

The Solar Chimney – a recent paper by Koonsrisuk and Chitsomboon

Effects of flow area changes on the potential of solar chimney power plants

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In the Abstract the authors say that, “The proper combination between the sloping collector roof and the divergent-top chimney can produce the power as much as hundreds times that of the conventional solar chimney power plant.”

The paper uses CFD technology to investigate the changes in flow properties caused by the variations of flow area in a theoretical model. The reference solar chimney has a collector of diameter 200 m and a height of 2 m and it has a 100 m high chimney with a diameter of 8 m. The most outstanding divergent-top chimney has a ratio of the chimney outlet area to the chimney inlet area of 16.

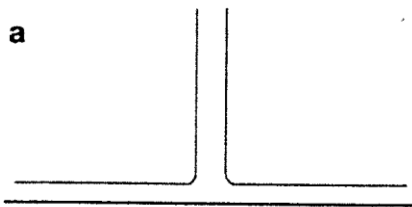


Fig. 2a reference plant

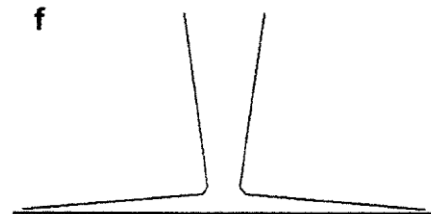


Fig. 2f a sloping collector with a divergent-top chimney

In their Conclusion, the authors say that, “The system with the sloping collector and divergent-top chimney of chimney ratio of 16 can produce power as much as 400 times that of the reference case.”

The present author says, “I find the above results quite startling. Indeed in Table 2 of the paper, configuration 2f is shown as having an efficiency of up to 64% for conversion of solar energy absorbed by the collector into flow kinetic energy at the base of the chimney. I have read 100-300 papers on the solar chimney/natural convection over the last decade but I have never seen anything remotely like 64% efficiency for conversion of solar into mechanical energy. These results are startling and potentially extremely important.”

The findings are very significant for the proposals on this website too as they also involve a nozzle/venturi to multiply air flow velocity. An earlier paper (May 2012) titled

“The solar chimney – would a venturi multiply efficiency?” involves the same principles as Fig. 2f above.