

THE MONITORING AND REPORTING OF ENERGY MANAGEMENT IN A COMPANY

HAZI ANETA, HAZI GHEORGHE

University of Bacau

Abstract: In this paper there are presented two components of energy management: monitoring and reporting and computer program for processing data and generated reports. These are applied in a company and are shown results obtained.

Keywords: monitoring, reporting, energy management.

1. INTRODUCTION

Monitoring and reporting energy consumption are essential elements of an effective energy management strategy. Tight budgetary controls of a company's energy consumption could reduce waste and establish a level of energy efficiency. But, the cost control alone will not provide the information needed to show whether energy is being used efficiently or how it can be used more efficiently. To establish proper control over energy use it is necessary to have information on energy flows and inputs across the entire company. When treated in this manner, energy use can effectively be managed in a similar manner to other operating resources.

In this paper there are presented monitoring and reporting energy consumption in a company. There is established energy management structure and collection data and reporting procedure. For data processing and reports generating it was made software.

2. MONITORING ENERGY CONSUMPTION

Monitoring is the process of measuring and recording data. Effective monitoring of energy use will lead to, [1]:

- maintenance of savings from any existing efficiency investments;
- identification of new opportunities for savings;
- a database to enable cost control and external comparison;
- an understanding of where the energy resource is used in company.

The choice of an appropriate monitoring system for company was proceed through the following steps:

- review existing metering and identify any additional requirements;
- identify the appropriate energy management structure for the company;
- identify computer software and hardware to assist in operating the system;
- review the scope of the system with respect to the likely benefits;
- purchase relevant equipment and install the system;
- develop the appropriate reporting procedure;
- review performance regularly.

Costs vary according to the level of sophistication and coverage offered and the extent to which use can be made of existing metering and computing facilities. There are direct costs (such as the purchase and installation of metering and software) and indirect costs (such as management effort to ensure the system is run effectively).

The budget for a new monitoring system is related to the company's current total energy bill. Thus, for a company it was analyzed of energy cost: weight in the total cost and value, table 1, [3].

Table 1. weight in the total cost and value

	Electricity cost	Fuel cost	Energy cost
Weight, %	17	14	31

It was reviewed existing metering. For example, in the fig.1 it is shown electricity monitoring system.

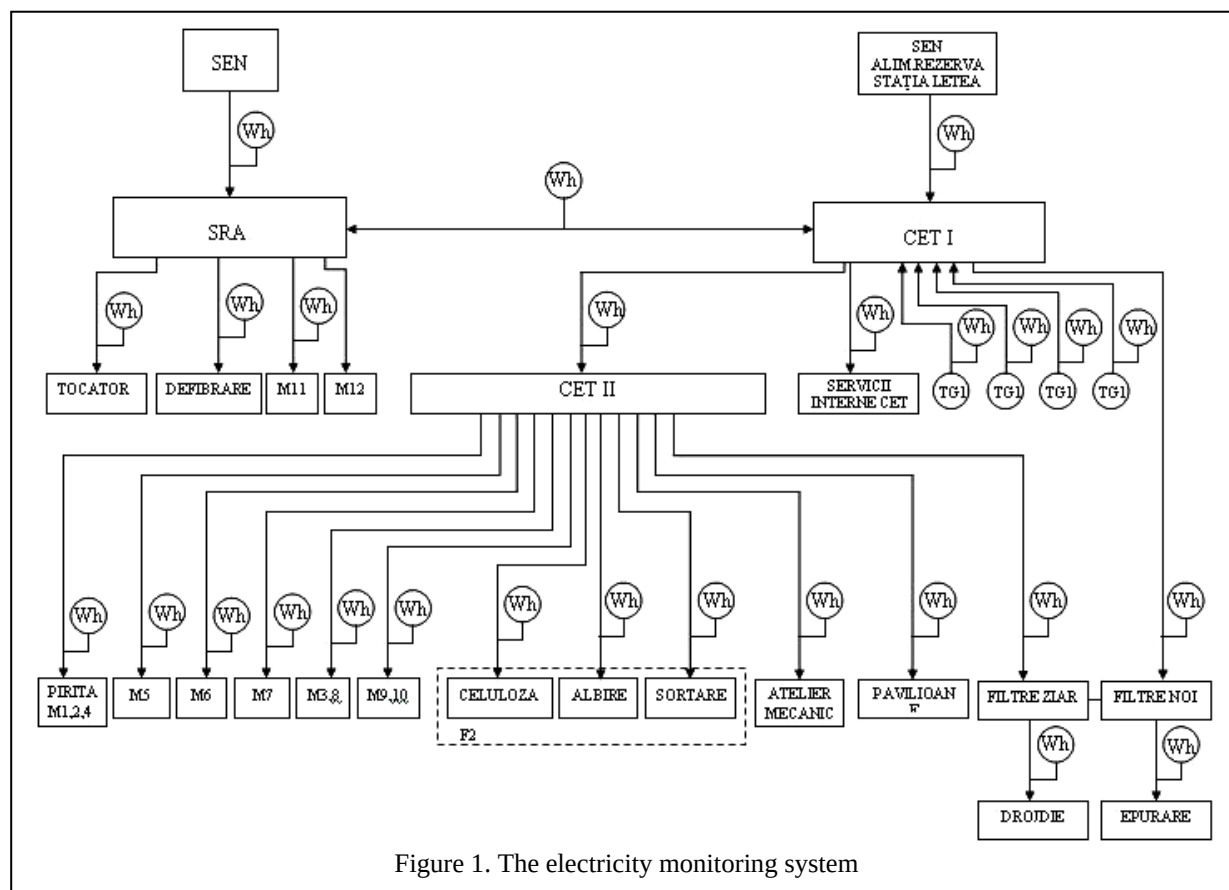


Figure 1. The electricity monitoring system

After that, it was exchanged monitoring system for electricity and fuel taking account by tariff, by cost of them, by total energy bill and by electricity balance. Thus:

a) for electricity monitoring, it was choosing Zeus system. The system components are following: impulse meter, tele-summation system, computer PC with Zeus software. Zeus system cost was recovered on the three month's period.

b) for fuel monitoring it was choosing SMG1 system (ACK Pascani). This system is used for measuring and metering the gas natural flow. It has:

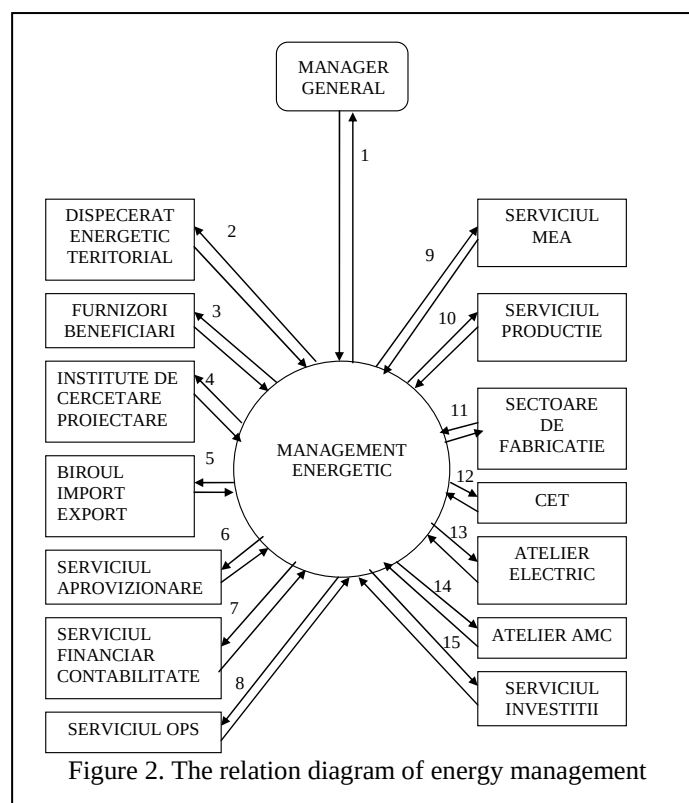
- four measuring points with orifice plate as primary element
- multivariable transducers with digital output and MODBUS protocol
- additional transducers for differential pressure with the industry standard 4-20mA output.

The flow calculation and the flow compensation with the pressure and the temperature is made according to the normative.

The measuring error of this system is $\pm 1.5\%$. SMG1 system cost was recovery on the two months.

For establishing of data collection and reporting procedure it was made a relation diagram of energy management, fig.2, and energy responsibilities of every compartment. For example, energy responsibilities in the relation between energy management and power plant are:

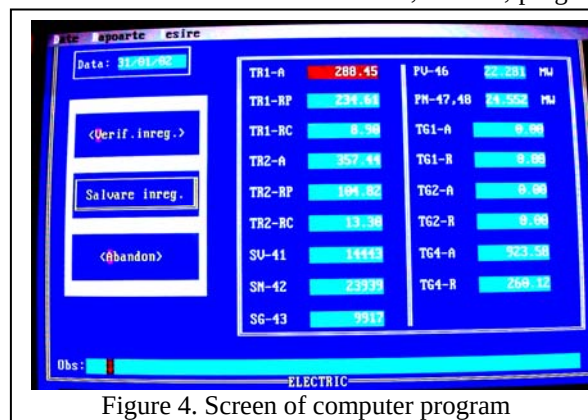
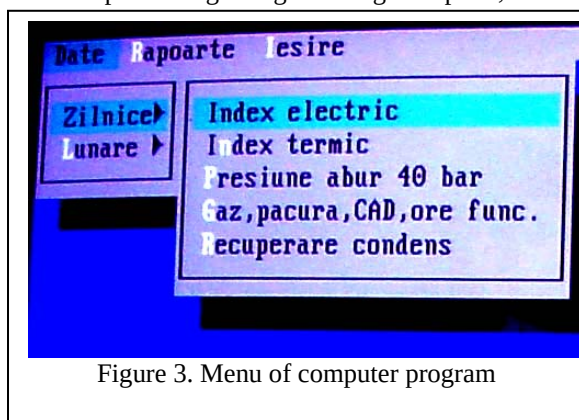
- power plant receives from energy management: electricity and thermal planning and producing, fuel quote and consumed, working hours of boilers and turbines, energy saving measures, program for supply with thermal energy regarding to quotes, damages analyze of installations.
- power plant transmits to energy management: primary data referring to working of installations, steam consumption, condensate recovery, damages of installations, proposals for increase of energetic efficiency.



3. REPORTING ENERGY CONSUMPTION

Information is data that has been processed so that it speaks clearly to end-users and helps them make decision. When designing a reporting process for company, the aim is to reduce the amount of data that senior management receives, while increasing the quality of relevant information at their disposal-quality information is the key to effective energy management, [2].

For data processing and generating of reports, it was made software. This contains database, screens, programs,



reports and menu. For example, in the figure 3 is shown the menu and in the figure 4 – a screen for entering of electrical data. The programs calculate energetically consumptions (electrical, thermal, water) for installations and sectors for different periods (decadal, monthly, quarterly, terminal, yearly).

There are generated reports, for example – figure 5. Internal communications and reporting energy use takes place on a regular basis with: senior manager, department heads and budget controllers, member of the implementation committee, members of staff. External communications takes place with: zone energetically dispatcher, electricity and natural gas suppliers, customers, regulatory authorities, the local community.

For example quarterly report, annual report and monthly report are handed over to production area manager. These reports contain summary against production and totals: % (for area), consumption, greenhouse, benchmarks. Target of these reports are: feedback from shop floor staff, control analysis, assessment.

Zi	En.electrica produsa [MWh]				Reactiv CET [MVARh]	Consum gaze [mii mc]				Păcura [t]				Abur produs [t]			Rand. CET [%]
	Cota	Zi	Cum.	[t/MWh]		Cota	Zi	Cum.	Dif.	Intr.	Zi	Cum.	Stoc	CET	C&D	TOTAL	
1	71	36	36	16.5	67	123	61	61	-62	0	0	0	0	595	0	595	0.81
2	142	40	76	16.7	131	245	61	122	-123	0	0	0	0	668	0	668	0.91
3	213	39	115	17.5	203	368	77	199	-169	0	0	0	0	682	0	682	0.74
4	284	38	153	17.9	275	490	77	276	-214	0	0	0	0	680	0	680	0.74
5	355	40	193	17.7	348	613	77	353	-260	0	0	0	0	707	0	707	0.77
6	426	34	227	18.2	423	735	77	430	-305	0	0	0	0	620	0	620	0.67
7	497	35	262	17.9	496	858	72	502	-356	0	0	0	0	627	0	627	0.73
8	568	31	293	20.0	570	981	72	574	-407	0	0	0	0	619	0	619	0.72
9	639	33	326	19.9	643	1103	72	646	-457	0	0	0	0	658	0	658	0.76
10	710	32	358	17.5	716	1226	72	718	-508	0	0	0	0	559	0	559	0.65
11	781	35	393	18.3	781	1348	72	790	-558	0	0	0	0	640	0	640	0.74
12	852	40	433	17.3	856	1471	72	862	-609	0	0	0	0	691	0	691	0.80
13	923	45	478	16.8	930	1594	72	934	-660	0	0	0	0	754	0	754	0.87
14	994	49	527	16.4	1013	1716	72	1006	-710	0	0	0	0	802	0	802	0.93
15	1065	67	594	17.6	1101	1839	100	1106	-733	0	14	14	-14	1179	0	1179	0.84
16	1136	74	668	17.2	1202	1961	111	1217	-744	0	29	43	-43	1271	0	1271	0.73
17	1207	76	744	17.5	1305	2084	111	1328	-756	0	29	72	-72	1332	0	1332	0.76
18	1278	87	831	14.1	1403	2206	117	1445	-761	0	19	91	-91	1226	0	1226	0.73
19	1349	84	915	15.7	1505	2329	116	1561	-768	0	27	118	-118	1322	0	1322	0.75
20	1420	87	1002	15.0	1607	2452	118	1679	-773	0	18	136	-136	1305	0	1305	0.78
21	1491	86	1088	14.4	1709	2574	116	1795	-779	0	19	155	-155	1239	0	1239	0.75
22	1562	78	1166	15.5	1809	2697	118	1913	-784	0	18	173	-173	1212	0	1212	0.73
23	1633	61	1227	15.6	1910	2819	99	2012	-807	0	7	180	-180	951	0	951	0.74
24	1704	40	1267	18.0	1974	2942	79	2091	-851	0	0	180	-180	721	0	721	0.76
25	1775	60	1327	13.5	2040	3065	91	2182	-883	0	0	180	-180	809	0	809	0.74
26	1846	18	1345	43.9	2117	3187	91	2273	-914	0	0	180	-180	790	0	790	0.72
27	1917	71	1416	14.8	2219	3310	92	2365	-945	0	3	183	-183	1051	0	1051	0.92
28	1988	69	1485	16.2	2324	3432	119	2484	-948	0	0	183	-183	1117	0	1117	0.78
29	2059	71	1556	15.8	2427	3555	122	2606	-949	0	1	184	-184	1119	0	1119	0.76
30	2130	70	1626	15.8	2543	3677	115	2721	-956	0	6	190	-190	1108	0	1108	0.76
31	2201	75	1701	15.7	2660	3800	133	2854	-946	0	73	263	1250	1179	0	1179	0.54

Figure 5. Report of computer program (for power plant)

4. CONCLUSIONS

Energy management does more than reduce costs and increase profitability; it can drive the whole business to improved performance through its effect on production, operations, maintenance and environmental issues. Monitoring implies closer measuring of energy use, which can include the whole site, particular areas or just a single item of company. Results of monitoring inform the energy manager and other relevant parties of problems and possible solutions to wayward energy use.

Reporting and communication with individuals, groups and the entire company is an essential part of the task. Computer program is necessary for processing of data and generating reports, quickly and easily.

REFERENCES

1. U.S.Department of Energy, *Establishing an Energy Management Program and Identifying Energy Savings Opportunities. A guidebook for small manufacturers*, december, 2000
2. A.Leca, et.all, *Principii de management energetic*, Editura Tehnica, Bucuresti, 2004
3. A.Hazi, Gh.Hazi, *Energy management in company*, Congress ECOS'98, Nancy, France, juillet 1998.