ISSN: 2168-9873
Journal of Applied Mechanical Engineering
OPEN ACCESS Freely available online
Opinion Article

Applications of Thermodynamics and Equilibrium in Mechatronics

Sherly Williams*

Department of Mechanical Engineering, University of Toronto, Toronto, Canada

DESCRIPTION

Any modification to the system's thermodynamic state is referred to as a thermodynamic process. A transition from an initial to a final state of thermodynamic equilibrium characterises a change in a system. The actual course of the process is not the main focus in classical thermodynamics and is frequently disregarded. Until a thermodynamic operation that starts a thermodynamic process interrupts a state of thermodynamic equilibrium, it remains unchanged [1]. Each equilibrium state is fully specified by a suitable set of thermodynamic state variables that depend only on the system's current state and not on the path taken by the processes that produce the state.

In general, a system may go through physical states that cannot be described as thermodynamic states during the course of a thermodynamic process because they are out of internal thermodynamic equilibrium. However, non-equilibrium thermodynamics takes into account processes where the system's states are relatively close to thermodynamic equilibrium and aims to describe the path's continuous progression at specific rates of progress [2]. A process may be imagined to proceed practically infinitely slowly or smoothly enough to allow it to be described by a continuous path of equilibrium thermodynamic states, in which case it is referred to as a "quasi-static" process. This is a useful theoretical limit case, but it is not physically feasible. Instead of describing a hypothetical physical process, this is a theoretical exercise in differential geometry. In this idealised scenario, the calculation might be accurate.

Considered closely, friction is a thermodynamic process that is actually possible or occurring. In contrast, quasi-static processes that are theoretically idealized, imagined, or limited but not actually feasible may take place with a theoretical slowness that prevents friction. Additionally, it contrasts with idealised frictionless processes in the environment, which are sometimes referred to as "purely mechanical systems"; this contrast is nearly identical to the definition of a thermodynamic process [3]. A cyclic process starts and ends in a specific state and moves the system through a series of stages. The main focus is not on the descriptions of the system's staged states. The amounts of matter and energy inputs and outputs to the cycle are critical. When thermodynamics was first being studied and the idea of the thermodynamic state variable was being developed, cyclical processes were crucial conceptual tools.

A flow process is a steady state of flows into and out of a vessel with specific wall properties that is defined by flows through a system. The condition of the vessel's interior is not the main issue [4]. The quantities of primary concern describe the states of the materials flowing into and out of the vessel, as well as the exchanges of heat, work, kinetic, and potential energies. Engineering is interested in flow processes.

Cyclic process

A cyclic process, which is defined by a cycle of transfers into and out of a system, is described by the quantities transferred during the cycle's various stages. It's possible that the descriptions of the system's staged states will hold little to no interest. A cycle is a collection of a few related thermodynamic processes that frequently and endlessly bring a system back to its initial state. Since it is the transfers that are important in this, the staged states themselves need not necessarily be described [5]. The assumption is made that the states are persistently unchanged if the cycle can be repeated endlessly frequently.

The precise nature of the recurrent states may be of greater interest than the state of the system during the various staged processes. The cycle is represented by a path through a continuous progression of equilibrium states, however, if the various staged processes are idealised and quasi-static.

Flow process

A flow process is a steady state of flow into and out of a vessel with specific wall properties that is defined by flows through a system. The condition of the vessel's interior is not the main issue. The quantities of primary concern describe the states of the materials flowing into and out of the vessel, as well as the exchanges of heat, work, kinetic, and potential energies. The internal states, as well as their kinetic and potential energies as

Correspondence to: Sherly Williams, Department of Mechanical Engineering, University of Toronto, Toronto, Canada, E-mail: sherly.williams@gmail.com

Received: 03-Oct-2022, Manuscript No. JAME-22-18920; **Editor assigned:** 05-Oct-2022, Pre QC No. JAME-22-18920 (PQ); **Reviewed:** 20-Oct-2022, QC No JAME-22-18920; **Revised:** 25-Oct-2022, Manuscript No. JAME-22-18920 (R); **Published:** 04-Nov-2022, DOI: 10.35248/2168-9873.22.11.444.

Citation: Williams S (2022) Applications of Thermodynamics and Equilibrium in Mechatronics. J Appl Mech Eng. 11:444.

whole bodies, are what make up the states of the inflow and outflow materials. The quantities that characterise the internal states of the input and output materials are frequently estimated under the presumption that they are bodies in their own internal thermodynamic equilibrium states. Rapid reactions are allowed, so the thermodynamic treatment may be approximate rather than precise.

REFERENCES

1. Hall PJ, Bain EJ. Energy-storage technologies and electricity generation. Energy policy. 2008;36(12):4352-4355.
2. Battaglini A, Lilliestam J, Haas A, Patt A. Development of SuperSmart Grids for a more efficient utilisation of electricity from renewable sources. J Clean Prod. 2009;17(10):911-918.
3. Liu W, Li Q, Liang F, Liu L, Xu G, Yang Y. Performance analysis of a coal-fired external combustion compressed air energy storage system. Entropy. 2014;16(11):5935-5953.
4. Svec OJ, Goodrich LE, Palmer JH. Heat transfer characteristics of in-ground heat exchangers. Int J Energy Res. 1983;7(3):265-278.
5. Peng H, Yang Y, Li R, Ling X. Thermodynamic analysis of an improved adiabatic compressed air energy storage system. Appl Energy. 2016;183(1):1361-1373.