сбросной тепловой энергии. При использовании сбросной теплоты повышается энергоэффективность технологического процесса.

Можно выделить три основных направления применения жидкопоршневого пузырькового насоса. Во-первых, использование в качестве циркуляционного насоса в системах отопления небольших домов (коттеджей). Во-вторых, применение в качестве циркуляционного насоса в системах охлаждения. При этом источником теплоты для работы насоса будет охлаждаемое устройство. И, в-третьих, использование вместо электрического насоса абсорбционной холодильной машины. В результате отпадает необходимость в электрической энергии и получается холодильная установка, работающая только за счет тепловой энергии.

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Научный руководитель: Е.В. Стариков, к.т.н., доцент кафедры атомные станции и возобновляемые источники энергии УралЭНИН УрФУ.

TEMPERATURE OF A SOLID UNDER THE INFLUENCE OF HEAT RADIATION OF HIGH INTENSITY

D.K. Baktybaeva, V.E.Yukhnov
Tomsk Polytechnic University, Institute of Power Engineering, Department of Theoretical and Industrial Heat Systems Engineering

The study of the nature of radiant heat is one of the young branches of physics. Broad scientific interest, to the study of the invisible heat rays, is associated with early changes in the metallurgical and chemical production of European industrialization.The use of steam engines and the associated interest in thermal phenomena contributed to the development of the doctrine of the heat.

For the first time the concept of thermal radiation is referred to Swedish chemist Carl C. Scheele in its Chemical treatise on air and fire (1777e.o.) on the basis of many observations. In 1779, in proceedings of Pyrometry, German mathematician and physicist Johann G. Lambert, have been described experiments, consistent with observations Scheele and for the first time experimentally proved that heat rays propagate rectilinearly, and their intensity decreases inversely to the square of the distance. In 1790, the experiments continued mark O. Pictet, the experiments which were of great importance to determine the nature of radiant heat and the further development of her theory.

It is now known that the thermal radiation is electromagnetic radiation emitted by the substance and emerging due to the energy of thermal motion of atoms and molecules, is one of the modes of transmission of heat energy, along with such species as the thermal conductivity and convection.

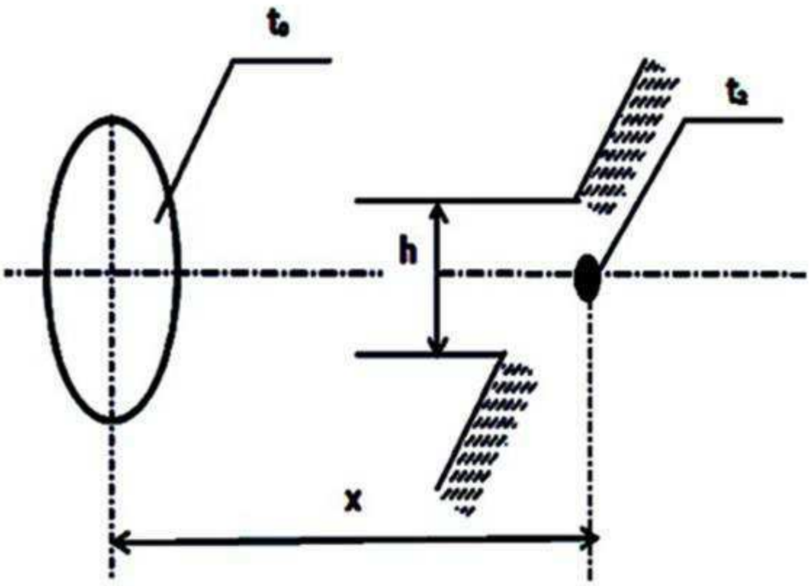
Recently, the importance of the study of thermal radiation connected with natural and techno genic processes, for example, fire risk assessment and the prevention of such emergencies [1, 2]. Open fire is a source of thermal radiation of high intensity. This flow of heat radiation significantly affects the rate of spread of fire. As a rule, in view of substantial economic costs, such studies are carried out on numerical models. Therefore, to obtain reliable experimental data in the study of heat sources, open flame of the surrounding objects is an important practical task.

The aim of the present work is an experimental study of the effect of distance from the source to the density of thermal radiation $130 \cdot 10^3$ W/m^2 on the temperature of the sample.

The research task is the measurement of the temperature of the sample at different distances from the source of thermal radiation, as well as the definition of the analytical dependence of the temperature of the sample at different distances from the source of thermal radiation.

A scheme of the experimental area setup on which the research was conducted in accordance with figure 1.The installation consists of a source of thermal radiation (T_0), sample with temperature sensor (T_2), two sliding screens, and meter distance from the source of thermal radiation to the sample with temperature sensor.

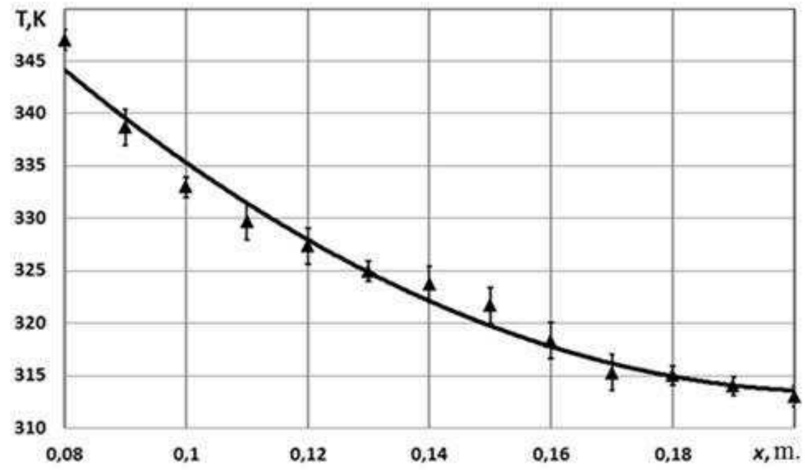
A source of thermal radiation was the flame of the burner, placed in the flame of a thermoelectric transducer for temperature measurement.
Distance x between the source of thermal radiation and the irradiated sample is changed from $8 \cdot 10^{-2}$ m to $20 \cdot 10^{-2}$ m. Measuring the steady-state temperature of the sample T_2 was conducted at an average temperature of the source of thermal radiation is equal to T_0 =1233,15K.



Scheme of the experimental setup: T_2 - is the temperature of the sample, x - is the distance from the source to the sensor ,h - is the distance between the screens, T_0 - is the temperature of the source

Fig. 1.

Part of the flow of thermal radiation incident on the sample was cut two screens with a gap width $h=0{,}5 \cdot 10^{-2}$ m. Each measurement was performed three times. The results of statistical data processing with regard to the detection and elimination of gross errors (promahov) [3, 4] received in accordance with figure 2.



The dependence of the sample temperature T_2 of the distance x when h = 0,5·10^{-2} m.

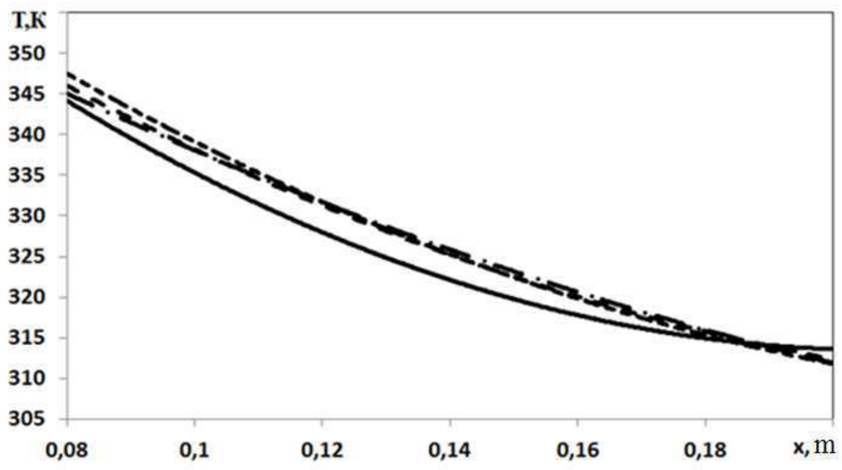
Fig.2.

In accordance with figure 2, the results showed that with increasing distance x between the source of thermal radiation and the sample, the temperature decreases.
Experimental data of the dependence of the sample temperature on the distance from the source of thermal radiation, in accordance with figure 2, the approximated power-law dependence

$$T_2(x) = ax^b, \text{ K},$$

where the coefficients a=2,7461; b=−0,648. The approximation error does not exceed 0,5 %.

To clarify the influence of the width of the gap between the screens on the temperature of the irradiated sample held four experience. Obtained different results, in accordance with figure 3, four approximations of the experimental data of the temperature of the irradiated sample with different width of the gap between the screens h from 0,5·10^{-2} to 8·10^{-2} m. It was found that by increasing the width of the gap between screens h from 2·10^{-2} to 8·10^{-2} m. leads to an increase in temperature of the sample is not more than 6 % compared with the temperature of the sample T_2 if the width of the gap between the screens h=0,5·10^{-2} m., which is comparable to the measurement error.



A generalized graph of sample temperature on the distance x when h·10^2=0,5, 2,4,8 m.

Fig. 3.

Conclusion. The study and experimental data on the dependence of the temperature of the irradiated sample distance x to the source of thermal radiation, in the range of from $8\cdot10^{-2}$ to $20\cdot10^{-2}$ m. when the temperature of the source of thermal radiation is equal to 1233,15 K.

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Supervisor: V.E. Yukhnov, k.t.s., assistant Professor Department of Theoretical and Industrial Heat Systems Engineering, Tomsk Polytechnic University.

СНИЖЕНИЕ ПОТЕРЬ ТЕПЛОВОЙ ЭНЕРГИИ В СИСТЕМАХ ТЕХНОЛОГИЧЕСКОГО ПАРОСНАБЖЕНИЯ

Д.В. Терёшина

Дальневосточный федеральный университет, инженерная школа, направление - теплоэнергетика и теплотехника

Одними из наиболее ярких примеров нерационального использования органического топлива на объектах промышленной теплоэнергетики являются потери тепловой энергии в системах технологического пароснабжения. В целом, данные потери могут составлять до 50% от общей вырабатываемой тепловой энергии теплоисточника.

Объектом анализа по повышнию энергетической эффективности систем технологического пароснабжения выбрана котельная № 3 филиала «Приморский» ОАО «Оборонэнерго». Назначение – выработка пара на нужды производственных объектов и кораблей ВМФ. На основании данных [1] в таблице 1 представлена информация о количестве потребляемой тепловой энергии с разбивкой по месяцам

Таблица 1. Потребление тепловой энергии

Потребитель	Количество	Январь	Февраль	Март	Апрель	Май	Октябрь	Ноябрь	Декабрь	Год
БПК	2	332,41	313,62	267,14	179,13	48,79	74,85	210,09	276,34	1702,39
ПЖК	1	58,66	55,35	47,14	31,61	8,61	13,21	37,07	48,77	300,41
Эсминец	2	351,96	332,06	282,86	189,67	51,66	79,26	222,45	292,60	1802,51
Варяг	1	244,42	230,60	196,44	131,71	35,87	55,04	154,49	203,19	1251,75
Здан (штаб, КПП)	2	58,66	55,35	47,14	31,61	8,61	13,21	37,07	48,77	300,41
Всего		1046,11	986,97	840,71	563,74	153,54	235,57	661,17	869,67	5357,48

Годовая выработка тепловой энергии – 5357.48 Гкал.

Для обеспечения необходимой потребности в тепловой энергии на рассматриваемой котельной установлено следующее оборудование: