A critical mathematical evaluation of the Andy Motor

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Purpose:

The purpose of this document is to show mathematically that the so-called Andy Motor cannot faction as claimed. It will be shown that the device called the Andy Motor is a classic perpetual motion machine of the first kind.

Objective 1:

Define s in terms of ϕ, e and r, the physical parameters of each torque arm. This will give the length of the torque arm.

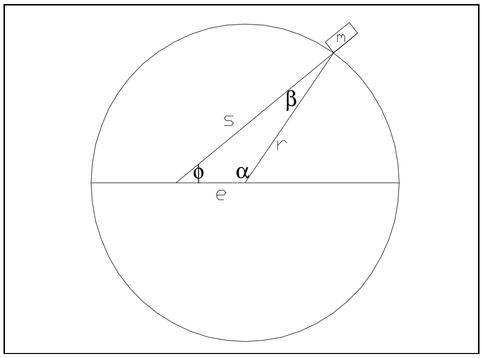

Figure 1: Definition of angles and lines of one arm of the Andy Motor

s: Distance from eccentric pivot to mass
r: Radius of the circular guide
e: Eccentricity of the Andy Motor (e < r)
m: The mass at the end of each of the 8 pivot arms. This mass follows the circular path.
ϕ,α and β: Relevant internal angles of the triangle as shown

$s^2 = r^2 + e^2 – 2.r.e.\cos(\alpha)$ (using cosine rule) (1)

$r / \sin(\phi) = e / \sin(\beta)$ (using sine rule)

Thus $\beta = \mathrm{asin}(r / e / \sin(\phi))$ (2)

$\alpha = \pi - \phi - \beta$ (sum of internal angles)
$= \pi - \phi - \mathrm{asin}(r / e / \sin(\phi))$ (substituting eq. 2) (3)

Substituting eq. 3 back into eq. 1 and solving for **s** gives our first objective

$s = (r^2 + e^2 – 2.r.e.\cos(\pi - \phi - \mathrm{asin}(r / e / \sin(\phi))))^{0.5}$ (4)

Objective 2:

Determine the effect of the mass perpendicular to the torque arm (direction y), taking into consideration the effect of the guiding circle. This multiplied by the length of eq. (4) will give the resultant torque caused by the mass.

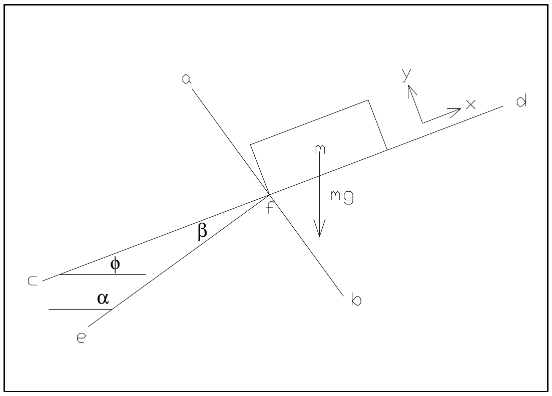

Figure 2: The position of the torque causing mass:

Line a-b:	The guidance circle section.
Line c-d:	Torque arm section. Comes from the eccentric pivot point.
Line e-f:	Radius line of the guidance circle. It is perpendicular to a-b.
m:	The mass which causes the torque.
g:	Gravitational acceleration

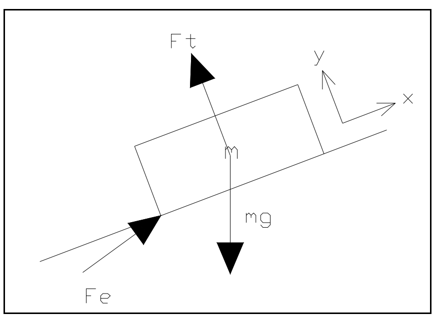

Figure 3: The free body diagram of the mass indicated in figure 2.

F_e: The force between the guidance circle and the mass (In direction e-f, from circle centre, obviously perpendicular to circle circumference).

F_T: The resultant force perpendicular to c-d that causes the torque around the pivot point.

<u>ΣF_x:</u>

$F_e.\cos(\beta) - m.g.\sin(\phi) = 0$

thus $F_e = m.g.\sin(\phi) / \cos(\beta)$ (5)

<u>ΣF_y:</u>

$F_T + Fe.\sin(\beta) - m.g.\cos(\phi) = 0$ (6)

Substituting eq. 2 and 5 into eq. 6 gives:

$$F_T = m.g.\cos(\phi) - m.g.\sin(\phi) / \cos(\beta).\sin(\beta)$$
$$= mg(\cos(\phi) - \sin(\phi)\tan((\mathrm{asin}(r / e / \sin(\phi)))))) \quad (7)$$

Objective 3:

Determine the resultant torque from the torque of each arm.

$T = F . S$ (torque is the product of the perpendicular force and the length of the arm)

More generally put:
$T_n = F_n . S_n$ where n is the numbers 0 – 7 (for an 8 arm Andy motor)

Where (from eq. 7) $F_n = m.g.(\cos(\phi_n) - \sin(\phi_n)\tan((\mathrm{asin}(r / e / \sin(\phi_n)))))$ (8)

and (from eq. 4) $S_n = (r^2 + e^2 - 2.r.e.\cos(\pi - \phi_n - \mathrm{asin}(r / e / \sin(\phi_n))))^{0.5}$ (9)

and $\phi_n = n . 2 . \pi.\varphi / 8$ where φ is any arbitrary angle. (Division by 8 basically means that we do the calculation for an 8 arm Andy Motor with evenly spaced arms around the full circle (2π)).

Thus the total torque is:

$$T_T = \Sigma_{n = 0, 7}(F_n . S_n) = 0 \text{ for any value of } \varphi. \quad (10)$$

See the numerical evaluation below.

r	0.2	m
e	0.04	m
Φ	0	rad
M	0.2	kg
g	9.81	

n	0	1	2	3	4	5	6	7	
Θn	0	0.785398	1.570796	2.356194	3.141592654	3.926991	4.712389	5.497787	
Sn	0.24	0.226274	0.195959	0.169706	0.16	0.169706	0.195959	0.226274	
Fn	1.962	1.189152	-0.400492	-1.585535	-1.962	-1.585535	-0.400492	1.189152	
Tn	0.47088	0.269074	-0.07848	-0.269074	-0.31392	-0.269074	-0.07848	0.269074	
								TT	0

Summary

This then proofs beyond any doubt that the Andy motor is a perpetual motion machine that cannot perform as claimed.

About the author

The author, Barend C Greyling is a mechanical engineer (B.Eng) who spends his free time thinking and reading about the coming energy revolution.