

# WHO YOU NEED A DYNO!

If you do general out-of-chassis engine service, engine rebuilding and overhauling, or salvage and restoration work, you have probably repaired or modified components that have affected an engine's performance. The best way to qualify your workmanship, or to evaluate the performance of an engine prior to or after a repair, is by using a dynamometer.

Testing the performance of an engine before repairs, restorations and component changes can verify if the engine is meeting its specifications prior to your work. Dyno testing allows you to show customers previous existing problems and/or poor performance. Documenting pre-existing engine conditions can eliminate problems with the engine and your customer.

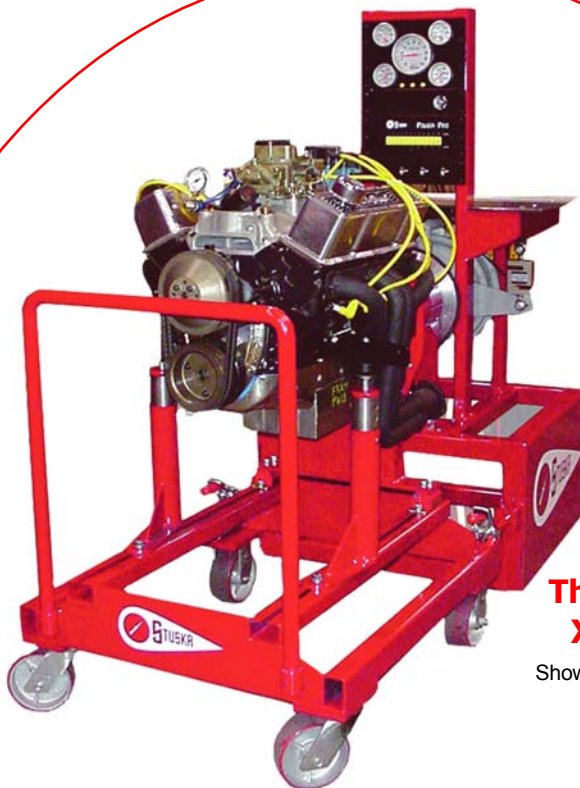
Dyno testing an engine also allows you to prove to your customer that their engine is meeting or exceeding its spec's after a repair, restoration or component change. This verifies your work and gains customer confidence in your services.

If you are a performance/race engine builder, an engine dynamometer can isolate and quantify many performance parameters from overall vehicle performance. For instance, many modifications that increase power only help at high rpm and can actually reduce power at low rpm. Testing the different combinations at the track could take days or weeks, an engine dynamometer can help you nail down the right combination with a couple of 20 second sweeps.

If you do salvage work, showing proof of an engine's performance spec's allows you to charge more for that engine and gives you a competitive sales advantage over other salvage yards. Providing diagnostic engine data along with mileage numbers, verifies the quality of a *used* engine.

Owning a dynamometer will benefit both you and your customers. It allows you to qualify your workmanship while ensuring that proper run-in procedures and engine monitoring is done prior to the engine hitting the street or track. Quality workmanship backed with matched statistical performance information is hard data to argue with!

# NEEDS A DYNO?



**The Trackmaster  
XS-211 "Gold"**

Shown with cart and base module  
(included) and optional  
gauge package

## Shops that perform the following services should have a dyno:

- General Out-of-Vehicle Service
- Engine Overhauling/Rebuilding Performance Testing
- Performance Engine Builder/Retailer
- Salvage and Restoration Work

## Benefits:

- Gain new customers
- Add engine performance services to existing customer base
- Create customer confidence and satisfaction
- Increase shop credibility
- Verify engine performance records
- Measure performance quality before and after service
- Detect assembly deficiencies before chassis installation
- Generate additional income and charge more for your work



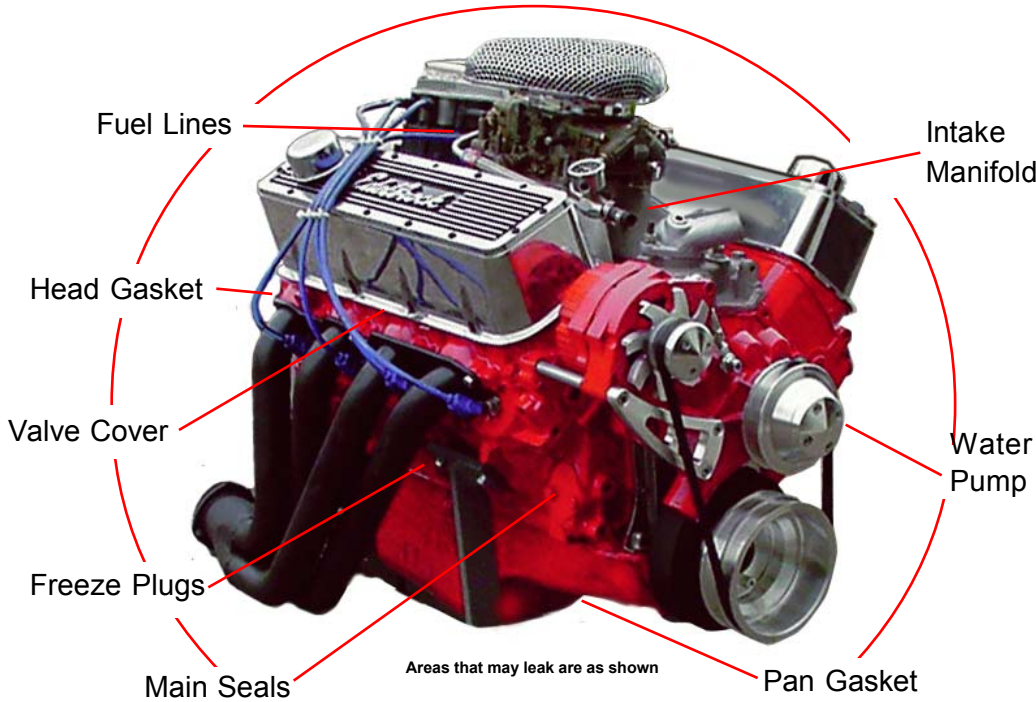
# Why You Need A Dynamometer

## Engine testing and power verification

Dynamometer testing is the only true means of performing power verification on an engine.

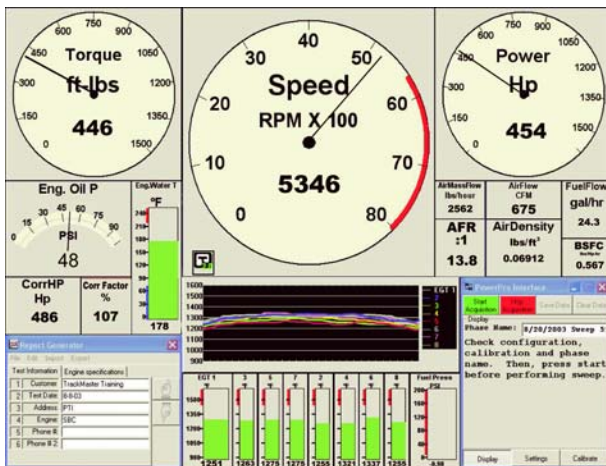
## Check peak power and torque

Horsepower and torque give the engine dyno operator or engine builder a solid basis for making modifications in the engine's tuning or to the engine itself. If horsepower and torque go up, the modification was probably correct. If they go down, the change was probably incorrect. Some of the many tuning variables are; carburetor size and jetting, intake manifold selection, cam grind and timing, ignition timing and advance curve, the headers primary tube diameter and length, collector diameter and length and carburetor spacers. A engine dynamometer with computerized data acquisition can accurately measure torque and rpm, then calculate horsepower.



Check for leaks that may only appear under load

## Monitor fuel consumption



PowerPro Main Display Screen

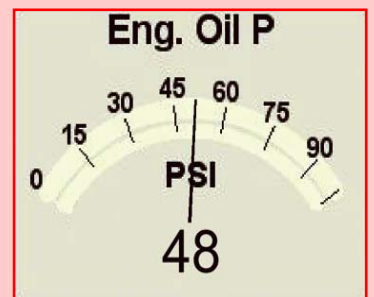
Time	Speed (RPM)	Power (HP)	Eng. Oil Pressure (PSI)	Fuel Flow (gal/hr)	Air Flow (CFM)	BSFC (lb/hr/HP)
12:41:01	3000	251	35	1.25	6.25	13.8
12:41:02	3000	251	35	1.25	6.25	13.8
12:41:03	3000	251	35	1.25	6.25	13.8
12:41:04	3000	251	35	1.25	6.25	13.8
12:41:05	3000	251	35	1.25	6.25	13.8
12:41:06	3000	251	35	1.25	6.25	13.8
12:41:07	3000	251	35	1.25	6.25	13.8
12:41:08	3000	251	35	1.25	6.25	13.8
12:41:09	3000	251	35	1.25	6.25	13.8
12:41:10	3000	251	35	1.25	6.25	13.8
12:41:11	3000	251	35	1.25	6.25	13.8
12:41:12	3000	251	35	1.25	6.25	13.8
12:41:13	3000	251	35	1.25	6.25	13.8
12:41:14	3000	251	35	1.25	6.25	13.8
12:41:15	3000	251	35	1.25	6.25	13.8
12:41:16	3000	251	35	1.25	6.25	13.8
12:41:17	3000	251	35	1.25	6.25	13.8
12:41:18	3000	251	35	1.25	6.25	13.8
12:41:19	3000	251	35	1.25	6.25	13.8
12:41:20	3000	251	35	1.25	6.25	13.8
12:41:21	3000	251	35	1.25	6.25	13.8
12:41:22	3000	251	35	1.25	6.25	13.8
12:41:23	3000	251	35	1.25	6.25	13.8
12:41:24	3000	251	35	1.25	6.25	13.8
12:41:25	3000	251	35	1.25	6.25	13.8
12:41:26	3000	251	35	1.25	6.25	13.8
12:41:27	3000	251	35	1.25	6.25	13.8
12:41:28	3000	251	35	1.25	6.25	13.8
12:41:29	3000	251	35	1.25	6.25	13.8
12:41:30	3000	251	35	1.25	6.25	13.8
12:41:31	3000	251	35	1.25	6.25	13.8
12:41:32	3000	251	35	1.25	6.25	13.8
12:41:33	3000	251	35	1.25	6.25	13.8
12:41:34	3000	251	35	1.25	6.25	13.8
12:41:35	3000	251	35	1.25	6.25	13.8
12:41:36	3000	251	35	1.25	6.25	13.8
12:41:37	3000	251	35	1.25	6.25	13.8
12:41:38	3000	251	35	1.25	6.25	13.8
12:41:39	3000	251	35	1.25	6.25	13.8
12:41:40	3000	251	35	1.25	6.25	13.8
12:41:41	3000	251	35	1.25	6.25	13.8
12:41:42	3000	251	35	1.25	6.25	13.8
12:41:43	3000	251	35	1.25	6.25	13.8
12:41:44	3000	251	35	1.25	6.25	13.8
12:41:45	3000	251	35	1.25	6.25	13.8
12:41:46	3000	251	35	1.25	6.25	13.8
12:41:47	3000	251	35	1.25	6.25	13.8
12:41:48	3000	251	35	1.25	6.25	13.8
12:41:49	3000	251	35	1.25	6.25	13.8
12:41:50	3000	251	35	1.25	6.25	13.8
12:41:51	3000	251	35	1.25	6.25	13.8
12:41:52	3000	251	35	1.25	6.25	13.8
12:41:53	3000	251	35	1.25	6.25	13.8
12:41:54	3000	251	35	1.25	6.25	13.8
12:41:55	3000	251	35	1.25	6.25	13.8
12:41:56	3000	251	35	1.25	6.25	13.8
12:41:57	3000	251	35	1.25	6.25	13.8
12:41:58	3000	251	35	1.25	6.25	13.8
12:41:59	3000	251	35	1.25	6.25	13.8
12:42:00	3000	251	35	1.25	6.25	13.8

PowerPro Fuel Consumption Report



PowerPro test printout with Performance Multi-phase graph

## Check oil pressures under load



Oil Pressure display from PowerPro Software Main Display Screen



Optional Analog Gauge Package for Trackmaster System

## Check for unusual vibrations and noise

This may indicate other problems that effect engine performance.

# Dynamometers Allow For A Controlled Run-In



Engine break-in routines specified by cam and ring manufacturers can be accomplished under controlled conditions. Blow-by can even be monitored as the piston rings seat. Pre-heating the engine can be easily accomplished under light load.

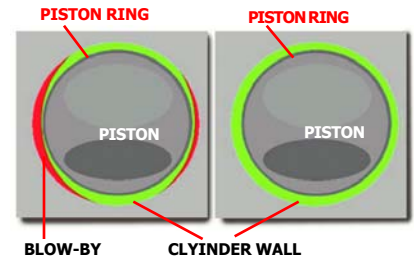


## Break in bearings, rings, & cylinders in a controlled manner

- Monitor oil consumption
- Check oil for particles
- Record crankcase pressure

## Minimize oil consumption, fuel consumption, and emissions

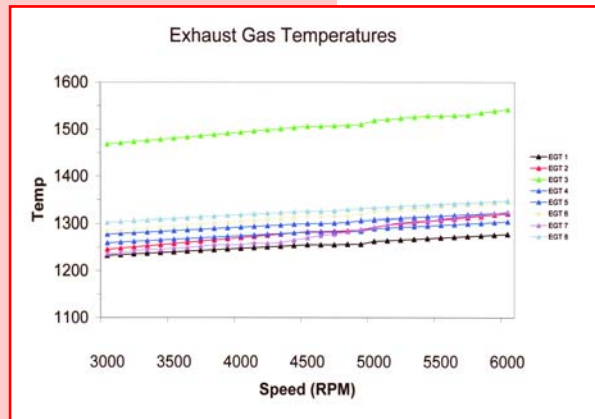
- Proper break-in improves ring/cylinder fit



## Analysing exhaust gas temperatures from dyno tests

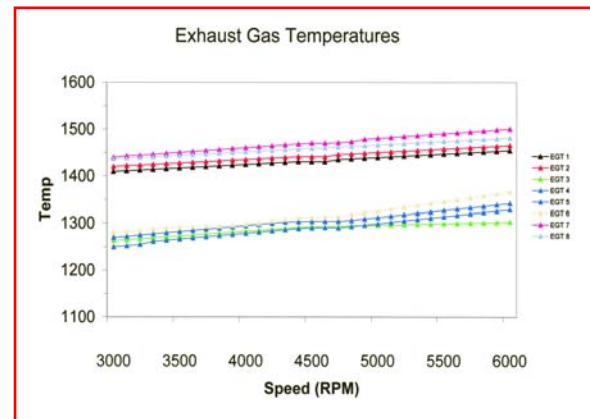
Exhaust gas temperatures (EGTs) are even more important than horsepower and torque numbers for tuning carburetor size, carburetor jetting, fuel distribution, and carburetor spacers. The two test results shown below detail the information available from dyno testing.

Engine #1



Engine #1 test results show that cylinder #3 is running significantly leaner than the other cylinders. This piston could be at risk of melting. Catching this during a dyno test enables you to fix the problem before it causes expensive damage.

Engine #2



Engine #2 test results show the four corner cylinders running much hotter (leaner) than the center cylinders. Knowing this information before the engine is put in the vehicle, allows the engine builder to make important decisions and changes to maximize the engine's performance, and minimize problems.

## Q: Can dyno tests wear out an engine?

**A:** With the use of proper technique, dyno testing does not wear out an engine. When an engine is subjected to out-of-chassis testing, its parts may fail from a myriad of circumstances. Some of the failures may be due to the condition of the engine prior to testing. Factors to be considered are; the amount of miles that are on the engine, whether the parts were stock or replacement, the quality of the workmanship during those repairs and the overall maintenance of the engine. In many cases older, stock engines are used as "mules" to practice dyno techniques and system tests with no unusual problems occurring. Here is one example:

*A small block 360 engine with 40,000 miles, forged pistons and stock 1973 heads (with 50,000 miles on them) was pulled over 140 times on a dyno before any problems occurred. Ninety-nine percent of the tests performed were full throttle sweeps run from 2500 to 5500 rpm. Eventually, an intake valve head sank into the cylinder head. This was due to a lean condition from additional carburetor spacers. A fuel distribution problem caused the #2 cylinder's EGT to consistently be above 1500°. This caused the header tubes to overheat and the valve to sink into the cylinder head. This problem would no longer allow the engine to run above 4900 rpm without floating the valve.*

*Soon after, the engine was disassembled and no unusual signs of wear were found. The bearings, main and connecting rod were intact and then reused. In summary, there wasn't any excessive wear caused by the dyno tests. \**

The purpose of out-of-chassis dyno testing is just that - to test an engine's reliability and performance. If an engine part fails during the dyno test, there is a strong probability that it would have failed at some point anyway. It is better to identify a potential problem during a test and then repair it, than to have it fail in the vehicle, which would make repairs more difficult and costly.

\*Example courtesy of [www.RevSearch.com](http://www.RevSearch.com)



# Dynamometers Create a Competitive Advantage



Owning a dynamometer and data acquisition system will help you maintain your competitive edge. As a business owner it is important to offer your customers new and innovative services that benefit the performance of their vehicles, as well as reinforce the credibility of your workmanship. Below are some of the competitive advantages you will create by owning a dynamometer.

## WITH A DYNO YOU CAN:

- Ensure that engine quality is proven, and rework is minimized!
- Build customer confidence in the workmanship of your engines.
- Allow for a true evaluation of out-of-chassis performance.
- Measure and inspect for power, leaks, tuning problems and vibrations.
- Prove the rebuild quality before the customer takes delivery, confidently minimize warranty claims and customer complaints.

Time	SpeedRPM	EngineRPM	PowerHP	PowerKW	CrankcasePsa	ExhaustFlowCFM
0:00	1000	1000	100	73.5	0.0	0.0
0:05	1000	1000	100	73.5	0.0	0.0
0:10	1000	1000	100	73.5	0.0	0.0
0:15	1000	1000	100	73.5	0.0	0.0
0:20	1000	1000	100	73.5	0.0	0.0
0:25	1000	1000	100	73.5	0.0	0.0
0:30	1000	1000	100	73.5	0.0	0.0
0:35	1000	1000	100	73.5	0.0	0.0
0:40	1000	1000	100	73.5	0.0	0.0
0:45	1000	1000	100	73.5	0.0	0.0
0:50	1000	1000	100	73.5	0.0	0.0
0:55	1000	1000	100	73.5	0.0	0.0
1:00	1000	1000	100	73.5	0.0	0.0
1:05	1000	1000	100	73.5	0.0	0.0
1:10	1000	1000	100	73.5	0.0	0.0
1:15	1000	1000	100	73.5	0.0	0.0
1:20	1000	1000	100	73.5	0.0	0.0
1:25	1000	1000	100	73.5	0.0	0.0
1:30	1000	1000	100	73.5	0.0	0.0
1:35	1000	1000	100	73.5	0.0	0.0
1:40	1000	1000	100	73.5	0.0	0.0
1:45	1000	1000	100	73.5	0.0	0.0
1:50	1000	1000	100	73.5	0.0	0.0
1:55	1000	1000	100	73.5	0.0	0.0
2:00	1000	1000	100	73.5	0.0	0.0
2:05	1000	1000	100	73.5	0.0	0.0
2:10	1000	1000	100	73.5	0.0	0.0
2:15	1000	1000	100	73.5	0.0	0.0
2:20	1000	1000	100	73.5	0.0	0.0
2:25	1000	1000	100	73.5	0.0	0.0
2:30	1000	1000	100	73.5	0.0	0.0
2:35	1000	1000	100	73.5	0.0	0.0
2:40	1000	1000	100	73.5	0.0	0.0
2:45	1000	1000	100	73.5	0.0	0.0
2:50	1000	1000	100	73.5	0.0	0.0
2:55	1000	1000	100	73.5	0.0	0.0
3:00	1000	1000	100	73.5	0.0	0.0
3:05	1000	1000	100	73.5	0.0	0.0
3:10	1000	1000	100	73.5	0.0	0.0
3:15	1000	1000	100	73.5	0.0	0.0
3:20	1000	1000	100	73.5	0.0	0.0
3:25	1000	1000	100	73.5	0.0	0.0
3:30	1000	1000	100	73.5	0.0	0.0
3:35	1000	1000	100	73.5	0.0	0.0
3:40	1000	1000	100	73.5	0.0	0.0
3:45	1000	1000	100	73.5	0.0	0.0
3:50	1000	1000	100	73.5	0.0	0.0
3:55	1000	1000	100	73.5	0.0	0.0
4:00	1000	1000	100	73.5	0.0	0.0
4:05	1000	1000	100	73.5	0.0	0.0
4:10	1000	1000	100	73.5	0.0	0.0
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6:55	1000	1000	100	73.5	0.0	0.0
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10:45	1000	1000	100	73.5	0.0	0.0
10:50	1000	1000	100	73.5	0.0	0.0
10:55	1000	1000	100	73.5	0.0	0.0
11:00	1000	1000	100	73.5	0.0	0.0
11:05	1000	1000	100	73.5	0.0	0.0
11:10	1000	1000	100	73.5	0.0	0.0
11:15	1000	1000	100	73.5	0.0	0.0
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14:30	1000	1000	100	73.5	0.0	0.0
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14:50	1000	1000	100	73.5	0.0	0.0
14:55	1000	1000	100	73.5	0.0	0.0
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