Drainback solar thermal systems: A review

Although solar drainback systems have been used for a long time, they are still generating questions regarding smooth functioning. This paper summarises publications on drainback systems and compiles the current knowledge, experiences, and ideas on the technology. The collective research exhibits a lack of scientific publications dedicated to the drainback technology, however a significant number of patents have been published, detailing innovative technical solutions towards improvements and reliability. Based on the evaluation of drainback hydraulics, a detailed classification of this technology has been developed, with a brief description of each hydraulic typology. The operating modes have been split into three stages: filling, operation, and draining, which have been studied separately. A difference in the minimal filling velocities for a siphon development in the solar loop has been discovered in various reports. Specific features of the operation mode have been described. For the draining, existing mechanisms to initiate the emptying process have been identified and categorised. Finally, state-of-the-art hydraulic components for drainback systems have been established, with emphasis on their requirements. Based on those findings, the authors suggest potential future research paths in order to fill the knowledge gap and disseminate the drainback technology.

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