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SDI FINAL EVALUATION FORM 1.1

PART 1:

Journal Name:	**Journal of Energy Research and Reviews**
Manuscript Number:	**2019/JENRR/48514**
Title of the Manuscript:	**Efficient thermal cycle undergoing adiabatic contraction based work by releasing heat**
Type of Article:	

PART 2:

FINAL EVALUATOR'S comments on revised paper (if any)	Authors' response to final evaluator's comments
The original text of the article contained the statement that the described experiments violate the law of conservation of energy. The equations of the corrected paper in a few days show that the laws of physics are fulfilled. It follows that the theoretical part of the work is done without understanding the processes occurring in the experimental part of the work.	Thanks for the valuable comments; the discussion is always enriching. The proposed cycle described in the article with reference to Eqs. (14)-(16) for the T-s and p-V diagram of the thermal cycle depicted in Fig. 4 for a chamber of the reciprocating double acting cylinder is summarized as: Leg 1-2: Corresponds to a closed isochoric heating process. It as isochoric heat adding q_i process, where the amount of heat added from an external heat source at constant volume is $q_i = q_{12} = u_2 - u_1 = Cv \cdot (T_2 - T_1)$ derived from (14) Leg 2-3: Corresponds to a closed adiabatic process. Thus, because there is no heat transfer from an external source, the change in internal energy is completely converted into mechanical work according to the general expression $w_{o(\exp)} = w_{23} = \frac{p_2 \cdot v_2 - p_3 \cdot v_3}{\gamma - 1} = Cv \cdot (T_2 - T_3)$ derived from (15) Leg 3-4: Corresponds to a closed isochoric cooling process. It as isochoric heat extraction q_o process, where the amount of heat extracted from the thermal cycle at constant volume is $q_o = q_{34} = u_3 - u_4 = Cv \cdot (T_3 - T_4)$ derived from (18) Leg 4-1: Corresponds to a closed adiabatic process. Consequently, because there is no heat transfer between the process and its surroundings, the change in internal energy is fully converted into mechanical work according to the general expression $w_{o(cont)} = w_{14} = \frac{p_4 \cdot v_4 - p_1 \cdot v_1}{\gamma - 1} = Cv \cdot (T_1 - T_4)$ derived from (16) **Discussion of the facts:** In conventional thermal cycles (based on adding and rejecting heat to the environment or a heat sink) the first law indicates us that the net work w_n of the cycle is $w_n = q_i - q_o$ However for the proposed thermal cycle (based on adding heat and extracting heat from the cycle to the environment or heat sink) the net work w_n of the cycle according to expressions (14-(16) is:

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$q_i - q_o = Cv \cdot (T_2 - T_1) - Cv \cdot (T_3 - T_4) = Cv(-T_1 + T_2 - T_3 + T_4)$ (rev 2.1)
Because of $q_i = q_{12} = u_2 - u_1 = Cv \cdot (T_2 - T_1)$, and $q_o = q_{34} = u_3 - u_4 = Cv \cdot (T_3 - T_4)$
While
$w_n = w_{o(\exp)} + w_{o(comt)} = Cv \cdot (T_2 - T_3) + Cv \cdot (T_1 - T_4) = Cv(T_1 + T_2 - T_3 - T_4)$ (rev 2.2)
Because of $w_{o(\exp)} = w_{23} = \frac{p_2 \cdot v_2 - p_{3.} \cdot v_3}{\gamma - 1} = Cv \cdot (T_2 - T_3)$, and $w_{o(cont)} = w_{14} = \frac{p_4 \cdot v_4 - p_{1.} \cdot v_1}{\gamma - 1} = Cv \cdot (T_1 - T_4)$
According to the first law for conventional thermal cycles follows that the first law indicates us that
$w_n = q_i - q_o$ implies that Eq. (rev 2-1) = Eq. (rev 2.2), so that
$q_i - q_o = Cv(-T_1 + T_2 - T_3 + T_4) = w_n = w_{o(\exp)} + w_{o(comt)} = Cv(T_1 + T_2 - T_3 - T_4)$
That is $(-T_1 + T_2 - T_3 + T_4) = (T_1 + T_2 - T_3 - T_4)$ (rev.2.3)
Since clearly Eq. (rev 2.3) is an inequality, Eq. (rev 2.3) is a flagrant violation of the first law when it is applied to the heat work balance of conventional thermal cycle. That is, for a quadrilateral thermal cycle that performs work by extracting heat on the basis of contraction based compression work follows that for thermal cycles undergoing contraction based compression work,
$w_n \neq q_i - q_o$.
This result is shown also in the Fig. 7 of the paper.
Based on the fact that the energy balance described by (rev 2.3) is a clear inequality, it means that it does not comply with the first principle.
However, despite the contradictions with the definition of the first principle applied to the proposed thermal cycle, it has been shown that the equations (rev 2.1) and (rev 2.2) are correct and in individually, they fulfil the first principle.
A general conclusion can be expressed as (irrefutable since it is validated by means of experimental proof of concept):
The expression $w_n = q_i - q_o$ comply with the first principle for conventional thermal cycles (operating by adding and rejecting heat), but it is not a general expression of conservation of energy for all possible thermal cycles.
I expect that any reader expert in the thermodynamics of closed processes could agree and reach this conclusion by interpreting the analysis presented in the paper.
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<td>The author has created a complex mechanism to increase the efficiency of heat engines. According to the measurements obtained, this mechanism can be used to obtain additional useful work. It means. that such installations can be widely used in energy production.</td>
<td>As described in the paper, the main objective is to demonstrate the possibility of implementation of a thermal engine that exhibits the ability to perform net useful mechanical work by contraction based compression (never described before) by operating under a thermal cycle characterised by closed processes involving isochoric heat addition, isochoric heat extraction, and doing work by adiabatic expansion and adiabatic contraction based compression.</td>
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However, the author must consistently and in detail prove the effectiveness of his mechanism. Description of the installation and its operation is described in the article schematically. The analysis is carried out on the scheme of one cycle of the installation. In fact, the operation of the installation contains several cycles that interact with each other. The calculation of the energy balance requires a thorough analysis of all the processes of the proposed installation. According to the article, the installation contains working cylinders, valves, heat exchangers, fans, generators. The interaction of all these mechanisms should be described in detail in the article. This is the only way to prove the effectiveness of the process described in the article. I wish the author to do this work successfully. In this case, its mechanism can be widely used in industry.	Furthermore, the proposed thermal cycle ca operate by means of a typical reciprocating double effect cylinder. To verify the concept of doing useful work by contraction based compression a proof of concept has been carried out. The concept has been validated successfully through experimental evidence (**low-cost test rig**), so that a paper describing the fundamental thermodynamic model will be sufficient to comprehend the proposed new concept **(doing work by contraction based compression using a new thermal cycle)**. In order to consistently and in detail prove the effectiveness of this mechanism, a high-cost prototype will be required as well as a description of the experiments that clearly its complete description will require an entire book. This reasonable requirement could not be achieved by means of a paper, and consequently they are out of the objectives of a simple paper that presents new contribution with innovative concepts that are useful for the development and advancement of the human kind as is.