Dear Sir,

Please receive the revised paper (for archival publication) titled “Efficiency of solar ray use by parabolic, cylindrical solar concentrator for heat production” by Milorad Bojić, Nenad Marjanović, Ivan Miletić to be presented at 5th DUBROVNIK CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY WATER AND ENVIRONMENT SYSTEMS. The paper keywords are the following: solar energy, concentrator, heat, CATIA, software.

Kragujevac, 28. July 2009.

Best regards

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Response to Reviewer's comments:

Comment (a) The explanation of Î´, the aperture angle of the concentrator, as given in Fig. 2 is misleading, since any other parallel ray would give different intersection with the O - F line, and thus, different Î´ value. In my opinion, the real width of the aperture area is the linear section between points T and F, and the real aperture angle can be defined as the angle between lines OF and TF. (Though this angle is much larger, in this case also all rays of the beam radiation that are not absorbed by the reflecting surface have the chance to collide with or to be reflected to the adsorber.)
Response: I agree with the reviewer that the angle (delta) is misleading compared to the location of the light ray, however (delta) does not have to do anything with the light ray. (Delta) is simply angle between the tangent line on the parabola at the parabola rim T and line TF representing the aperture width of the concentrator.
Comment: (b) Fig. 7 also is not correct: Here "Eficasnost" certainly means Efficiency. Since efficiency is, per definition (Cf., Equ. (2), the sum of curves 0, 1, 2, 3 and 3+, in that hypothetical case when the reflectivity is near 100 %, the efficiency also should be also near 100 %. Even in that extreme case, when the reflectivity is zero % (all rays colliding the reflector are immediately absorbed) up to about 40 degrees altitude angle, curve 0 (that refers to zero reflection)itself is much higher than the efficiency line given in Fig. 7.
Response: Fig.7 was not correct as “Efikasnost” should not be written there at all. “efikasnost” is erased from this figure.
Therefore, I propose to redraw Figs. 2 and 7, and rewrite their interpretation.
Further revisions: Figures 1-7 are revised for better comprehension and some other explanation added.

Editor's comments:

Please also include a modeling and numerical error analysis.
Response. The analysis is included in separate part of the paper devoted to the error analysis. The errors are presented by two separate figures.

Efficiency of solar ray use by parabolic, cylindrical solar concentrator for heat production

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ABSTRACT

Long stationary parabolic, cylindrical solar concentrator for heat production consists of the aluminium absorber (with water pipes inside) and parabolic, cylindrical reflector (with metal surface) and has geometrical concentration ratio up to 4. it is of CP-180A type. Direct solar radiation approaches the concentrator aperture at different angles and pathways. For different aperture angles and different kinds and types of metal surfaces of the reflector, it would be investigated how efficiently the direct solar radiation reaches absorber to be converted to heat by using software CATIA.

INTRODUCTION

Temperature increase has been constantly recorded on the global level. The increase is due to green-house effect because of CO2 emission from different sources in atmosphere. Usually this emission is blamed to combustion of fossil fuels mainly for heating and electricity production. A response to such a situation of world community may be increased use of solar energy for heating, cooling, and electricity production. Solar energy is source of all life on the earth and it is in abundance but dispersed. Here, we propose use of stationary, asymmetric solar concentrator for conversion of solar energy for heat production.

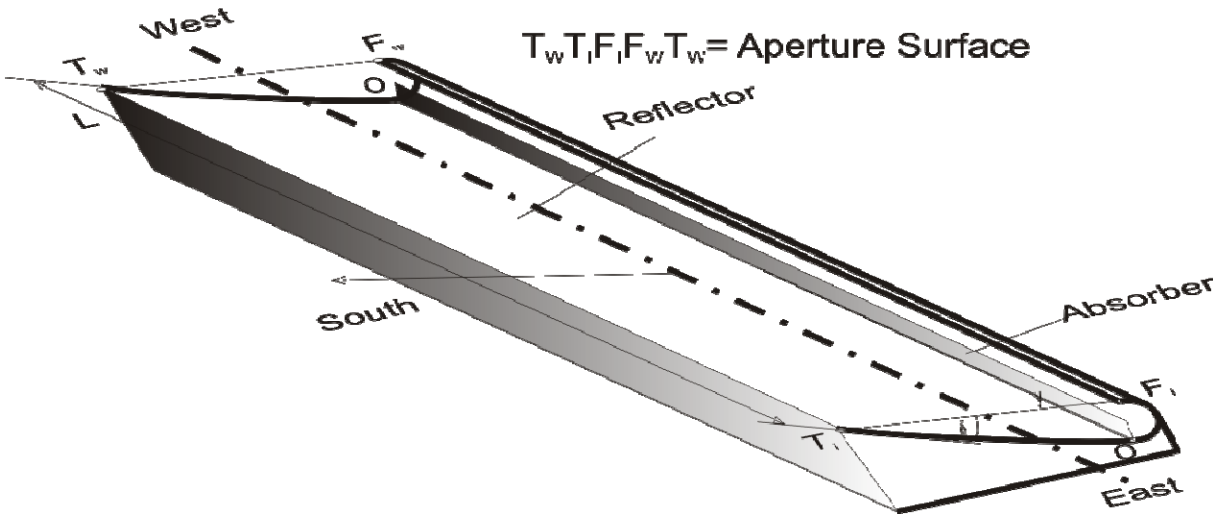

Fig. 1. The concentrator. The concentrator is positioned to have the reflector trough in the direction east-west, while the reflector surface faces south (valid for the north hemisphere)

The subject of this research (in Centre of heating, air conditioning and solar energy of Mechanical Engineering Faculty at Kragujevac in Kragujevac University in Serbia) is design optimization of stationary asymmetric solar concentrator (type CP-180A) for heat production with geometric concentration of up to 4 (see Fig.1 and 2).