MDT

F. Vranay, *Ing., PhD.,*
Technical University of Kosice, Kosice, Slovakia

IMPACTS OF HOT WATER REGULATION ON BUILDING OPERATION

Annotation: Rising energy prices force us to reconsider the supply of hot water (HW) to consumers and ensure the most accurate measurement of it while maintaining optimal performance. Because only the delivered amount of HW is measured directly at the sampling point (apartment, building) and not the temperature, measurement uncertainties arise. The main requirement is to ensure the same input temperature at each sampling point, and to minimize heat losses in the production and distribution of HW. During the HW circulation, the HW gradually cools down. The circulating flow is high at the supply points at the source and the water cooling is low. In remote distributions, due to resistance to longer pipe lengths, the circulation flow decreases and the HW cools down significantly. This phenomenon is the main cause of uneven HW delivery.

Keywords: hot water, insulation thickness, hydraulics, payback

Introduction. The multifunctional thermostatic control valve in the HW circuits ensures thermal and hydraulic balance by maintaining a constant temperature in the system, thereby limiting the flow in the circulation pipe to the minimum possible. When the temperature is raised above the set value, the thermal sensor expands and the valve cone approaches the valve seat to limit the circulation flow. When the temperature drops below the set, it opens to allow flow in the circulation pipe.

- Adjustment temperature range 25-60°C for the basic version of the valve. A thermostat is located in the valve cone. Recommended setting at 43°C.
- Possibility of retrofitting the *Legionella* bacteria disinfection module. The disinfection module forms a side branch in the valve when the temperature exceeds

65°C. This disinfection option is required in the EU standard.
- If the temperature in the HW is significantly lower than required - set on the thermostatic radiator valve (TRV), the valve thermostat is not able to fully regulate the HW system. Insufficient temperature may be in the event of a night-time offset, or if the power supply is insufficient to deliver the desired temperature. As a result, I also propose to preset the second level of control that this valve contains by default. If this control does not include the valve, I suggest that the valve with a TRV be added to the control valve with a preset option. This setting ensures an even distribution of flow in the risers even under these circumstances.

The effects of HW control and isolation on the operation of the system. In regulation, quantitative or qualitative regulation can be used.

Quantitative regulation:

- Modifying flow parameters at the entrance to the building
- Pre-adjust the TV's riser

The regulation is carried out under the condition that at all the sampling points the outlet temperature is practically the same. This condition is indirectly defined by the temperature gradient between the inlet temperature to the object (from the source) and the outlet temperature from the object (at the input to the source) = 5°C.

Qualitative regulation:

- Maintaining the inlet water temperature at the entrance to the building
- In the case of intensive withdrawals, the water in the circulation pipes is overheated, which increases the heat loss, with 1° increase in temperature representing about 2.5% increase in heat losses in the distribution pipes
- Elimination is possible by installing thermostats on risers or branches.

In the following I apply the information to the real object on which this adjustment was successfully implemented.

Defining input values for calculations:

A - Calculation performed with sustained circulation

B - Calculation performed with interrupted circulation: 18 h circulation and 6 h stop

The following graphs show the comparison of losses in modes A and B.

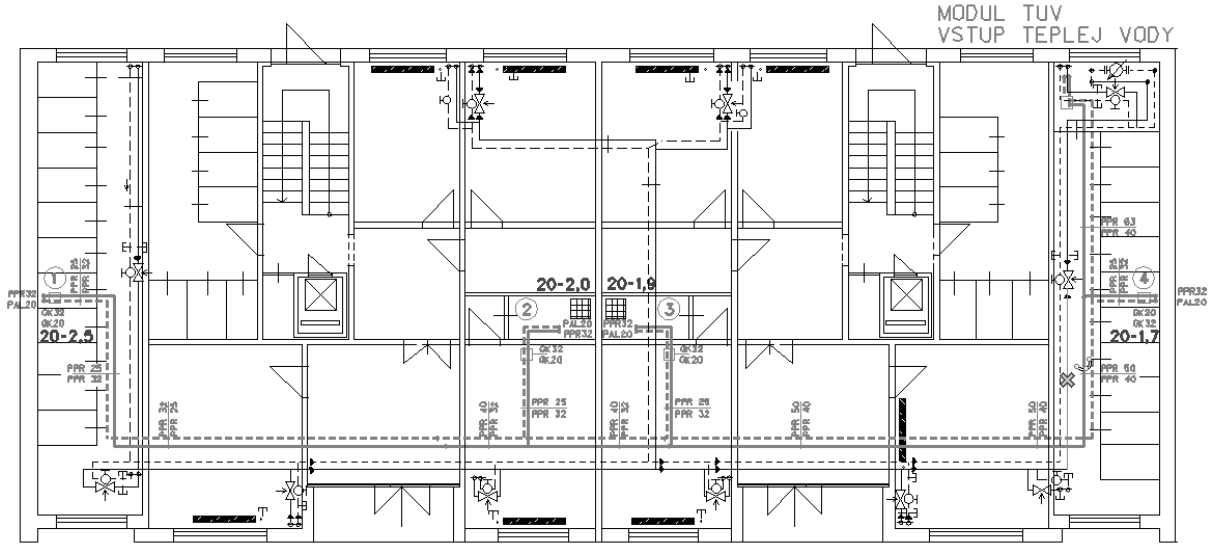
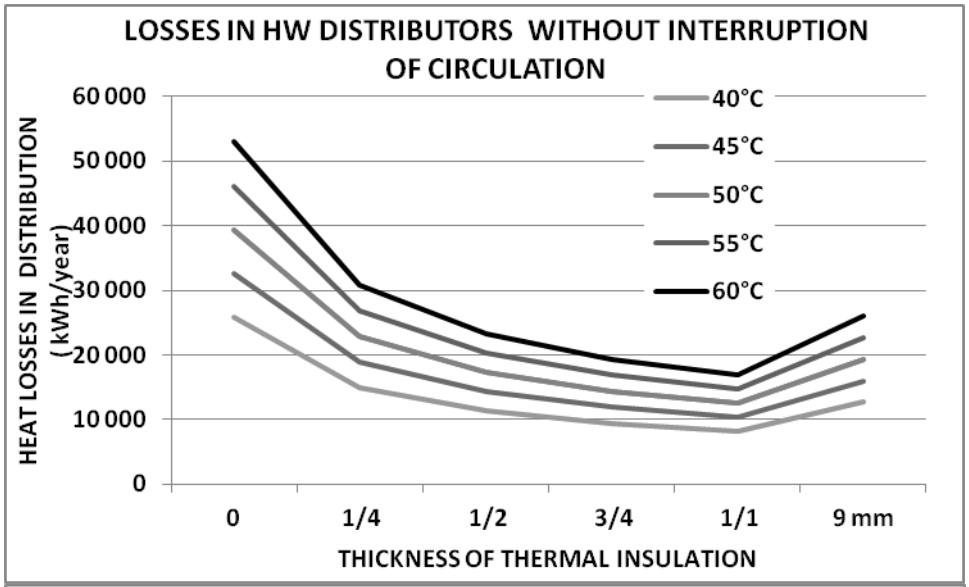


Figure 1: Demonstration of the project documentation of the object being solved.



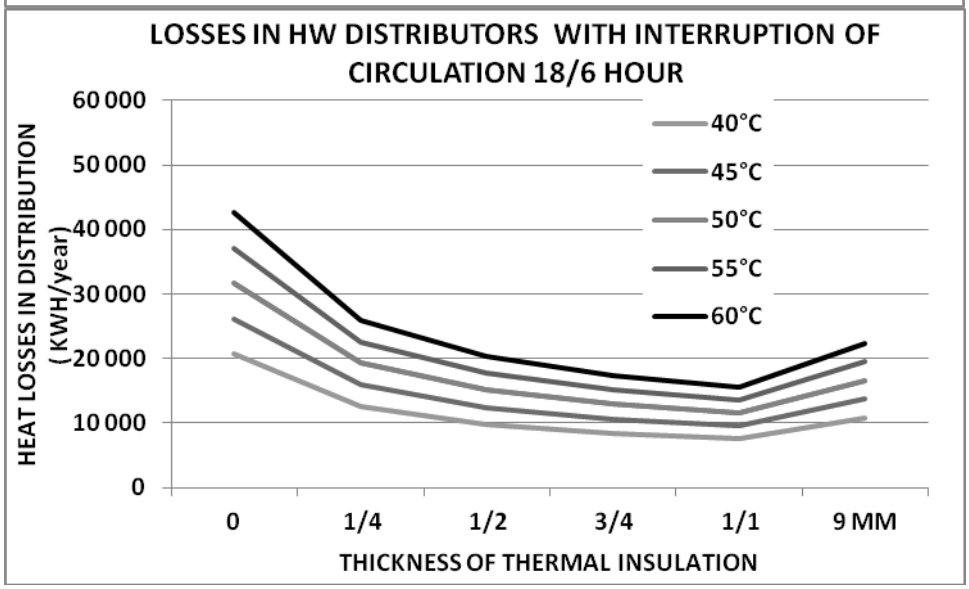


Figure 2: Heat losses in distribution systems for different modes.

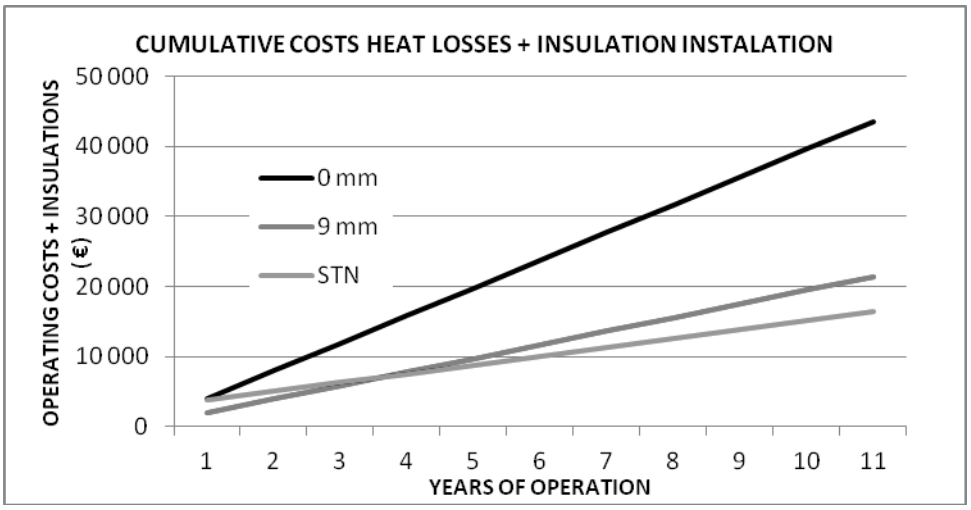


Figure 3: Return on investments in thermal insulation – case A.

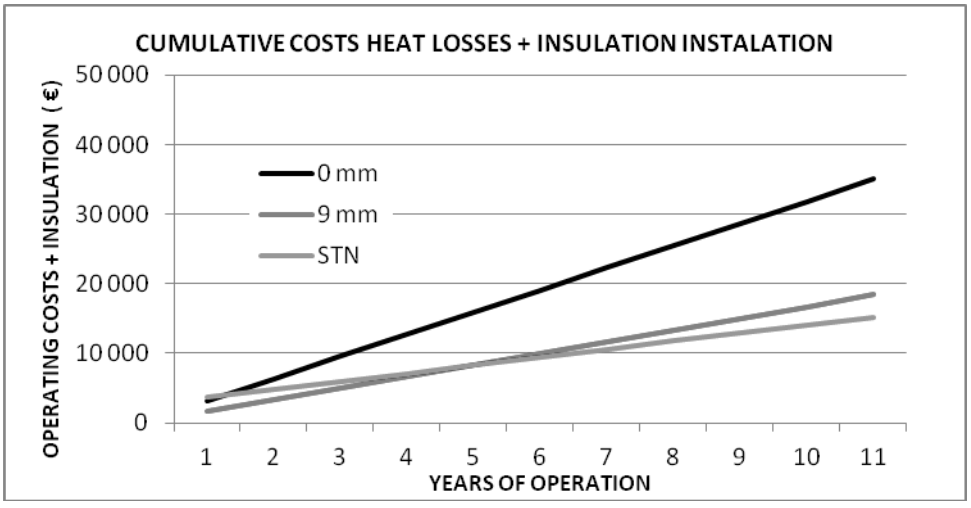


Figure 4: Return on investments in thermal insulation – case B.

Conclusion.

Comparison of heat losses in different modes shows the figure 2 for modes A and B. The final two graphs on figures 3 and 4 show the return on investments in thermal insulation for both modes.

It is clear that with continuous circulation the insulation return is about 3.5 years, when circulating interrupted this return rate is about 4.2 years.

Acknowledgements. This article was elaborated within the framework of the projects ITMS: 26220220182 and 26220220064.

The article was reviewed by two reviewers.

Анотація:

Зростання цін на енергоносії змушує нас переосмислювати постачання гарячої води (ТБ) споживачам і забезпечити найбільш точне вимірювання, зберігаючи при цьому оптимальну продуктивність. Оскільки тільки передана кількість телевізора вимірюється безпосередньо у точці відбору проб (квартира, споруда), а не в температурі, виникають невизначені вимірювання. Основна вимога - забезпечити однакову температуру вводу в кожній точці вибірки та мінімізувати втрати тепла при виробництві та розподілі телевізорів. Під час тиражу телевізора телевізор поступово охолоджується. Циркуляційний потік високий у точках подачі на джерелі, а водяне охолодження низьке. У віддалених розподілах, через стійкість до більшої довжини труб, циркуляційний потік зменшується, і телевізор значно охолоджується. Це явище є основною причиною нерівномірного телемовлення.

Аннотация:

Рост цен на энергоносители заставляет нас пересмотреть поставки горячей воды (ТВ) потребителям и обеспечить их наиболее точное измерение при сохранении оптимальной производительности. Так как только поставляемое количество ТВ измеряется непосредственно в точке отбора проб (квартира, здание), а не температура, возникают погрешности измерения. Основным требованием является обеспечение одинаковой температуры ввода в каждой точке отбора проб и минимизация потерь тепла при производстве и распределении ТВ. Во время телепередачи телевизор постепенно остывает. Циркуляционный поток высок в точках подачи в источнике, а водяное охлаждение низкое. В отдаленных распределительных устройствах из-за сопротивления более длинным длинам труб циркуляционный поток уменьшается, и телевизор значительно остывает. Это явление является основной причиной неравномерной доставки телевизора.

Ключевые слова: гаряча вода, товщина теплоізоляції, гідравліка, окупність.