

Erratum to “Confirmation of the First Law of Thermodynamics in Theory and Extended Bernoulli Equation” [Journal of Applied Mathematics and Physics, 11 (2023) 409-420]

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Abstract

The original online version of this article (Jin, C.S. (2023) Confirmation of the First Law of Thermodynamics in Theory and Extended Bernoulli Equation. *Journal of Applied Mathematics and Physics*, 11, 409-420. <https://doi.org/10.4236/jamp.2023.112023>) unfortunately has some errors. The mistakes easily caused some misunderstandings. Therefore, those need some further amendments and clarifications.

Keywords

Erratum

2. Relations of Heat, Work, and Internal Energy Change

2.2. Confirmation the First Law of Thermodynamics in Theory

In any spontaneous or realistic process, we always have [5] [18]

$$dU = C_v dT . \quad (2a)$$

For a matter in the same phase state, the internal energy change has to be equal to zero in any isothermal process. The Equation (2a) can be derived from the Clausius inequality. The real gases **that obey** the Equation (2a) had been proven [5]. The ideal gas, real gases, liquids, and solids all obey the Equation (2a) too. **According to the Equation (2a), in the isothermal process we have $dU = C_v dT = 0$. So that, U has to be a constant (because the differential of constant is equal to zero in mathematics). Where, $U = U_0 + \int_i^f C_v dT$. The U_0 values for identical matter in the solid, liquid, and gas status are different at the same**

temperature. U_0 hasn't any relationship with C_V .

If a matter appears phase transition in the isothermal process, the following equation will be given by

$$\Delta U = \int_f C_V dT - \int_i C_V dT = C(f) - C(i), \quad (2b)$$

where, i and f express the initial state and final state of a matter in the phase transition, respectively. $C(i)$ and $C(f)$ are all constants.

When the matters occur the variety at the chemical reactions or nuclear reactions in the isothermal process, we can obtain the Equation (2b) too, but i and f express the reactants and products respectively. $C(i)$ and $C(f)$ are all constants too. Hence, ΔU has to be equal to constant or zero in any isothermal process. Then, in the isothermal process, the following equation can be given by

$$C(f) - C(i) = \Delta H - p\Delta V. \quad (2c)$$

4. Results and Discussion

4.2. Force Diagram of Aircraft

In the extended or modified Bernoulli equations, ΔE_{kin} and $\Delta E'_{kin}$ are all equal to $\int_i^f mv dv$ or $\sum_i^f mv dv$, $\int_i^f V dp = \sum_i^f V dp$, $\int_i^f Sh dp = \sum_i^f Sh dp$ for the constant volume process, $\int_i^f mg dH_e = \sum_i^f mg dH_e$, $\int_i^f mg dH_f = \sum_i^f mg dH_f$, and $\int_i^f mg dh = \sum_i^f mg dh \approx \int_i^f G_0 \frac{m \cdot m_0}{(r_0 + h)^2} dh = \sum_i^f G_0 \frac{m \cdot m_0}{(r_0 + h)^2} dh$, where, v expresses velocity, m_0 is the mass of earth, r_0 is the radius of earth, G_0 is the gravitational constant, g is the acceleration of gravity, h is the elevation. Σ is summation symbol. Attentively, g isn't constant.

According to Boltzmann density distribution equation for the atmosphere, we can obtain an approximate equation as $h = -\frac{kT}{Mg} \ln \frac{p}{p_0}$, where, M is mass of air molecule, k is Boltzmann constant, p is equal to p_0 when $h = 0$. Attentively, \ln expresses natural logarithm symbol.

The right Boltzmann density distribution equation for the atmosphere should be $p = p_0 e^{\frac{G_0 M \cdot m_0 h}{kT(r_0 + h)r_0}}$.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.