Western Balkans Investment Framework WBIF

ces CLEAN ENERGY SOLUTIONS

iC consulenten

Energetska revizija i projekat energetske efikasnosti

Mašinstvo

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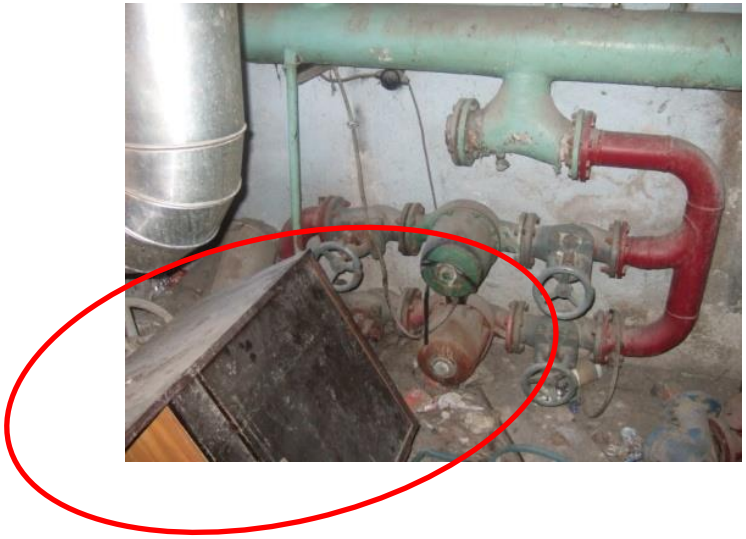
Sadržaj

- Sistemi za grejanje
- Ventilacioni sistemi
- Rashladni sistemi
- Sistemi za sanitarnu toplu vodu
- Vodovodni sistemi

Sistemi za grejanje

- Obično je decentralizovan sistem (van velikih gradova koji imaju DH)
- Postrojenja sa centralizovanim kotlarnicama
- Osnovno gorivo koje se koristi je DH/dizel (HFO)
- Često se dopunjava električnim grejalicama
- Uglavno je veoma loše stanje u kotlarnicama/podstanicama
- Diskutabilno održavanje (zamena samo po potrebi)
- Česte brze popravke i improvizacije
- Nedostaje izolacija na glavnim cevima i ostalim komponentama
- Problemi sa protivpožarnom zaštitom/bezbednost
- Kotlarnica se često koristi kao dodatni prostor za odlaganje stvari/opreme
- Cisterne sa gorivom cure
- Nepažljiva upotreba goriva

Sistemi za grejanje



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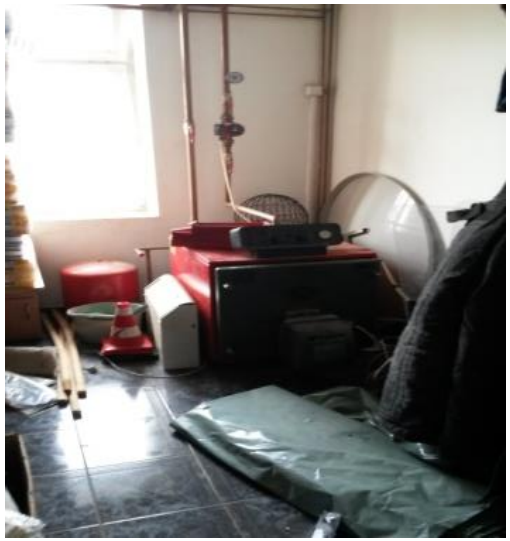

Sistemi za grejanje

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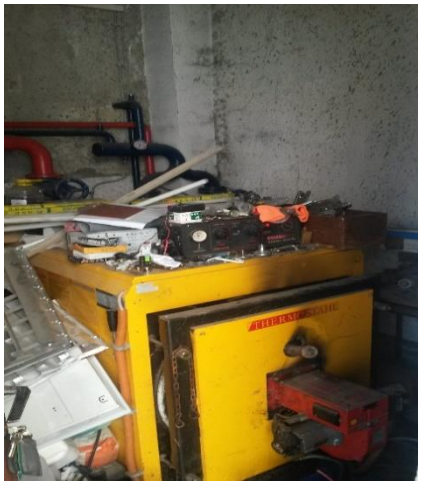


Sistemi za grejanje

- Nedostaje mašinska projektna dokumentacija, problemi sa:
  - Određivanjem da li su dimenzije za sistem na samom početku bile tačno premerene
  - Određivanjem parametara sistema
  - Dimenzioniranjem novih komponenti
  - Dostavljanjem dovoljne toplotne energije
- Nedostatkom informacija o održavanju, npr:
  - Koliko je puta sistem zaista bio ispražnjen i ponovo napunjen?
  - Da li je bio napunjen potrebnim medijumom?
- Nedostatkom termostatičkih ventila/nepravilnom ugradnjom
- Problemi za hidrauličkim balansom
- Regulacijom sistema za grejanje
- Improvizacijama na distributivnoj mreži za grejanje (nedostaju delovi cevi, radijatori su uklonjeni, itd..)
- Oštećeni radijatori (korozija, curenje, ventili,itd.)

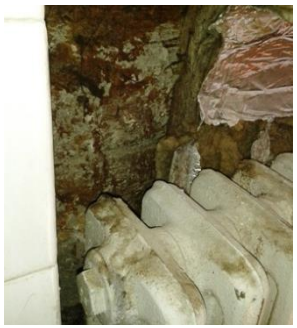
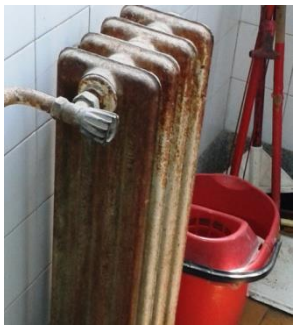
Sistemi za grejanje









Sistemi za grejanje






Sistemi za grejanje

- Nedostaju informacije/dokumentacija o sistemu - Šta raditi?
  - Delimična adaptacija?
  - Kompletna adaptacija?
- Kako doći do zaključka
  - Mere - sobna temperatura (veoma dobar pokazatelj)
  - Intervju sa tehničkim osobljem/korisnicima prostora/objekata
  - Posmatranjem
- Otkrića van datih zadataka?
  - Prijaviti ili ne?
  - Uticati na zadatak koji imate?
  - Posledice?
- Uključiti ih u investiciju?
  - Kao deo EE mera?
  - Zasebno?

Sistem za grejanje

- Na kraju…
  - Mora biti pravilno dimenzioniran (norme/standardi/ uredbe)
  - Mora da pokriva gubitak toplote nastao zbog karakteristika omotača
  - Mora da bude izbalansiran
  - Mora biti automatski regulisan
  - Mora biti efikasan
  - Mora da obezbedi regulisanje sobne temperature
  - Mora da obezbedi udobnost
  - Mora biti redovno održavan
  - Mora biti nadziran

Ventilacioni sistemi

- Apsolutno je neophodan u nisko-energetskim objektima
- Obezbeđuju svež vazduh/izvlače korišćeni
  - Sprečavaju pojavu buđi/Sredina sa visokom vlažnošću
  - Eliminišu visoke gubitke toplote izazvane otvaranjem prozora
  - Vraća toplotu
- Uglavnom zastupljena u bolnicama i laboratorijama
- Uglavno ne radi/ne radi dobro
  - Netačno izmerene cevi/pad pritiska u sistemu
  - Nedovoljna količina vazduha (izvlačenja/unos novog)
  - Pokvarene komponente
  - Nema povraćaja toplote
  - Bezbedni u slučaju požara?
- Nisu prisutni u mestima sa posebnim uslovima

Rashladni sistemi

- Uglavnom distributivni rashladni uređaju (klima jedinice sa split sistemom)
- Centralizovane jedinice prisutne u nekoliko slučajeva
- Koriste se za hlađenja, ali i kako dodatni aparati za grejanje
- U suštini, zamena novog split klima uređaja nije isplativa
- Uklanjanje ili ponovno postavljanje nakon renoviranja omotača?
- Ponovna ugradnja
  - Treba da se proveri u projektu
  - Napomena građevinskim kompanijama o pravilnom postavljanju nakon renoviranja kako bi se sprečila oštećena na omotaču.

Sistemi sanitarne tople vode

- Najčešće zastupljene distributivne naprave
- Centralizovane jedinice prisutne u nekoliko slučajeva (u velikim kompleksima)
- Prisutni solarni termalni sistemi
- Pokvareni kolektori
- Nepravilna ugradnja u krovnu konstrukciju
  - Problematično dimenzioniranje
  - Neredovna potražnja (npr. U studentskim domovima) - zaludno trošenje vode
- Stvarna potreba –smernice, standardi, itd.
- Potreba da se ima centralizovan sistem?
- Efikasnost sistema?
- Potreba za solarnim toplotnim sistemom?

Vodovodni sistemi

- Ne razmatraju se, ali
  - Mogu da prouzrokuju značajno povećanje operativnih troškova objekta
  - Potrošnja se može lako smanjiti – niski troškovi-veliki učinak
  - Slavine i dvostepeni toaletni rezervoari

Source: RC Mannesmann

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Ko šta radi? – nivo detalja

- **Energetski revizor**
- **Projektant**

Razmatrane EE & RE mere

- Mehaničke mere
  - Poboljšanje sistema grejanja
    - ugradnja TRVa
    - Zamena pumpi
    - Zamena, popravka i čišćenje postojećih distributivnih sistema za grejanje
  - Zamena goriva – gradskim grejanjem, biomasom, pumpama za grejanje
  - Priprema sanitarne tople vode – solarnim toplotnim sistemima

PRIMERI

In addition to this, Dormitory for men has installed solar panels with a total of 22 panels (1.2x2 m) and 4 water storage tanks of 1000 l each. The tanks are also connected to the electrical system for water preparation when solar panels are not supplying to full requirement, but currently they are turned off due to high energy expenses. SHW substation is located in the basement of the Dormitory and no major deficiencies were noted.

Sanitary hot water consumption is estimated to around 1314 m^3/a, meaning 77 MWh energy (calculated with 10°C average annual cold water temperature and 60°C desired SHW temperature).

Type	Description	Quantity
Solar panels	- D = 1.2x2.0 m	22
Hot water tank	- V = 1,000 l each	4
Expansion vessel	- V = 100 l each	2
Pumps	- Wilo, Ion 350/10	1

Table 12 – Installed equipment for Sanitary Hot water production and distribution

Figure 9 – SHW preparation

5.4. SPACE HEATING

Kosovo Academy for Public Safety campus has a centralized heating system with one heating plant serving all buildings within campus. Heating plant runs on diesel boilers. Entire heating system was refurbished during 2000-2002. The water is distributed through an underground pipeline system. Site visit revealed that the underground piping system was recently replaced (in 2014) (Dormitory men, Dormitory women, Administration, New Dormitory, and Range shooting). The old pipes were replaced with new pipes insulated with glass wool and laid into concrete trenches. The interview revealed that second phase of the project is expected to be finalized during 2015 when pipes that supply Sports Hall and School building will be replaced with new. This was already implemented in the second half of 2013 according to information that was received. Every building (besides Steve Benet building, Healthcare building and Building 14) has its own substation, where the hot water enters into the hot water header and then through the circulating pumps to upper floors.

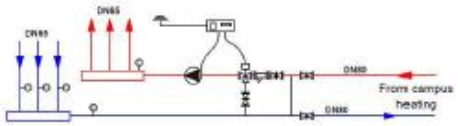

Figure 10 – Technological scheme of heating

5.4.1. Hot Water Preparation and Distribution

Substation is located in the basement covering an area of 12 m^2, which is sufficient for the current heating system and storages around it would allow placement of potential additional equipment.

Heating substation has been renovated in 2000 when new pumps, valves and piping were installed. Heating hot water is circulated with one Wilo pump without VFD. A three way valve is installed and working properly. The distribution pipes within the substation are well insulated with some minor deficiencies caused during some construction works. However, personnel didn't report any leakages in the system.

The installed equipment for heating preparation and distribution is listed below:

Type	Description	Quantity
Pumps	- Ion 340/2, type Wilo	1

Table 13 – Installed equipment for heating preparation and distribution

Figure 11 – Substation

PRIMERI

Figure 12 – Radiators installed in the building

Radiators

Basel ne

TYPE	Dimensions	No.	Capacity	Total
			W	kW
PCLP	600x1000	21	2,259	47.4
PCLP	600x1200	30	2,259	178.5
PCLP	600x1400	20	5,126	62.3
PCLP	600x1600	3	5,571	28.6
PCLP	600x1800	5	4,017	12.1
PCLP	500x1200	2	5,704	7.4
	TOTAL	154	45044	455

Table 14 – Specification of radiators

Internal temperature was measured in different places and the results show 19-22°C in most of the rooms. However there was a higher fluctuation in hallways where the measured temperature range was between 12-18°C.

The calculated system power for the baseline scenario is 422 kW (see Annex 2 for calculation details) which is above the total installed radiator capacity of 336 kW, and the comfort conditions are not met due to low capacity of radiators compared to heat losses.

After introducing EE measures, heat demand will drop significantly (200 kW), which means radiators capacity will be oversized. Therefore, it is recommended to install TRVs on each radiator.

5.5. AIR CONDITIONING

There is no central cooling system in the building.

5.6. SPACE VENTILATION

There is no central ventilation system installed.

5.7. ELECTRICAL SYSTEM

There are no data regarding the internal electricity distribution network. In general, the lighting is in a poor condition in terms of EE and there are no replacement parts

available. Fixtures are T8 linear fluorescent lamps operated by conventional control gear (COG) which has placed under reflecting grill for soft light distribution and incandescent 100 W lights. Lighting measurements accounted for 150-200lux in most of the rooms and approximately the same in hallways. It is recommended to replace the lighting system with a more efficient one which will also ensure higher lighting levels which will meet the national standards. A lighting simulation of one characteristic room is provided on the figure below.

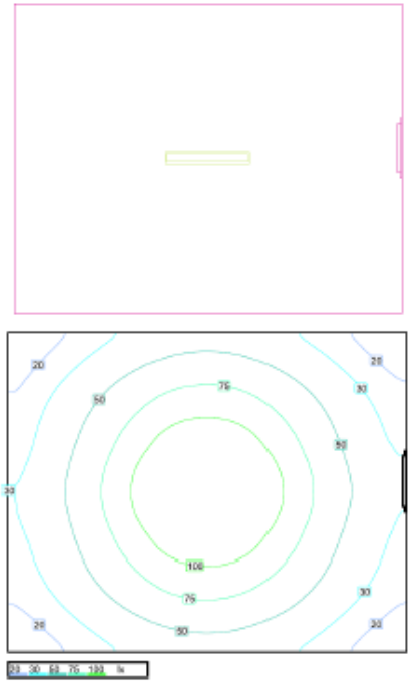

Figure 13 – Lighting simulation of one characteristic room

Since the baseline is calculated for the condition where all the lamps are in place and operating, the new lamps to be installed are only included in the Table of the Investment.

Profile

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Zlatko BAČELIĆ MEDIĆ

- Iskustvo u upravljanju timom i koordinaciji projektima energetske efikasnosti, obnovljivim energijama i primeni novih tehnologija
- Vođa tima za energetske revizije u javnom, privatnom i industrijskim sektoru
- Iskusto u obuci kadrova u zemljama u razvoju
- Izuzetno iskustvo u tehničkom oblikovanju i pripremi finansijskih analiza energetske efikasnosti i u projektima primene obnovljive energije
- Stručnost u optimizaciji i optimizovanju troškova u projektima energetske efikasnosti
- Stručnost u analizi i proceni energetskih sektora, uključujući energetsko planiranje
- Projektno iskustvo širom Jugoistočne Evrope

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to the future.
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Whenever!
With you.

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