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Palchoudhury Gas Theory and Role of Heat Engine

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ABSTRACT

Palchoudhury gas theory is capable of describing the function of a heat engine. We can measure the capacity of a heat engine in two ways. 1) The product of pressure and inner surface area 2) The outcome of the gas constant, number of moles, the outer surface area of gas and temperature.

Keywords: Heat Engine, Thermodynamics

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INTRODUCTION

There is a deep relation among the quantity of a gas, temperature, pressure, inner surface area of the gas container, the outer surface area of gas molecules and outcome of the force in the thermodynamic conversion. Thermodynamic conversion goes through a system that is called a heat engine. The heat engine is two kinds. 1) Internal combustion engine, example petrol engine, diesel engine. 2) The external combustion engine, example steam engine. Thermodynamic appears, a role of internal or external combustion of gases as well as expansion and compression of the inner surface area of a gas chamber of a heat engine. We already find in four articles of this author published in the International Journal of Fundamental Physical Science, Palchoudhury Gas theory is independently capable of describing all kind of behaviour of gases. Palchoudhury Gas equation is (Palchoudhury, 2017a)

$$PS = CnAT \qquad (1)$$

Here P is pressure, S inner surface area, C is constant of proportionality, n is number of moles, A covered outer surface area of tiny particles, T as temperature (Palchoudhury, 2017b) .

$$PS = F \qquad (2)$$

F, here is defined force (Palchoudhury, 2016). By comparing Eq (1) and (2), we have $PS = F = CnAT$ and therefore PS −

CnAT = 0. We can measure the capacity of a heat engine in two ways. Hence, the heat engine defined in two external and internal combustion. In a heat engine, a piston moves back and forth more and less in a closed gas chamber and leaves some force in every cycle during expansion and compression.

A piston moves back-and-forth (compression and enlargement) in a gas chamber more and less adiabatically depending on speedy repetition of the cycle of a piston. After expansion, the pressure in a gas chamber becomes lower, and the inner surface area becomes larger. A gas chamber may be in various size and shape like rectangular, square, cylinder etc.

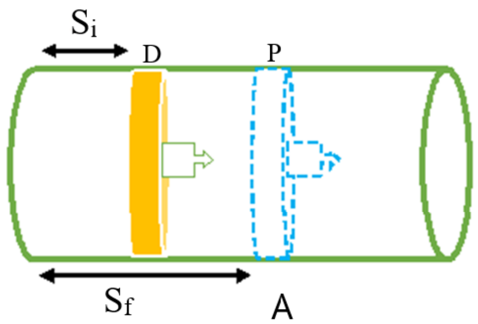

Fig 1

In the Fig 1, the point A is a gas cylinder and D is a piston that can move back-and-forth through the cylinder. The initial and final positions of the piston in the cylinder is S_i and S_f respectively. Here S_i is the initial inner surface area before the expansion of gases and S_f is the final inner surface area after the expansion of gases so that $S_i > S_f$.

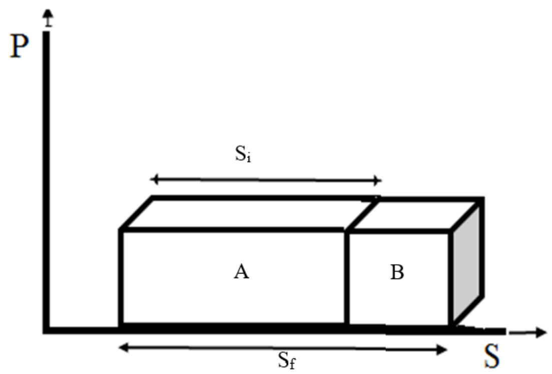

Fig 2

In Fig 2, A and B are rectangular and extended gas chamber respectively. The axis P and S also represents pressure and inner surface area of a rectangular shaped gas chamber. The product of pressure and inner surface area of a rectangular box may serve as PS.

S_i is the inner surface area of the gas chamber A and S_f is the inner surface area of the gas chamber including an extended gas chamber that is the final inner surface area.

In Fig 2, we can use a rectangular shaped gas chamber for demonstration. Here a rectangular gas chamber is in the Fig2, the length of the room positioned horizontally, the height indicating vertically in the figure and wide is another side of the rectangular gas chamber. In this situation, suppose the dimension of the wide of the rectangular gas chamber is constant.

The length and height of the gas chamber are variable. We can describe the variable inner surface area of the rectangular gas chamber accordingly. In all parts the indexes i, f and d show the initial, final and difference/increment positions. By using these indexes for temperature, pressure, surface and forces we have; T_i and T_f as initial and final temperatures and T_d as difference of two temperature, P_i and P_f for initial and final pressure of gas respectively and S_i and S_f are the initial and final inner surface area of gas, F_i and F_f show initial and final force of the gas. Exchanged inner surface area is $S_d = S_f - S_i$, $F_i = P_i S_I$, $F_f = P_f S_f$ and Force discharge $F_{disc} = F_f - F_i$, H_{disc} is the converts of F_{disc}, W is the converts of H_{disc}(1 Kcl = 4.1868 KJ). The discharged force can be measured by

$$F = (P_f S_f - P_i S_i) \qquad (3)$$

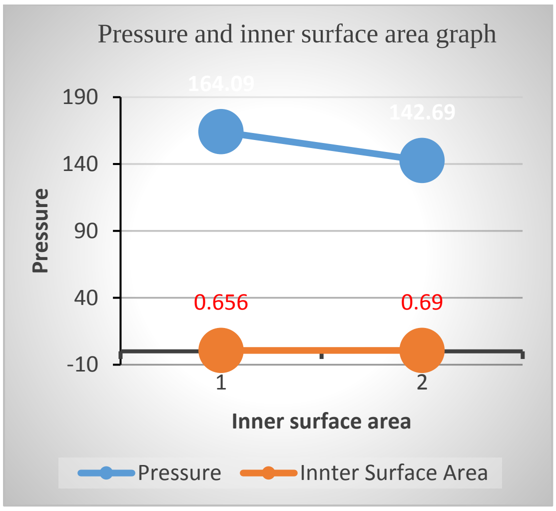

Fig 3

The above graph shows the pressure and inner Surface area Line. The product of pressure and inner surface area = Force. Left end the pressure line shows pressure (164.09) and right end (142.69).

The left end of the inner surface area line shows inner surface area (0.656) and right end (0.69). All data are available in table -1. Again, F = CnAT.

In Fig 3, we can use a rectangular shaped gas chamber for demonstration. Temperature (T) represents vertically, and A is a covered outer surface area of tiny particles serves horizontally. Therefore, CnAT = F. Suppose, a rectangular gas chamber marked doted located in the figure-3 shows the inner surface area of a gas chamber. Naturally, length situated horizontally, and height is determined vertically and wide is another side of the gas chamber at constant. The coloured rectangular box represents the outer surface of the area of molecules covered by the heat waves in the gas chamber.

Table 1 Behaviour of gases under compression and expansion effect on inner Surface is in the adiabatic process (Palchoudhury, 2018)

Common Gases	V	S_i	P_i	S_f	P_f	S_d	F_i	F_f	Gases discharges after adiabatic expansion		W (KJ)
									F_{disc}	H_{disc}	
CO_2	0.05	0.656	164.09	0.69	142.69	0.0328	107700436.37	98335181.00	9365255.36	71.63	299.912
	0.2	1.654	5.33	1.74	4.63	0.0827	8813175.41	8046812.33	766363.08	5.86	24.542
	22.4	38.428	0.10	40.35	0.09	1.9214	3873704.03	3536860.20	336843.83	2.58	10.787
He	0.2	1.654	12.79	1.74	11.12	0.0827	21151318.25	19312073.18	1839245.06	14.07	58.900
Ne	0.2	1.654	11.88	1.74	10.33	0.0827	19642006.82	17934006.23	1708000.59	13.06	54.697
H	0.2	1.654	12.47	1.74	10.85	0.0827	20627734.13	18834018.12	1793716.01	13.72	57.442
Ar	0.2	1.654	10.12	1.74	8.80	0.0827	16736743.54	15281374.54	1455369.00	11.13	46.607
O	0.2	1.654	10.57	1.74	9.19	0.0827	17480533.09	15960486.74	1520046.35	11.63	48.678
N	0.2	1.654	10.59	1.74	9.21	0.0827	17513337.08	15990438.21	1522898.87	11.65	48.769
CO	0.2	1.654	10.41	1.74	9.05	0.0827	17220252.77	15722839.49	1497413.28	11.45	47.953
CH4	0.2	1.654	8.73	1.74	7.59	0.0827	14439592.78	13183976.02	1255616.76	9.60	40.210
NH3	0.2	1.654	3.37	1.74	2.93	0.0827	5571507.79	5087028.86	484478.94	3.71	15.515

Naturally, length situated horizontally, and height vertically located and wide is another side of the box. In this situation, suppose, the dimension of the wide of the rectangular capacity is at constant. The length and height of the gas chamber are variable. We can describe the variable covered outer surface area accordingly. Temperature (T) vertically, A as inner surface area horizontally, $T_i$and T_f are the initial and final temperature of a gas respectively. A_i and A_f are the initial and final covered outer surface area of tiny particles of a gas.

$$A_d = A_f - A_i \,,\ F_i = CnA_iT_i \quad (4)$$

and

$$F_f = CnA_fT_f \quad (5)$$

$$F = Cn(A_fT_f - A_iT_i) = -Cn(A_fT_f - A_iT_i)(A_iT_i > A_fT_f) \quad (6)$$

Here the negative sign indicate internal force losses and converts into extension inner surface area, the magnitude PS and CnAT is same, $F_{disc} = F_f - F_i$, H_{disc} is the converts F_{disc}, H_{disc} = W work convert (1 Kcl = 4.1868 KJ).

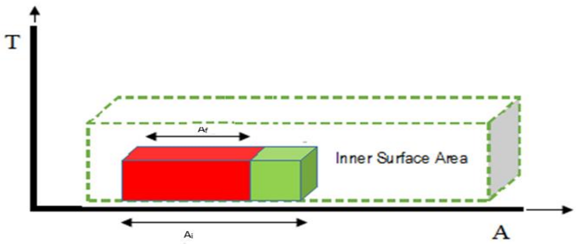

Fig 3

In Fig 3, colored box is the representation of the outer surface area of tiny particles of a gas. A represents an Outer surface area of gas. A_i serves the outer surface area of the initial stage of a gas. A_f represents the decreased outer surface area of the final state of gas after the extension of the inner surface of a gas. T_i and T_f are the initial and final temperature of gas respectively.

Table 2 Behaviour of gases under compression and expansion effect on covered the outer surface area in the adiabatic process (Palchoudhury, 2018)

Common Gases	V(dm^3)	Gas constant MPa/Mole-Kelvin	A_i	T_i K	A_f	T_f K	F_i	F_f	Gases discharges after adiabatic expansion	
									F_{disc}	H_{disc}
CO_2	0.05	6.680704501	0.059	273	0.056	261.13	107700436.37	98335181.00	9365255.36	71.63
	0.2	6.680704501	0.005	273	0.005	261.13	8813175.41	8046812.33	766363.08	5.86
	22.4	6.680704501	0.002	273	0.002	261.13	3873704.03	3536860.20	336843.83	2.58
He	0.2	6.680704501	0.012	273	0.011	261.13	21151318.25	19312073.18	1839245.06	14.07
Ne	0.2	6.680704501	0.011	273	0.010	261.13	19642006.82	17934006.23	1708000.59	13.06
H	0.2	6.680704501	0.011	273	0.011	261.13	20627734.13	18834018.12	1793716.01	13.72
Ar	0.2	6.680704501	0.009	273	0.009	261.13	16736743.54	15281374.54	1455369.00	11.13
O	0.2	6.680704501	0.010	273	0.009	261.13	17480533.09	15960486.74	1520046.35	11.63
N	0.2	6.680704501	0.010	273	0.009	261.13	17513337.08	15990438.21	1522898.87	11.65
CO	0.2	6.680704501	0.009	273	0.009	261.13	17220252.77	15722839.49	1497413.28	11.45
CH4	0.2	6.680704501	0.008	273	0.008	261.13	14439592.78	13183976.02	1255616.76	9.60
NH3	0.2	6.680704501	0.003	273	0.003	261.13	5571507.79	5087028.86	484478.94	3.71

CONCLUSION

According to our discussions it is show that we can measure convertible force in two ways more accurately either by
1) $F = Cn\,(A_f T_f - A_i T_i)$ or 2) $F = (P_f S_f - P_i S_i)$. We can predict the convertible force from first equation more accurately as Cn is the quantity of fuel, from general observation final and initial temperature (T_f and T_i) and final and initial covered outer surface area (A) according to Palchoudhury equation $PS = CnAT$. We also predict the convertible force from the second equation more accurately from general observation final and initial pressure and final and initial inner surface area of the gas chamber.

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