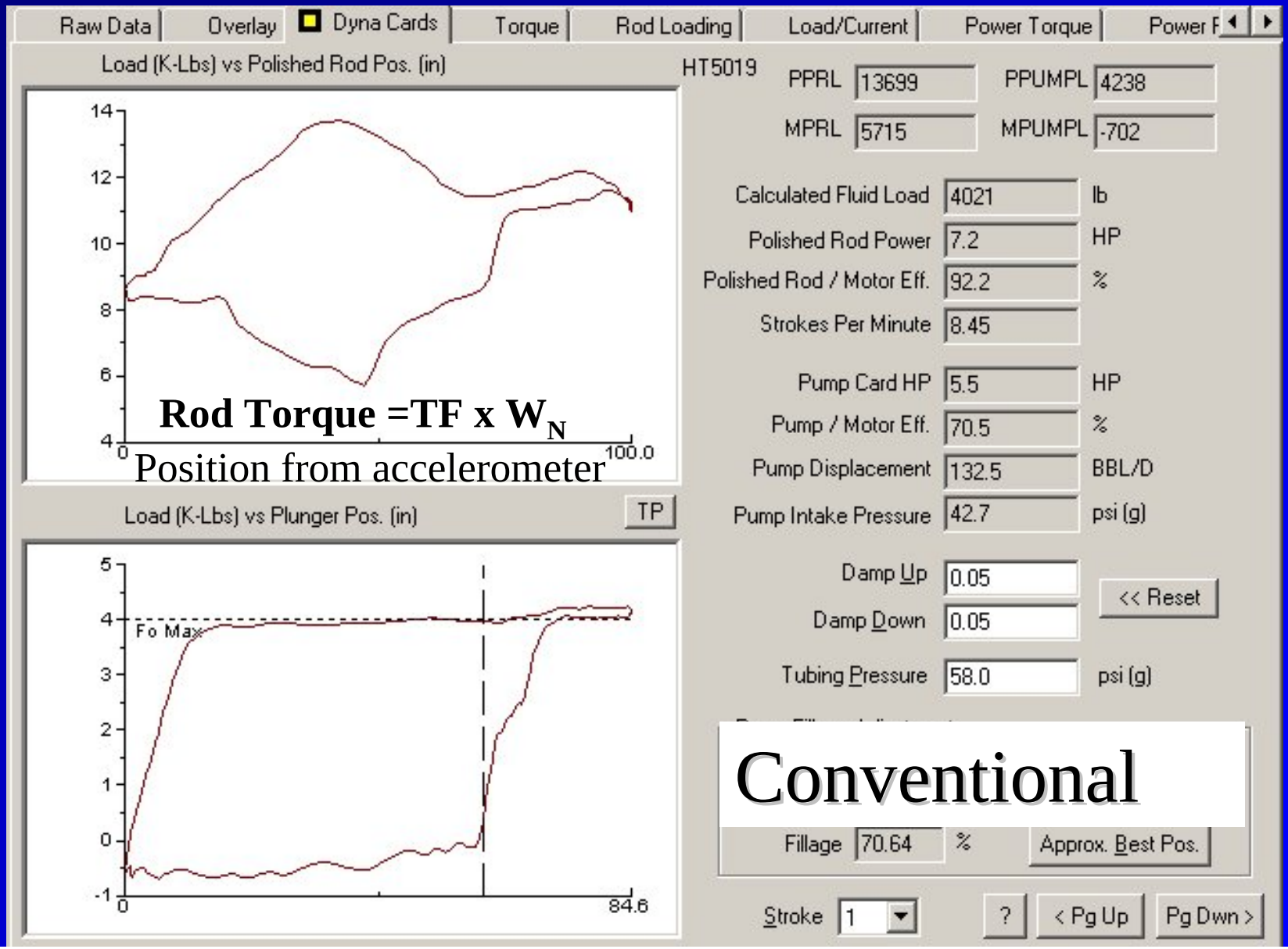
Real Time Performance Pumping Units & Motors Under Cyclic Loads

Conventional

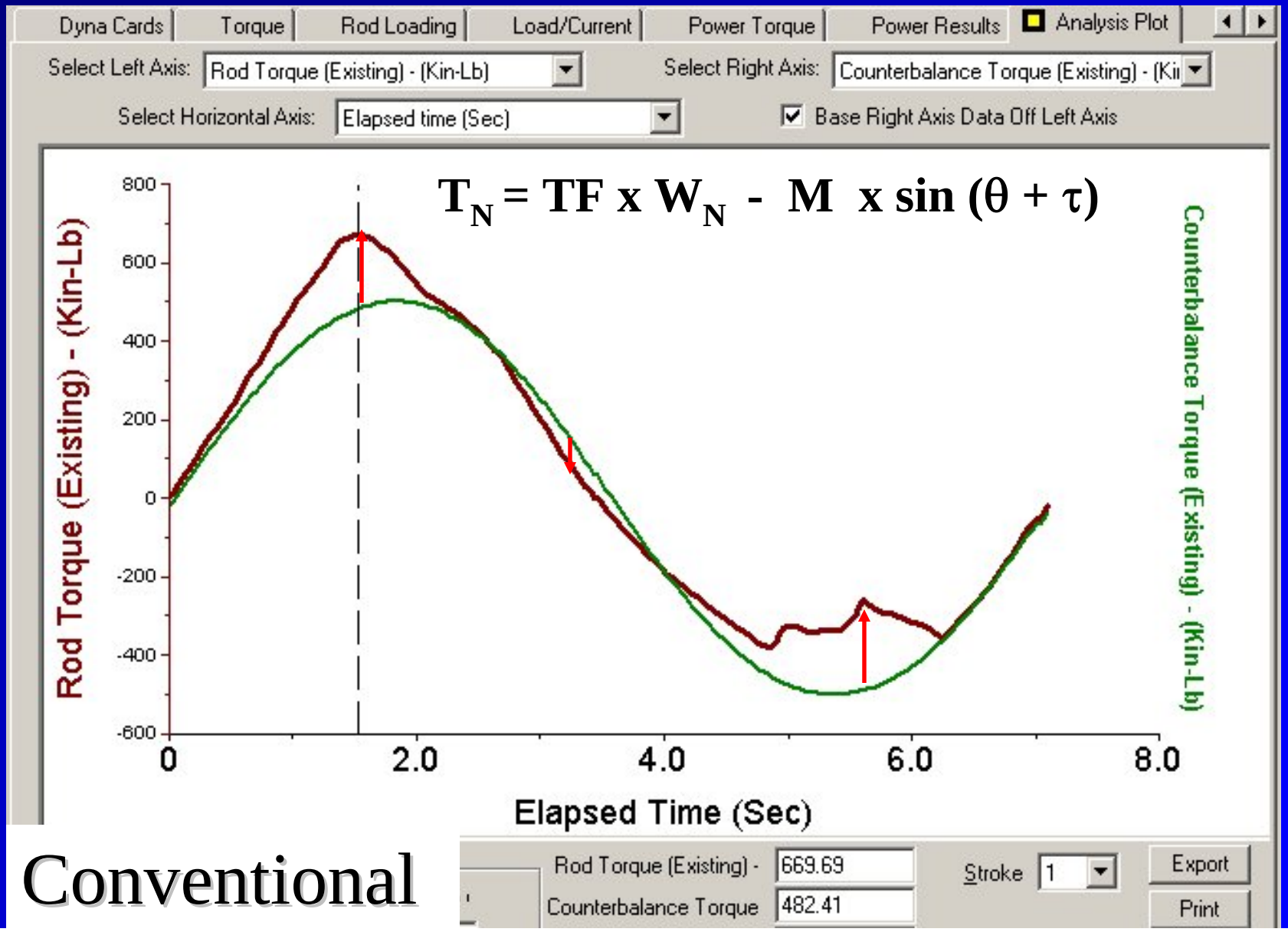
Typically if the unit is stopped and the break released the effect of the counterweights will be greater than the weight of the rods in fluids. As the fluid load is lost due to liquid slippage through the plunger-barrel clearance, the counterweights will come to rest at the 6 o'clock position. The opposite is an indication that the unit is underbalanced (rod heavy).

Un-Conventional Unit?

Surface and Pump Dynamometer Card

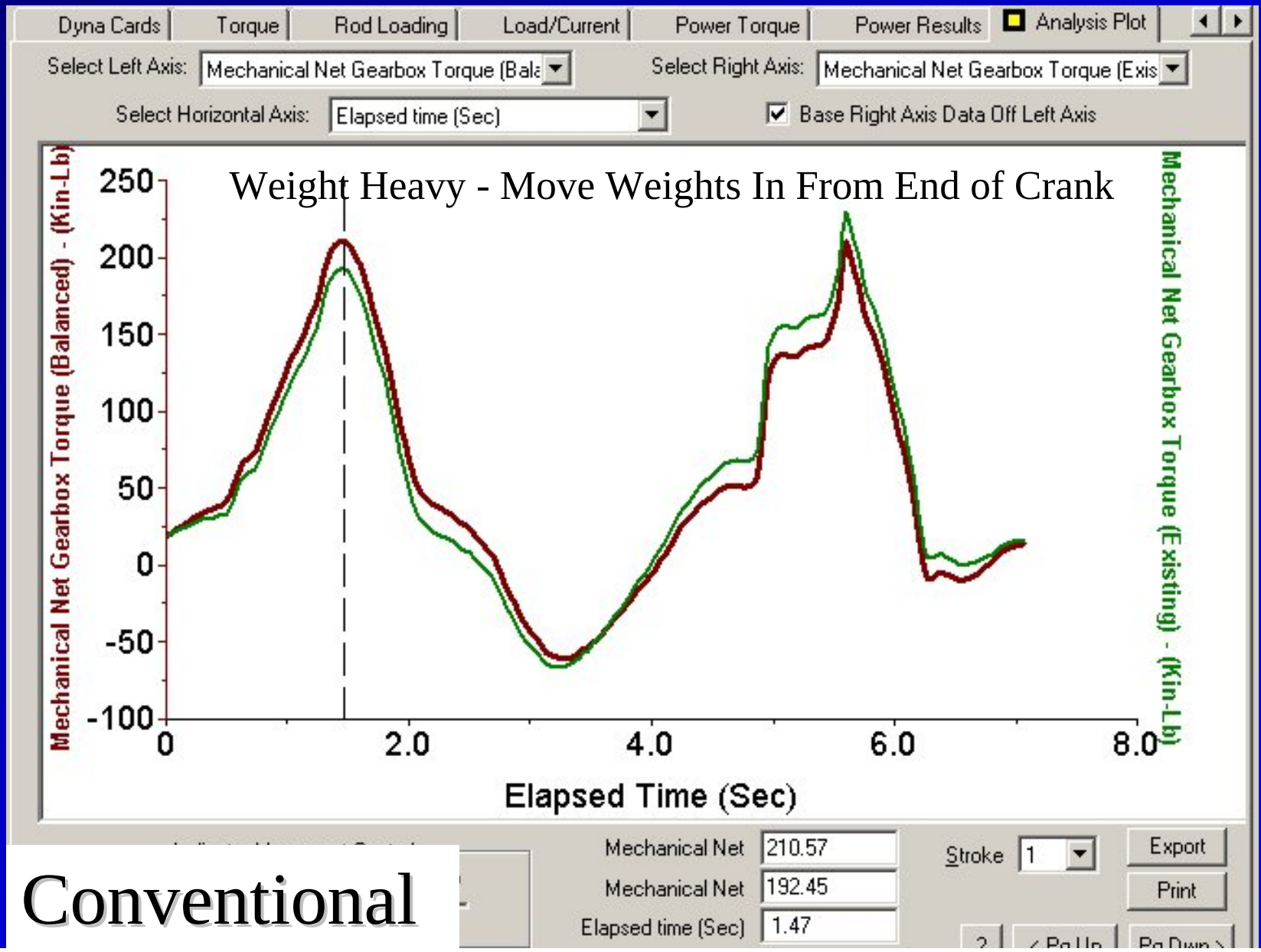


Counterbalance Torque in Phase with Rod Torque



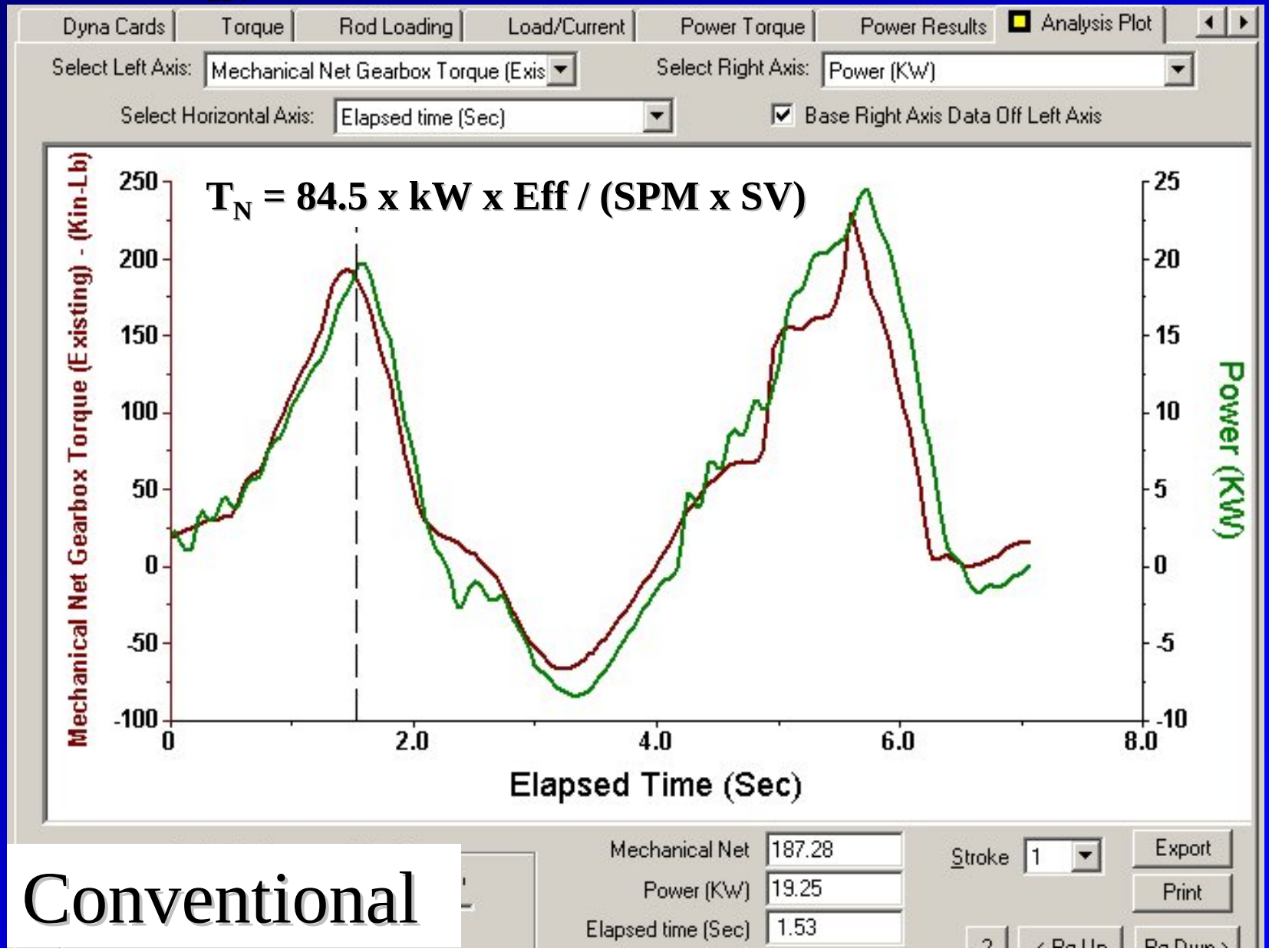
Conventional

Mechanical Existing & Inbalance Net Gearbox Torque



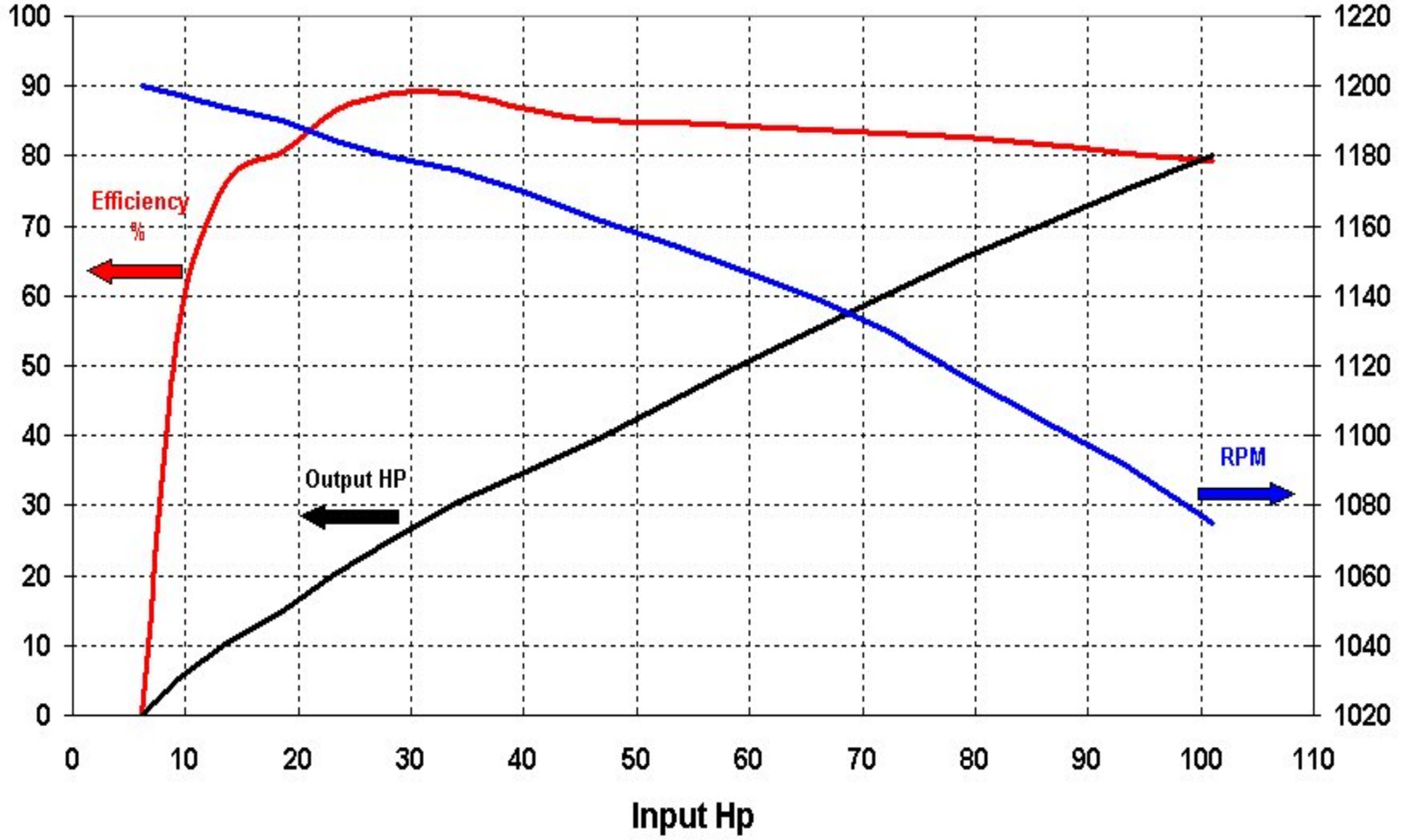
Conventional

KW Power Analysis Motor and Gearbox Plot
kW_{IN} and Torque are Directly Proportional

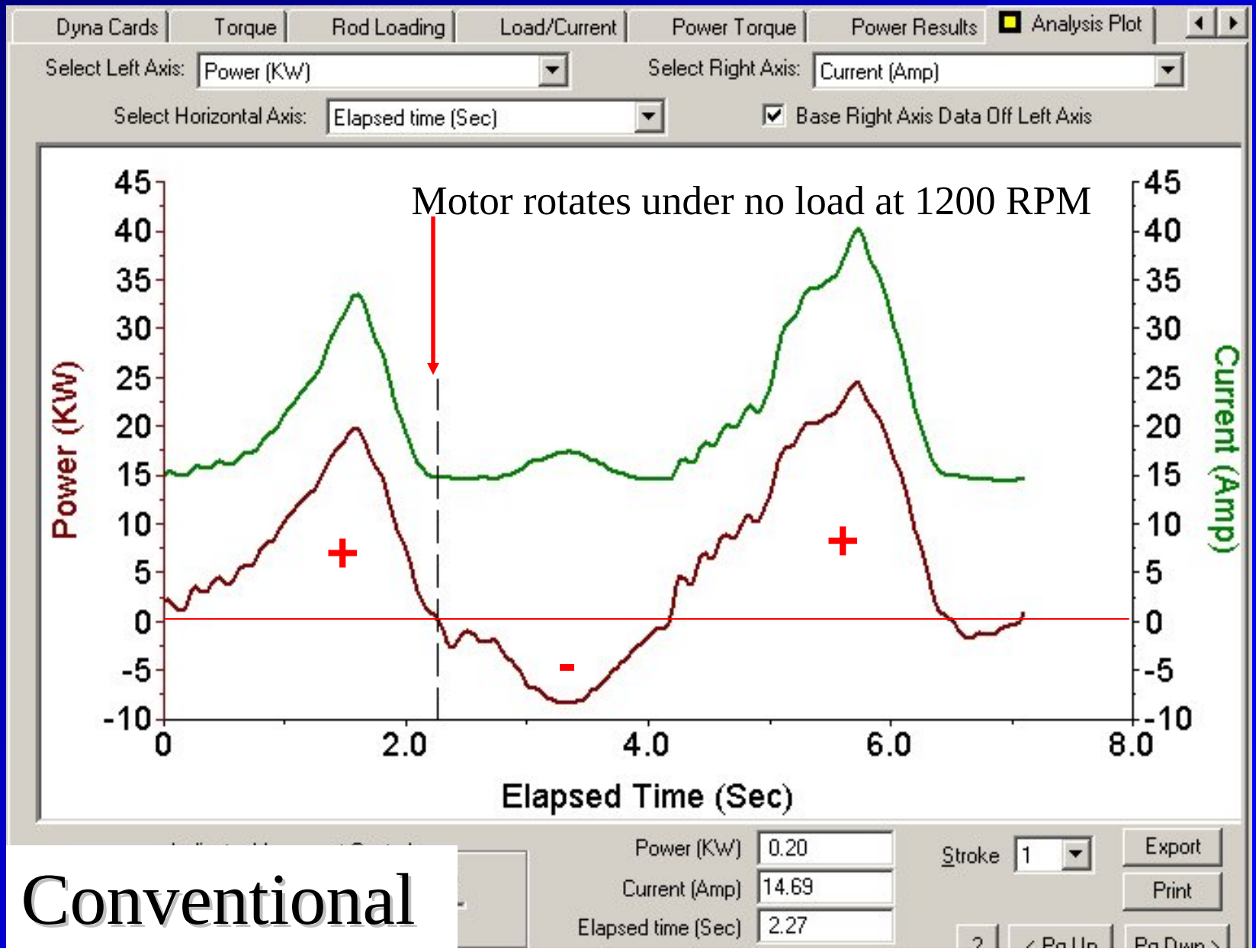


Conventional

Robbins-Myers 60Hp Motor
Performance Curve
NEMA D MOTOR

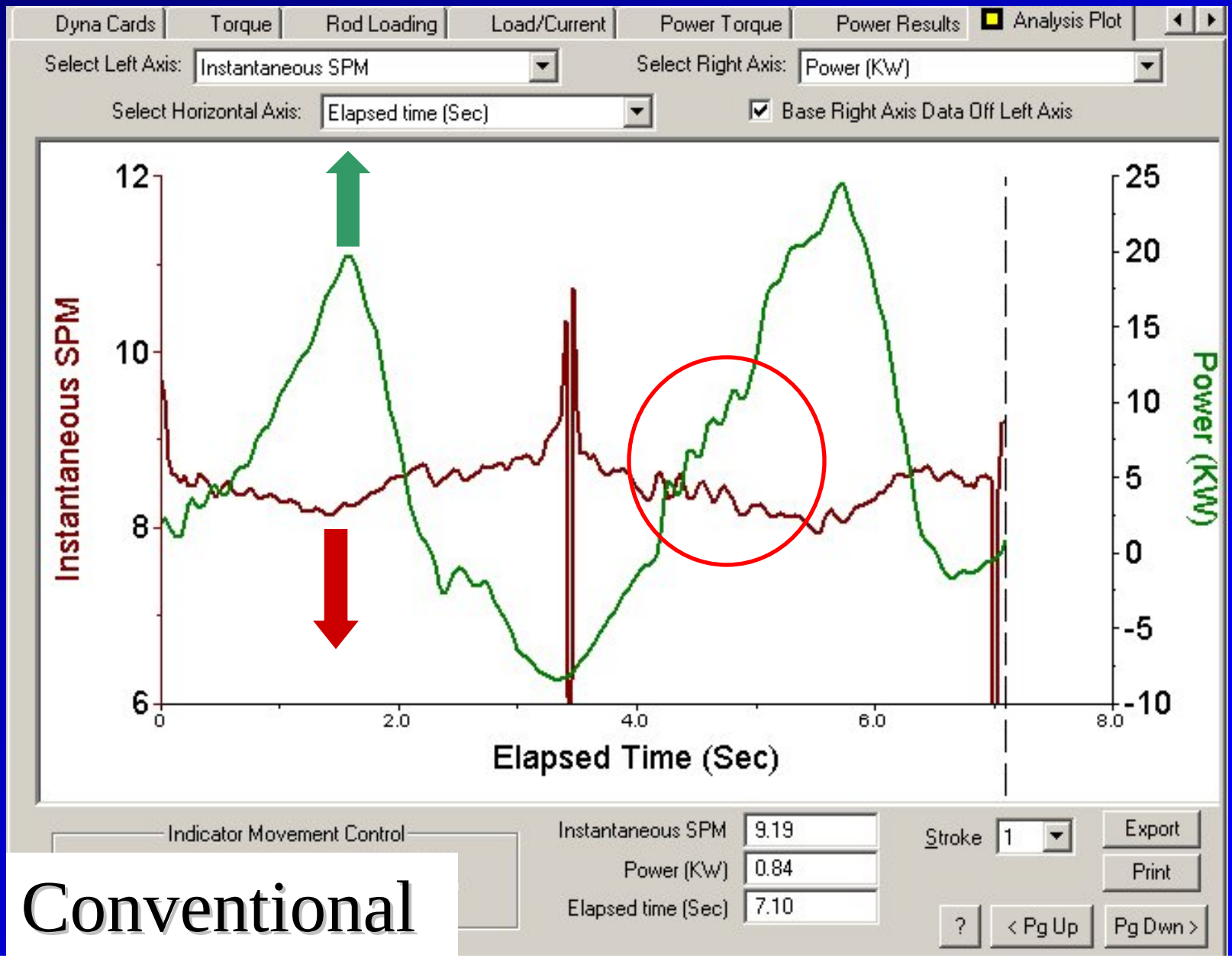


At speeds faster than 1200 RPM motor produces power
At slower speeds the motor is using power to do work.



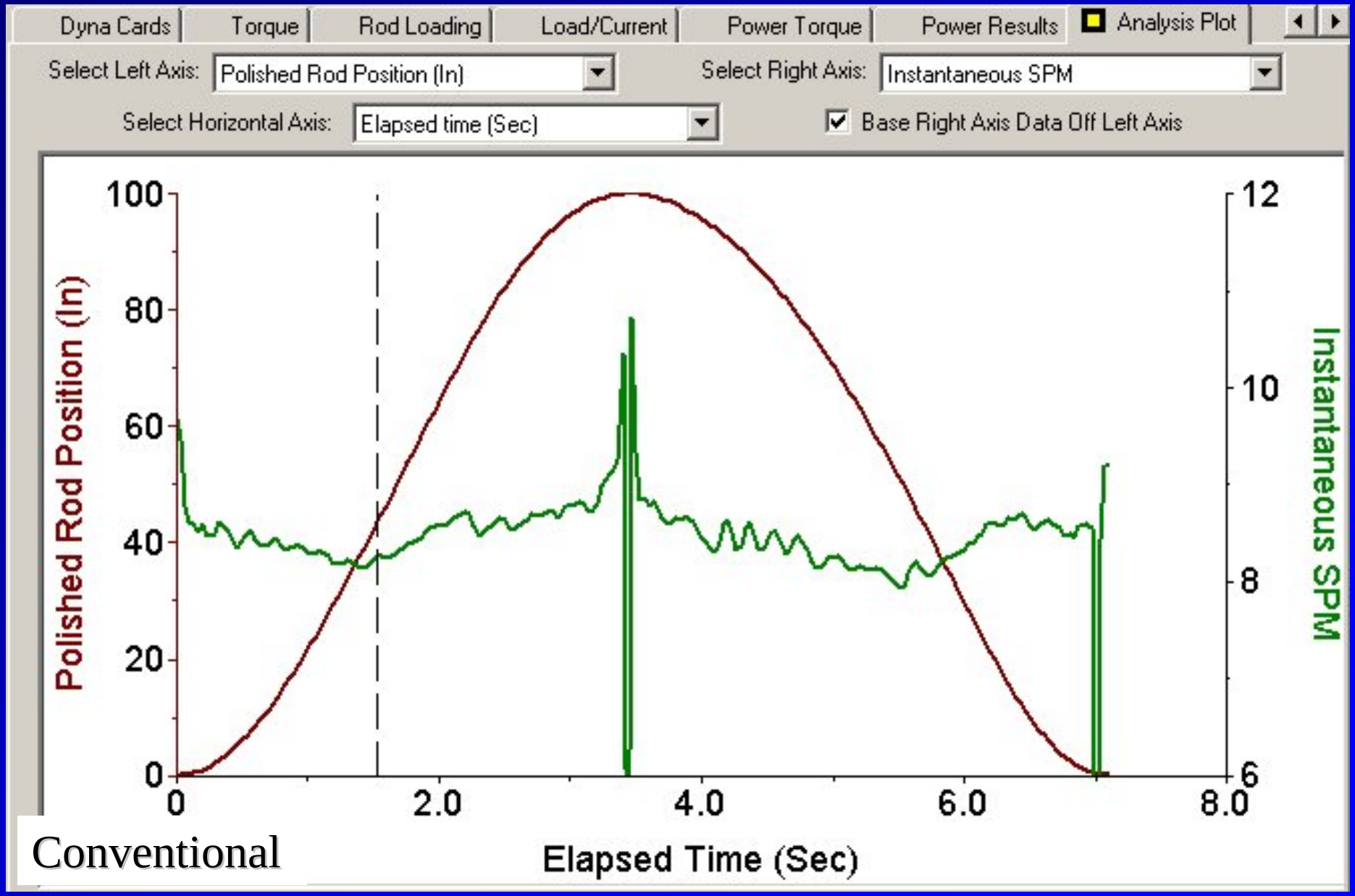
Conventional

Increase Motor KW Results in Decrease in SPM



Conventional

Position and SPM



Conventional

Mark - II

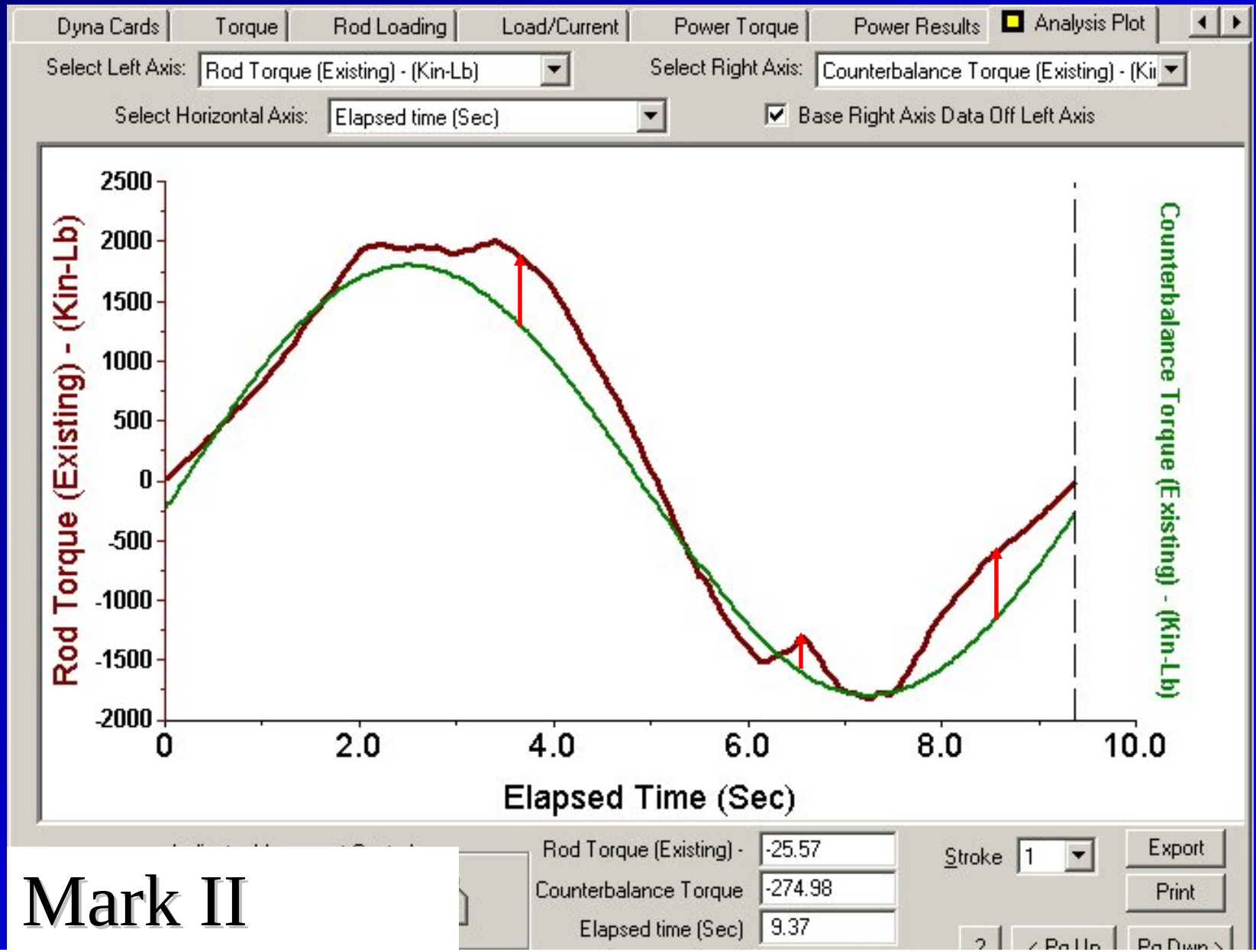
Geometry - class III lever system.

Gearbox is inside the structure and the pitman pushes up on the upstroke.

More compact design results in a lighter unit with a small footprint for a given stroke.

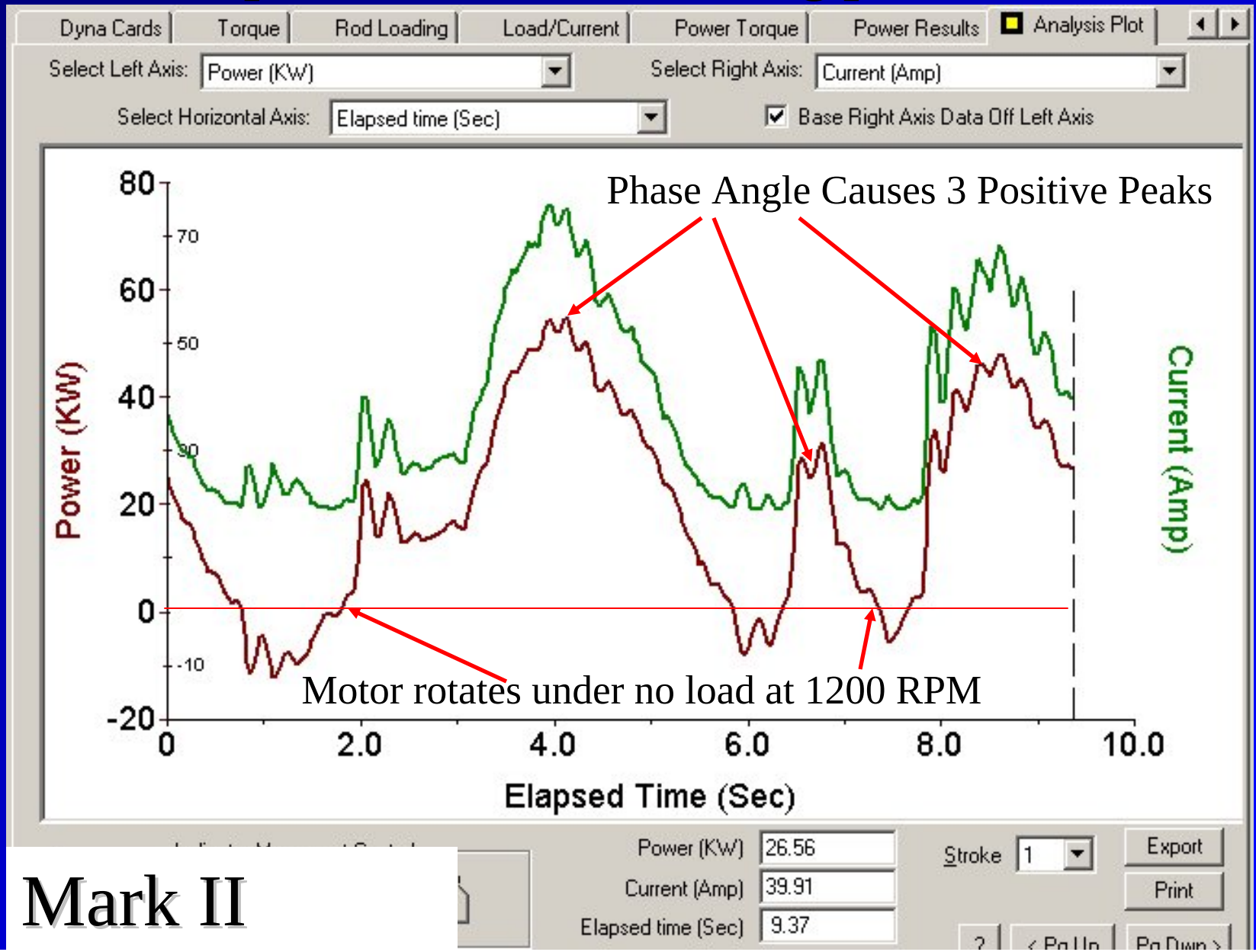
Unit is unidirectional and requires counter clockwise rotation

Phase Angle Causes 3 Positive Peaks



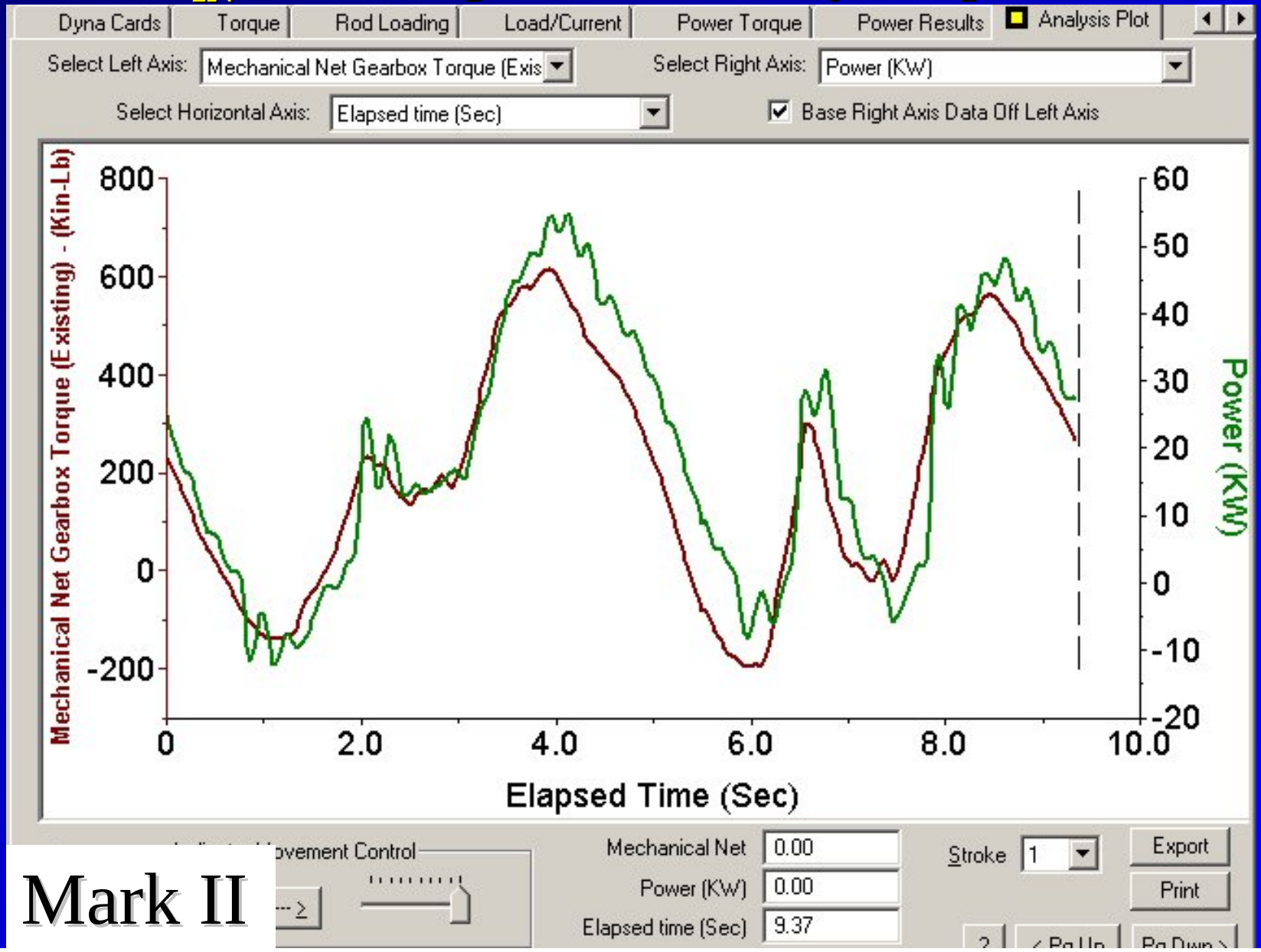
Mark II

At speeds faster than 1200 RPM motor produces power
At slower speeds the motor is using power to do work.



Mark II

KW Power Analysis Motor and Gearbox Plot
kW_{IN} and Torque are Directly Proportional

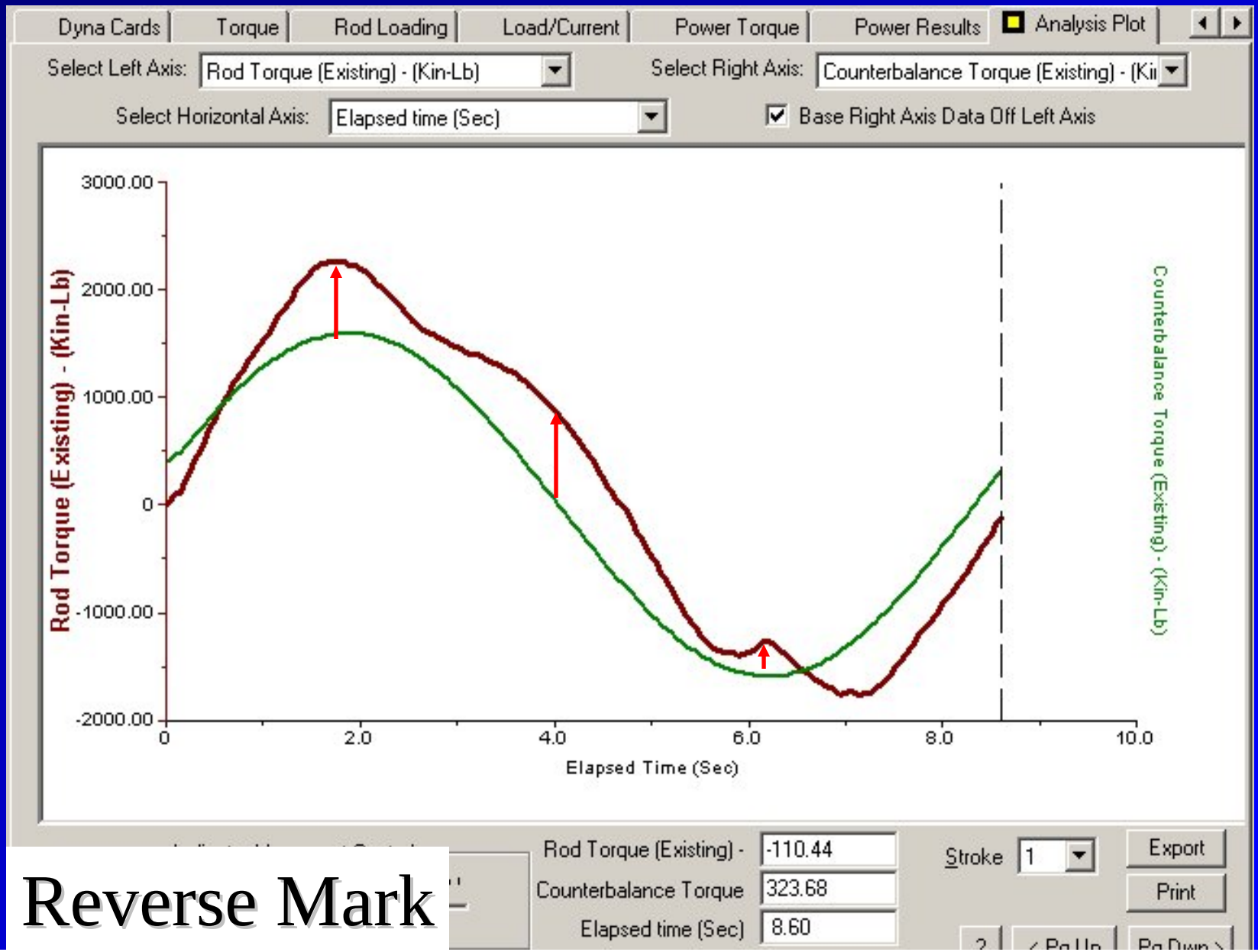


Mark II

Reverse Mark

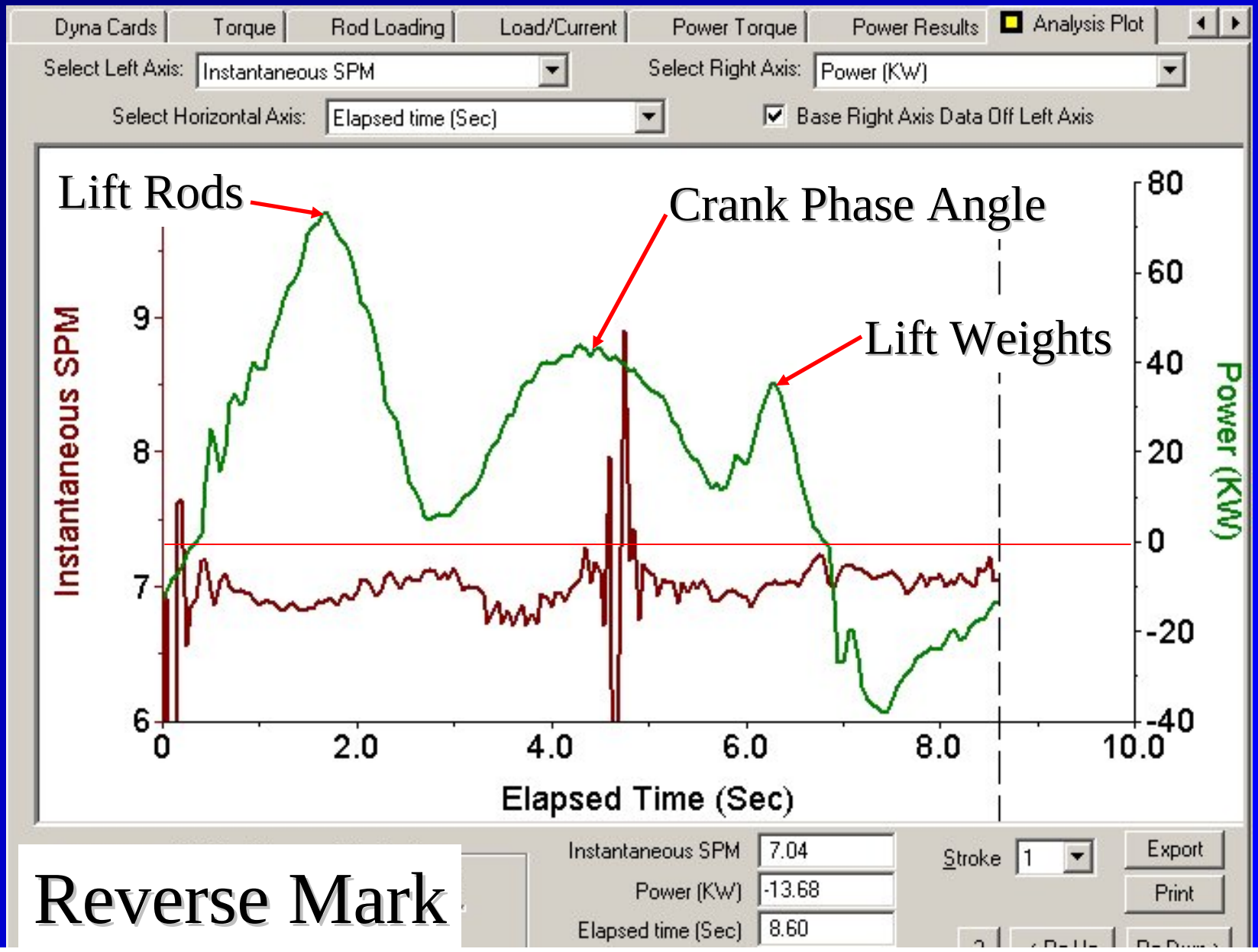
Reverse Mark is a modified conventional unit where the gearbox has been displaced forward so that the angle between the crank arm and the pitman is at 90 degrees when the cranks are level. This results in a faster downstroke than the upstroke.

Crank Phase Angle ~ Uniform Torque



Reverse Mark

Electrically Unbalanced Unit.



Reverse Mark

Rotaflex

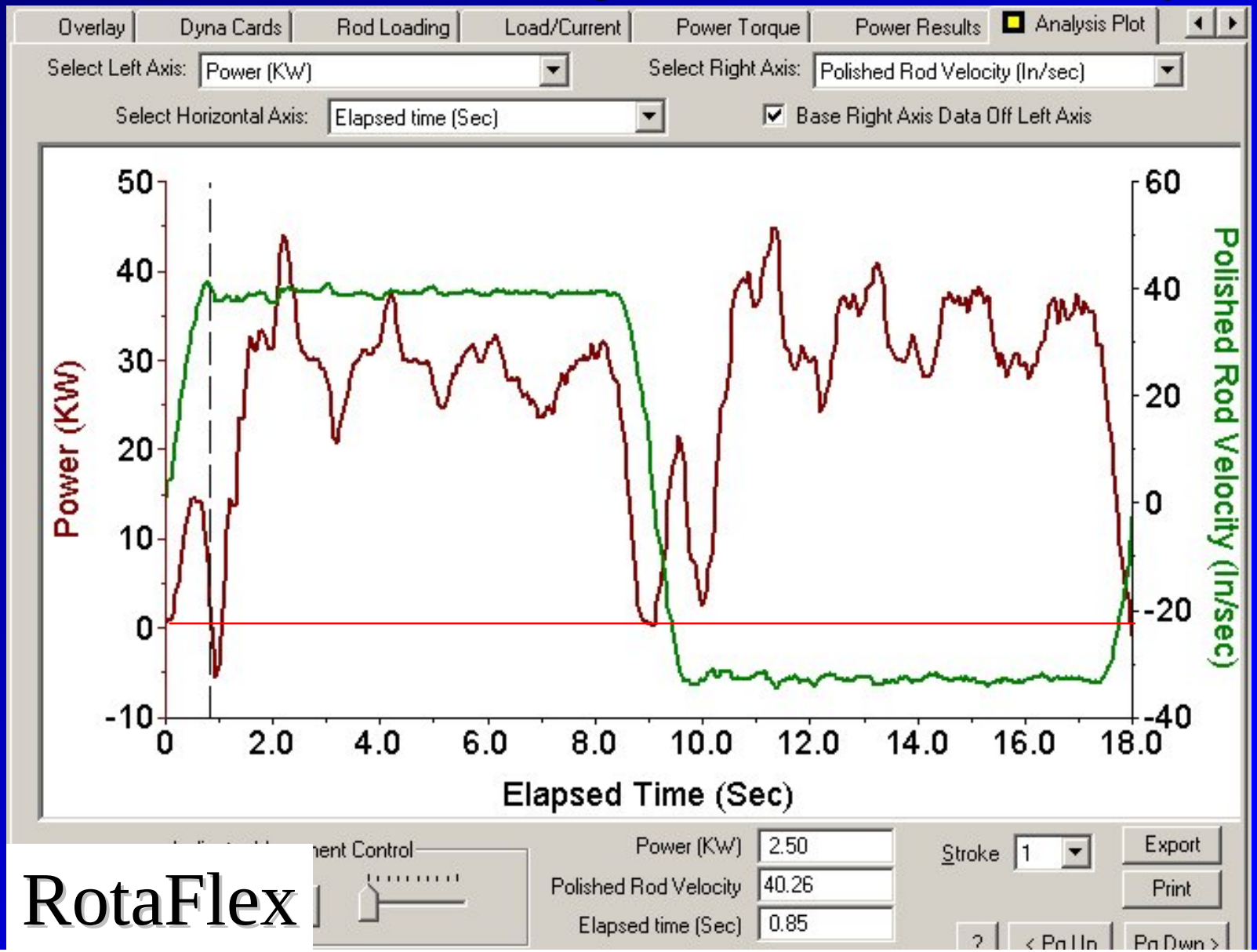
Stroke length of up to 25.5 feet

Rated up to 50,000 Lbs

Gearbox 320,000 in-lb

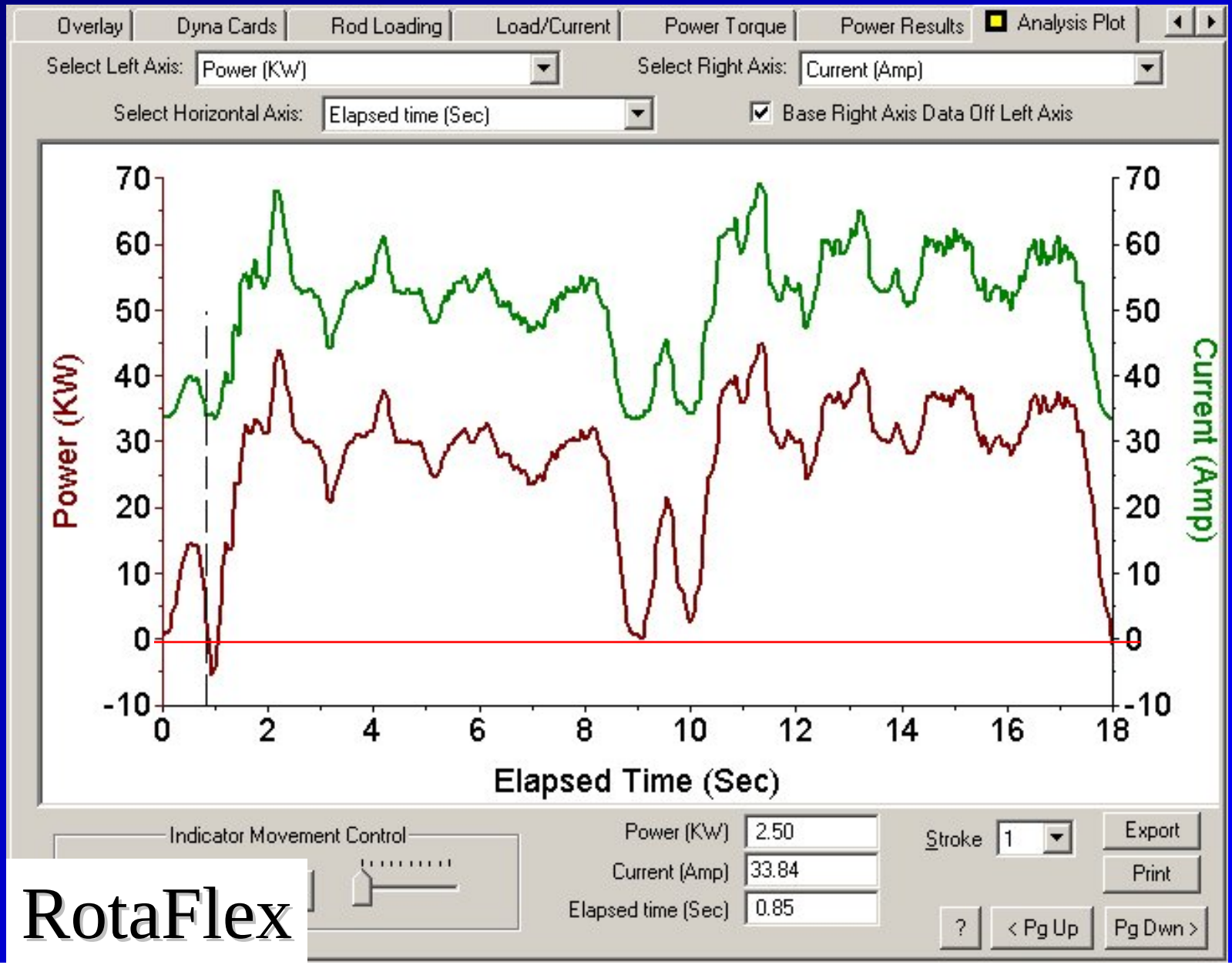
The structure supports a rotating drum over which rolls a wide elastomer-fiber belt connected to the polished rod on one side and to a counterweight box on the other side.

Constant Speed ~ Uniformly Loads Motor Can Results in High Motor Efficiency



RotaFlex

KW and AMPS Curves Same Shape

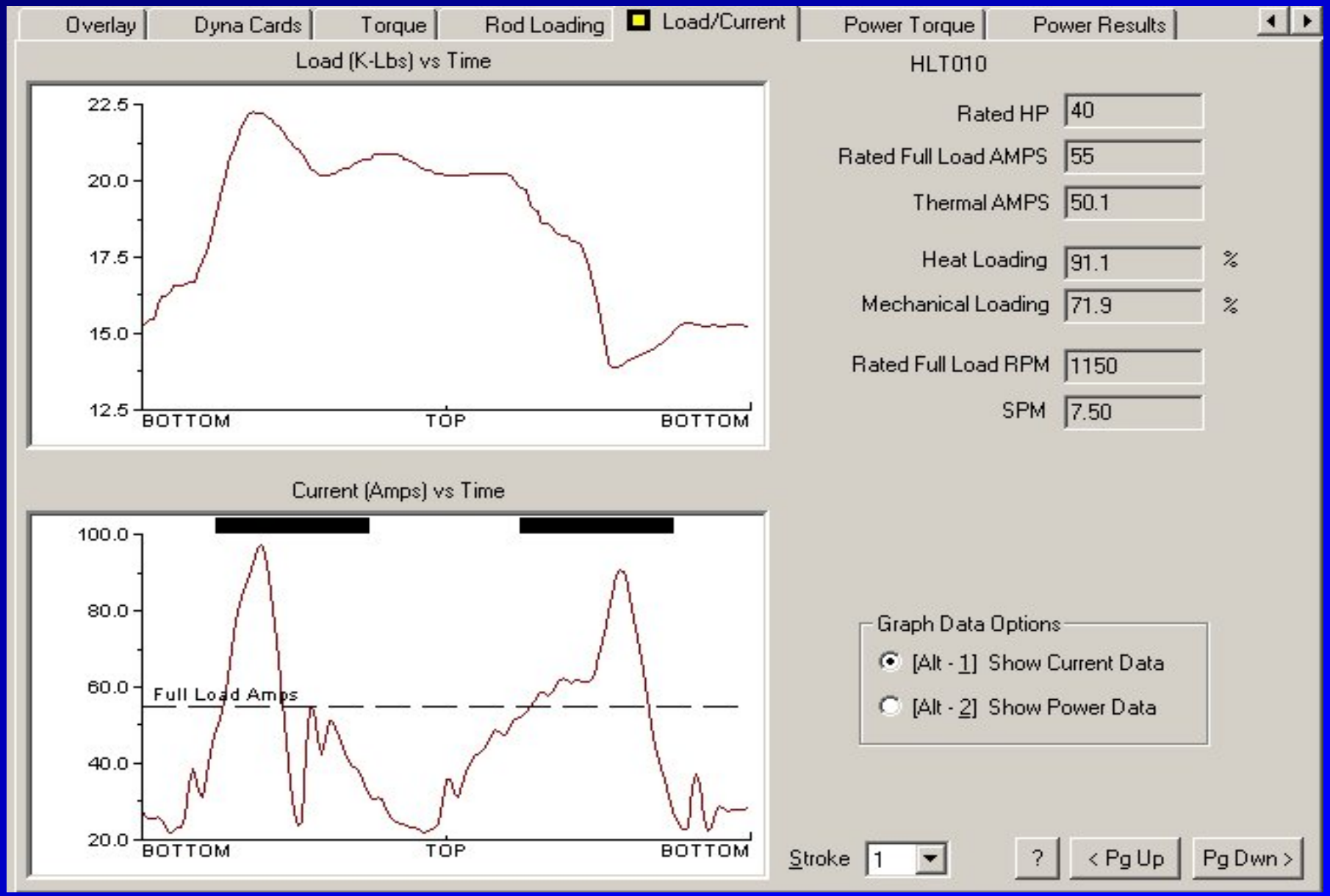


RotaFlex

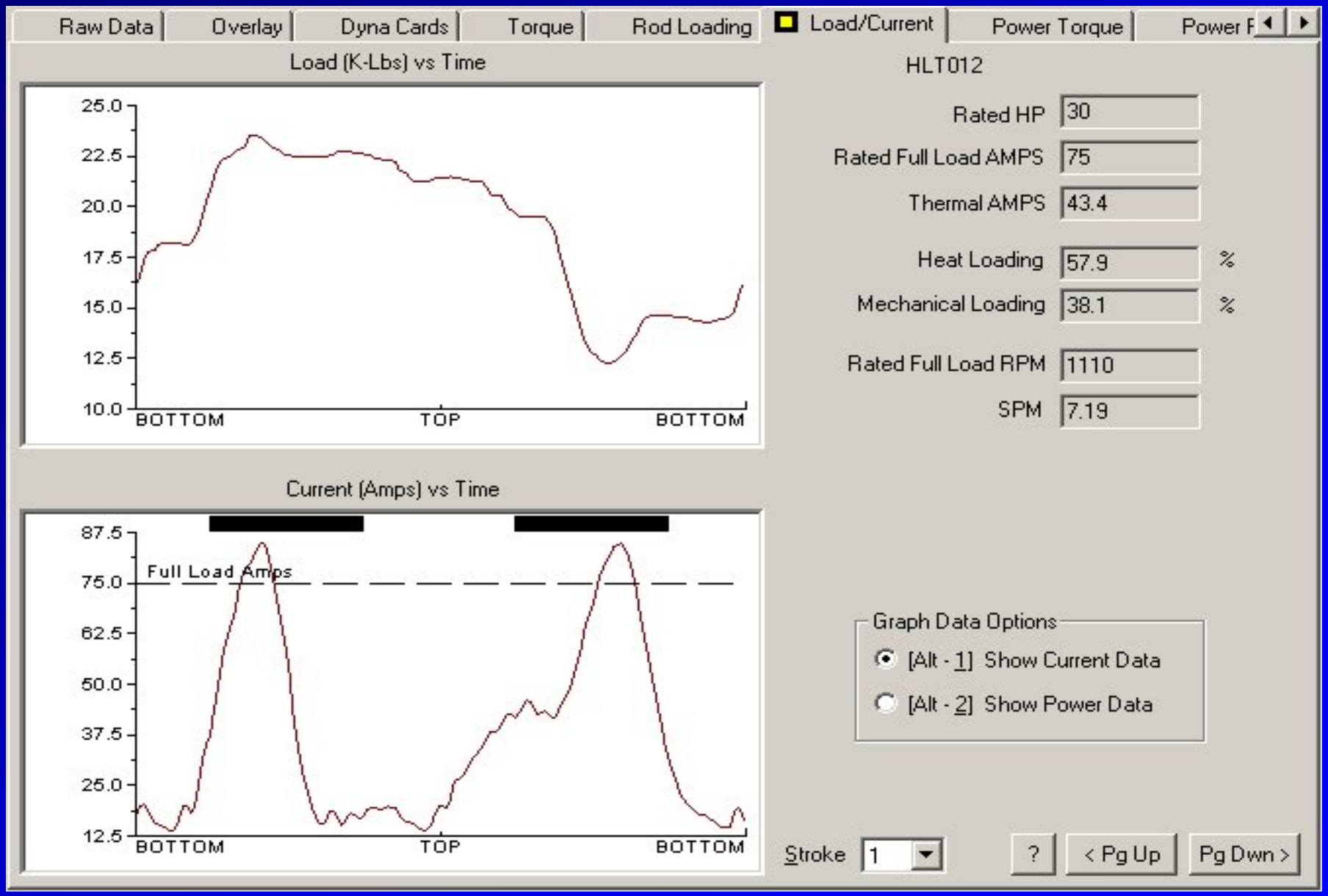
Upstroke if Rod Load Increases – KW goes Up
Dnstroke if Rod Load Decreases – KW Drops

RotaFlex

MOTOR LOADED? NEMA B



Same Well? Smaller NEMA D



What the Gearbox demands the motor provides.

- KW provided electric motor is directly related to the torque required by the Pumping Unit.
- Motor torque characteristics have similar "signatures" to that of the gearbox torque.
- These cyclic loads translate to peaks and valleys in the power demand at the motor.
- Easy to Identify and distinguish between an electrically unbalanced and balanced pumping unit.

Questions ?