisticated. Completely specific analysis of concrete condition in industrial enterprise is a biggest disadvantage of this methodology. It can be perform only by team of experts with technical-economical knowledge's. This is the reason of high costs of this analysis.

2.2. Outage costs calculation using public information sources

This method is based on using public information sources (for example Annual reports). Calculation of outage costs is not so time consuming like using the first method, but it is not so exact too.

2.3. Comparison of different calculation methods

There is shown comparison of advantages and disadvantages of both used methods in table 1.

Tab. 1. Comparison of calculation methods

Characteristics	Internal information	External information
Accuracy	Higher	Lower
Calculation Costs	Higher	Lower
Calculation speed	Lower	Higher
Reproducibility	Lower	Higher

Each method has advantages and disadvantages. For calculation we must choose suitable methods according to reason of calculation with respecting calculation condition.

3. GENERAL EXPRESS OF OUTAGE LOSSES USING PUBLIC INFORMATION SOURCES

During electrical power supply outages are raising damages which are closely connected with these electrical power supply outage in industrial enterprise. In industrial enterprise direct outage costs is composed from costs of damaged products, costs of waiting time of employers, costs of the restoration of production, costs arising from lost production, costs of penalty payment.

3.1 Calculation of costs arising from lost production

Final costs arising from lost production we can express

$$COSTS_1 = (T - NV) \cdot \frac{t_{OP}}{t_0} = Y \cdot \frac{t_{OP}}{t_0} \quad (1)$$

Where

Y - added value (Kč)

t_{OP} - service restoration time (h)

t_0 - total annual available time (h)

3.2 Calculation of costs of damaged product

Costs of damaged product we can express from total variable costs and available time of damaged product if we know total available time.

$$COSTS_2 = NV \cdot \frac{t_p}{t_0} \quad (2)$$

Where

NV - annual variable costs (Kč)

t_p - time corresponding with damaged products (h)

t_0 - total annual available time (h)

3.3 Calculation of costs of production equipment correction

If we calculate costs of production equipment correction we must know value of fixed assets and we calculate these costs as a proportion of these value

$$COSTS_3 = DHM \cdot k_D \cdot k_R \quad (3)$$

Where

DHM - Long term corporeal property (Kč)

Coefficients k_D and k_R we set as a part of long term corporeal property.

4. PRACTICAL PROCEDURE OF CALCULATION OF OUTAGE COSTS USING PUBLIC INFORMATION SOURCE METHOD

We create a methodology for calculation of outage costs from public information source directly for this industrial enterprise. From this calculation we found out basic know-how and key point of valuation. It is especially outage time and after that total restoration time if we know these basic information we can set outages types [1].

From annual report 2005 for studied industrial enterprise we use these three items (see table 2).

Tab. 2. Item needed for calculation of outage costs

Item	Kč
Added value - Y	710 431 000
Output consumption - NV	3 409 828 000
Long term corporeal property- DMH	1 067 539 000

Each coefficient we set after cooperation with experts from studied enterprise (economist, power-supply director and technologist).

4.1 Costs of production lost

If we put real values into formula (1) we can get costs of production lost

$$COSTS_1 = Y \cdot \frac{t_{OP}}{t_0} = 710\,431 \cdot 0,35 \cdot \frac{5,1}{7\,920} = 0,160 \text{ mil. Kč} \quad (4)$$

Value of added value we set as 35 % from total value of whole enterprise.

4.2 Costs of damaged products

Costs of damaged product we can calculate using formula (2). We must know total annual available time t_0 , next we must set time corresponding with damaged products t_p and annual variable costs NV. Output consumption of studied production unit is approximately 40 % from total consumption of enterprise.

$$COSTS_2 = NV \cdot \frac{t_p}{t_0} = 3\,409\,828 \cdot 0,4 \cdot \frac{0,1}{7\,920} = 0,017 \text{ mil. Kč} \quad (5)$$

4.3 Costs of production equipment correction

Costs of production equipment correction we can express using formula (3). Item Long term corporeal property we can find in financial balance sheet. We must set coefficient k_D at studied enterprise, which respect part (production unit) from total property and range of damage (coefficient k_R). Part of total property was set on 2 % from total enterprise

property and range of damage is 0,5 % from production line for outage under three minutes.

$$\begin{aligned} COSTS_3 &= DHM \cdot k_D \cdot k_R = \\ &= 1067539 \cdot 0,02 \cdot 0,005 = 0,107 \text{ mil. Kč} \end{aligned} \quad (6)$$

4.4 Total costs

If we summarized partial outage costs we can get total outage costs. Results of each calculation are shown in tables 3 and 4.

Tab. 3. Total outage costs using public information source method

	Outage A	Outage B	Outage C
	(mil. Kč)		
Costs of production lost	0,160	0,251	2,417
Costs of damaged products	0,017	0,017	0,017
Costs of production equipment correction	0,107	0,205	1,023
Total costs	0,284	0,473	3,458

Tab. 4. Total outage costs using internal data analysis

	Outage A	Outage B	Outage C
	(mil. Kč)		
Costs of production lost	0,153	0,244	2,352
Costs of damaged products	0,022	0,022	0,022
Costs of production equipment correction	0,121	0,151	0,885
Total costs	0,296	0,417	3,259

Comparison of total outage costs calculated from public information source and from internal data is shown at Fig. 1.

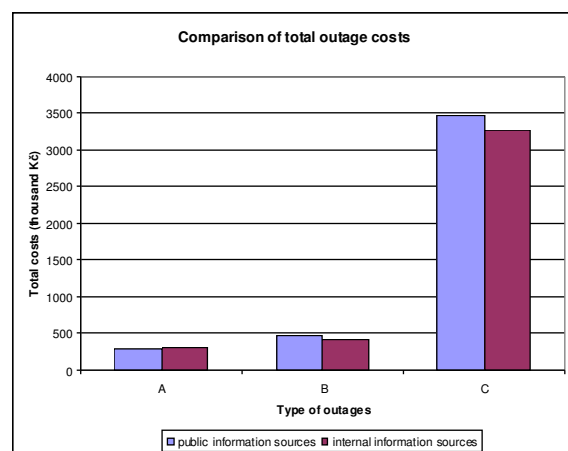


Fig. 1. Comparison of total outage costs

5. CONCLUSION

This paper deals with calculation of outage costs in real industrial enterprise using public information sources. There is described developed methodology in detail; description of advantages and disadvantages is added too. After comparison of result calculated by two independent methods we find out that this methodology is correct and we can use it to calculate outage costs in industrial environment.

Maximum difference of total outage costs is 6% in case of outage type C. Accuracy of calculation satisfactory. Setting of coefficients must be very rigorous to reach this accuracy in next calculation.

Application of this methodology will be observe in other cases in the future to improve methodology accuracy.

The customer can use the results of this analysis for planning investments to improve the reliability of power supply, as a basis for making an insurance against unplanned losses, etc.

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