NOTE TO FILE
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Three Shapes of AM Revisited

1 References

A. 140927 XLS Atwood's Machine -Three Shapes R3.xls
B. 150409 Family of Maps R1.xlsx
C. 150411 Boyle - Annex 2 - AM Example R2.docx
D.

2 Purpose

To explore the variations in the hump-backed curves coming out of the AM and the RM examples.

3 Background

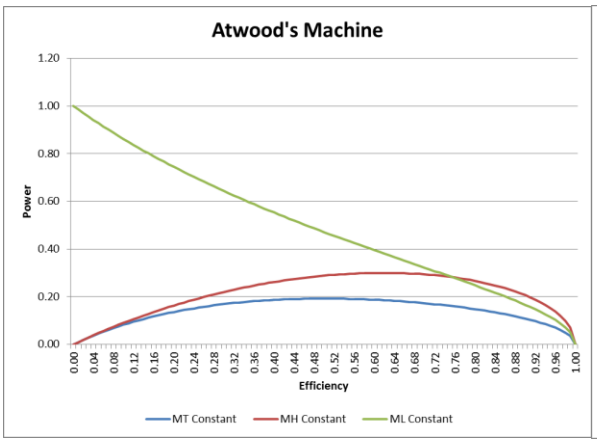
In September, at Ref A, I attempted to produce the curve of Pinkerton and Odum. I got three curves, the third of which was what I was looking for. I discounted the other two as anomalous, but always had the question in my mind as to why they arose.

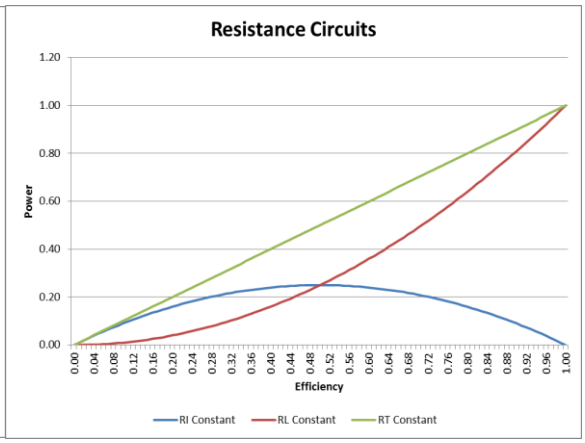
While writing Ref C I realized that there was a hidden constraint in the development of the Pinkerton curve, and if I exercised that constraint in the three ways possible, I got three curves.

I discovered, to my surprise, that there are actually three different maximum power curves coming out of an analysis of Atwood's Machine (the AM). Each depends on an arbitrary assumption about which of the three symbols for mass are held constant in the analysis. This assumption amounts to an additional arbitrary constraint on the design changes in the machine as it is modified to test/demonstrate different efficiencies. You can change ML, you can change MH, or you can change both. If you change both randomly, that is not of much interest. In that case, hold MT constant.

I then went back, in this note, to examine the AM and the Resistance Circuits of Jacobi's law to see what I could learn about this phenomenon. At Ref B I examine a set of 750 different unit maps, which form a family of unit maps, all of which have maximum power at an intermediate value of efficiency. However, of the six unit maps arising from the AM and RM examples, only three of the six have this feature.

The six curves are displayed here in these two JPG graphics.

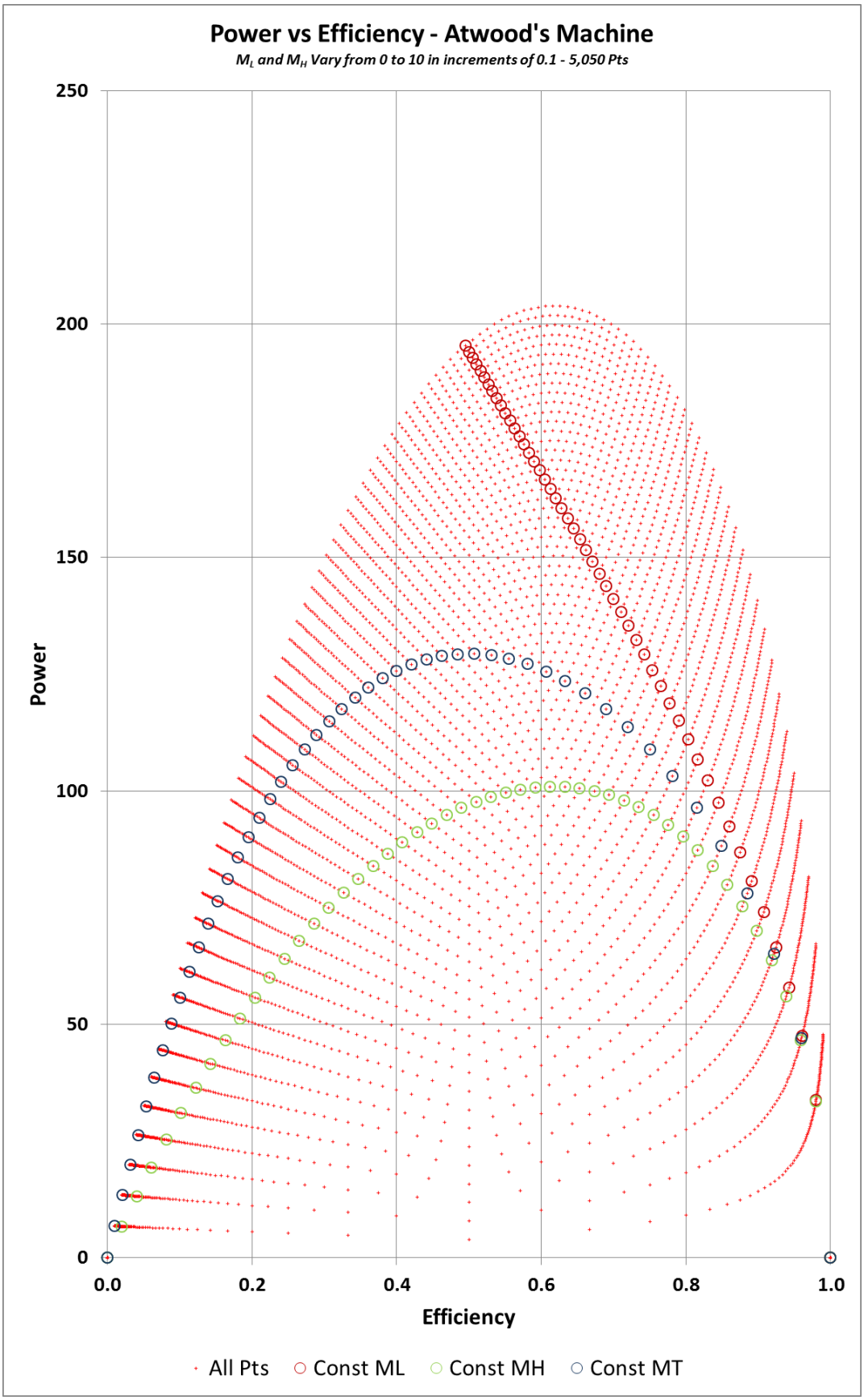




5 Conclusions

I need to understand better where this extra design constraint comes from. Is it real, or is it an arbitrary constraint that is only imposed by us artificially because it produces nice graphs? Since the MPP is evident in nature, there must be natural constraints that force systems to follow such power-efficiency curves. Is it the time regulation constraint that does this?

This family of unit maps seems to be important for understanding the dynamics of such systems. It seems that if parameter A or B are zero, we do not have the conditions for maximum power at an efficiency of intermediate value.


Power vs Efficiency - Atwood's Machine
M_L and M_H Vary from 0 to 10 in increments of 0.1 - 5,050 Pts
250
200
150
100
50
0
Power
0.0
0.2
0.4
0.6
0.8
1.0
Efficiency
All Pts
Const ML
Const MH
Const MT