Bay Area Engine Modelers Club, Branch 57 of EDGE&TA

The Crank Calls

October 2014

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NEXT MEETING
October 18, 2014 at
Chabot College, building 1500
25555 Hesperian Blvd, Hayward 94545
Doors open at **9:00 AM**
Meeting starts at **10:00 AM**

Upcoming Events

BAEM meetings: 3rd Saturday of the month

MEETING NOTES

September 13, 2014
Bob Kradjian

President, Don Jones called the meeting to order at 10:00 am.

VISITORS: Edward Stanley saw us at the Good Guys show at Pleasanton and decided to give us a look. Thanks, Ed, we hope you'll stay with us.

FIRST POPS: There were none reported.

EVENTS: The Blackhawk Auto Museum Show September 27 - Members Aldrich, Gilmore, Jones displayed engines.

TREASURER'S REPORT:. Our balance is in the green. We have $1,000 due owed us to offset WEME show expenses for the compressor and fuel.

CLUB BADGES: If you need a badge, contact Mike Rehmus (mrehmus@byvideo.com) who has offered to produce them.\

WEME REPORT: We received two congratulatory messages from the Good Guys management on a successful show.

John Palmer reported that no EDGE & TA meetings are scheduled. While we are no longer using their insurance coverage, we will still be members of Branch 57 but only if we pay $4.00 per member per year. Consider this and we will vote on this September 18.

Paul Chretien and Ken Richter who came up from Southern California representing the Southern California Machinists displayed engines at our show. Their club meets at the El Camino College in Torrance. See www.SCHSM.org for a generous report on their visit to WEME. They had a fine display and both hope to return next year. I plan to review their newsletter by e-mail and perhaps others will be interested as well.

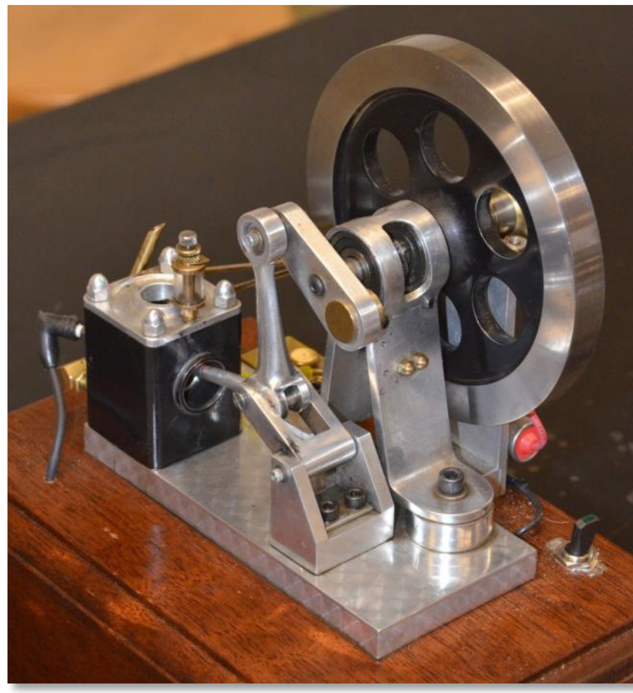
For members who missed the August show, go to You Tube (youtube.com) and type in:

"BAEM goodguys show 2014"

It was mentioned in the last newsletter that Randall Cox and John Vietti made the long trek from Wyoming for the Pleasanton show. However, we have received very sad news from John. Randall passed away two weeks ago. He had been treated with chemotherapy for his leukemia following the show, and suffered complications that led to his hospitalization. Our group has had a long and rich relationship with Randall. We met him first at the PRIME shows in Oregon and were intrigued by his ingenious and thoroughly original designs. His modesty and marvelous sense of humor made it a pleasure to be in his company. He developed the visible four and six cylinder engines with a modular design that he also made into V-twins and singles. His Hoglet V-Twin is a classic and will be made for many years to come. His Briggs and Stratton cylindered giant Hoglet powered his motorcycle and he was developing a new twin based on a small auto engine that he showed us at the August show. Randall mastered nearly all phases of the machining arts and was unique and fine human being.

Mike Rehmus and John Palmer would like to have help from members who can help with the preservation of the historical Wright brothers engine. They need a meticulous review of the drawing sets for the engine and a collection of all the redline corrections. These will be collected in one place so that the CAD files can be corrected. This will allow future use of the drawing set to make model or full-sized engines. Check with Mike for details.

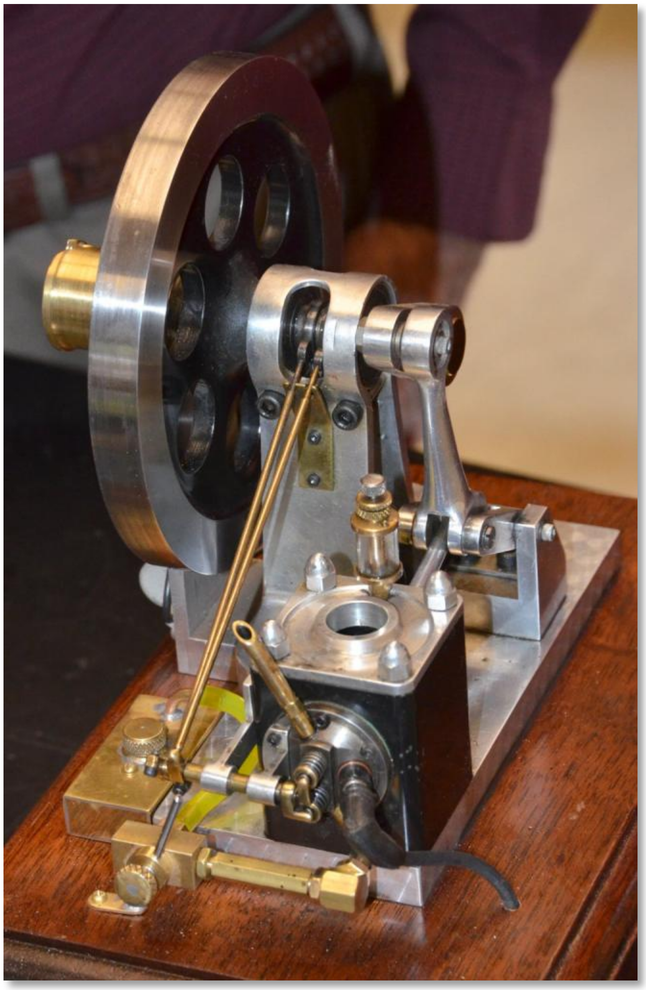
BITS AND PIECES:



Dwight Giles showed us one of three Atkinson Cycle engines that he built many years ago. The carburetor design was not satisfactory, so Dwight fitted a new design to the three engines. Recently all three engines were brought together and were all running well. George Gravatt also made some of his usual, fine modifications to his Atkinson.

An interesting discussion of the features of the 1886 engine followed. It's worth recalling that the unusual features of that engine were chiefly a result of attempts to avoid the Nicholas Otto patents. A feature of this design is that all four of the stroke cycles are contained in a single revolution of the engine.

For a full understanding of the Atkinson principles, it would be best to search Google where you will find a host of nice videos and animations. These work a good bit better than mere words. A Gingery book is available on how to build an Atkinson Cycle engine and is listed on You Tube. A build article was also featured in a Home Shop Machinist build series.

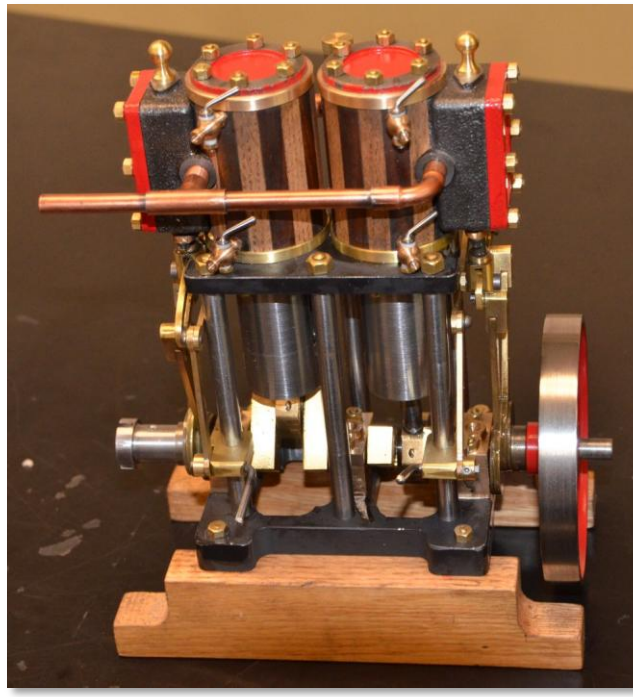


Another view of Dwight's Atkinson

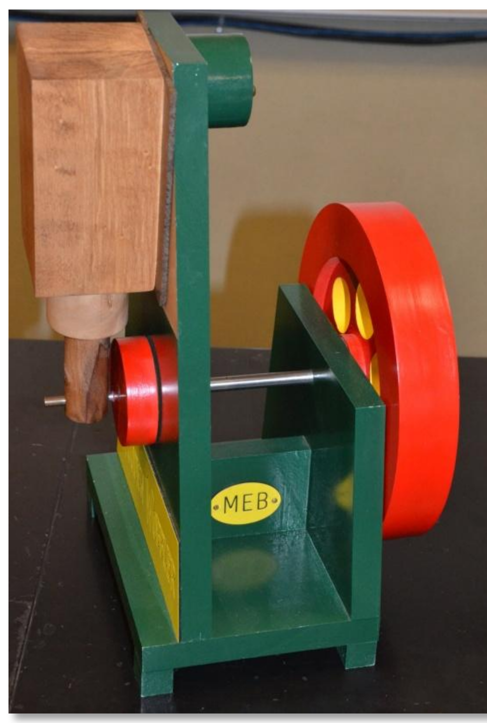
Jan Ridder has a fine depiction of the Atkinson with a glass cylinder and a graphite piston allowing the combustion to be seen. See the video at www.ridders.nu.

American engineers have taken this extremely old design and brought it up to date as a power unit to use with their hybrids. Lexus and Prius are using Atkinsons as well as several other manufacturers. Don Jones showed us a list of them.

"The Gingery Atkinson Cycle Engine" is the title of a You Tube offering



Jim Bove showed us another of his ingenious contrivances. This one is a fine steam engine using PM Research cylinders and flywheel. He describes it as an "off the wall project" It has a ninety degree crank and will start any time air is provided. It has the usual fine ingenuity and finish we associate with Jim's engines.



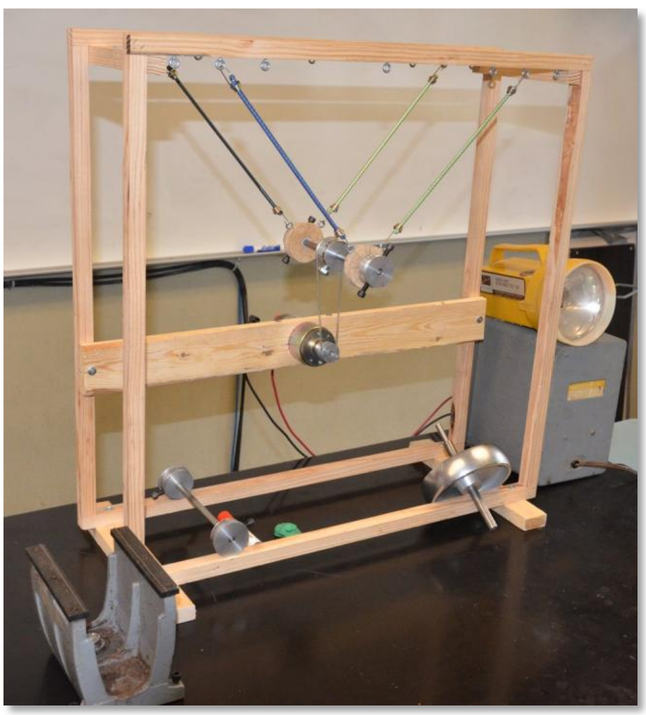
The 1991 "Wooden Wobbler" built from medium density fiberboard was shown by Mike Rehmus and Carl Wilson. It was designed by a UK builder, who gave Mike permission to print the plans. The piston and cylinder were made of hardwood. Mike gave out a number of plans to attendees at the show. However, Carl reported that it was "more difficult than advertised" to build. Wood parts shifted with time and alignment of bearings was a bit tricky. Dwight remarked that the engine is nearly silent, but the vacuum motor is noisy.

Steve Jasik kept us up to date on his adventures with a ZR-1 Corvette engine. This engine was a specialty beast designed by Lotus, built by Mercury Marine, and installed by GM. Steve designed an ingenious specialty tool for removing the notoriously stubborn spark plug boot assembly. He is making these available to the Corvette family.

Carl Wilson then followed with another of his detailed and erudite expositions of a complex subject, the balancing of rotating components.

TECH TOPIC:

Carl Wilson



I started with a narrow rotor that was very nicely machined but had an obvious heavy spot when placed upon the static balancing stand. Upon inspection the rotor rim was seen to be eccentric to the shaft. The rotor turned about the center line of the axle bearing surfaces until the heavy "spot" was down. The unbalanced weight was distributed all around the circumference of the rotor, but the force of unbalance was summed as a single weight at a specific location – the high point of eccentricity.

From this several definitions and conclusions were derived: first, a rotor has an axis of rotation – a theoretical line that passes through the center of shaft bearing surfaces. Second, unbalance is a material condition of the rotor where the weight of the rotor is not equally distributed about the axis of rotation. Third, unbalance may be thought of as a single point at a specific location and may be corrected by removing weight at that location or adding weight 180º around the circumference. Fourth, unbalance is a natural state of affairs and there is no such thing as perfect balance. How close do you need to get and how much time and money are you willing to spend?

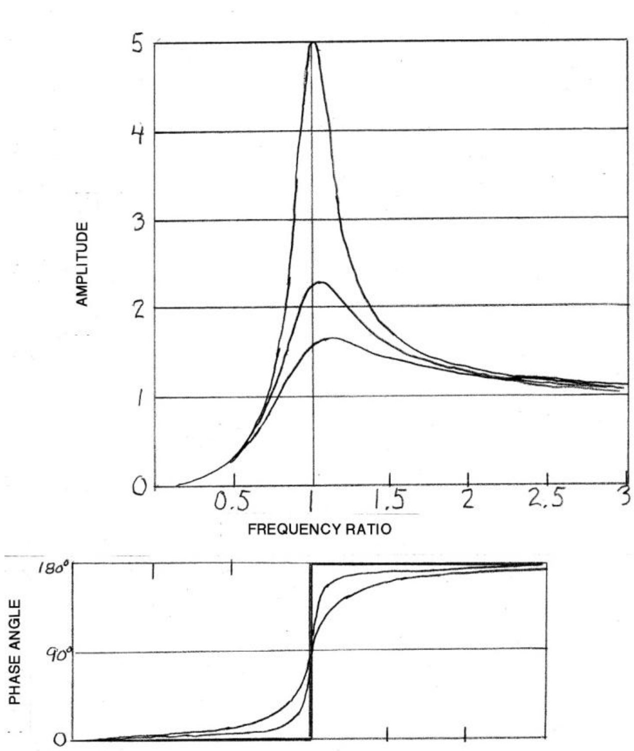
The first demonstration was **static** balancing: the location of the heavy spot is determined after the rotor has stopped moving. This simple system cannot determine the amount of unbalance, that is done by trial and error, but nonetheless good work may be done. The major limitation of this method is that gravity is the only force operating to determine the point of unbalance. Minor imperfections in the rotor bearing surfaces and the rails of the balancing stand will limit the accuracy of the balance correction achieved. Ball bearing stands are limited by friction within the bearings.

The other method of balancing is **dynamic**: the rotor is spun in bearings by an electric motor. The bearings are flexibly supported in a manner that allows the rotor to move in a horizontal plane under the force of unbalance. This motion is sensed by pickups and the signal is sent to a balancing amplifier. The amplifier is an analog computer that determines the amount and location of unbalance.

This system has several advantages: rotating an unbalanced part on its bearings brings centrifugal force into play and this force may be much greater than that of gravity. The force of unbalance increases as the square of the rotor rpm. This magnification of force makes it possible to achieve finer qualities of balance. Second, dynamic balancing machines can display both amount and location. Third, they may be calibrated so that the exact amount of correction may be displayed in terms of weight. From that a chart of weights, for example, what weight does a 1/8" hole drilled 1/8" deep with a 118º point drill remove.

But even more important is that dynamic balance may detect conditions of unbalance that are invisible to static methods. The next demo clearly showed this: a long rigid rotor with discs on each end and a cap screw in each disc 180º apart. The static stand showed this rotor to be in good balance, but the dynamic stand showed it to be very much out of unbalance. Each end had to be balanced separately by adding a weight to the disc at 180º to those that established the unbalance.

Summary: short (narrow rotors) may be balanced either statically or dynamically. Long rigid rotors usually **must** be balanced dynamically. Static balancing stands are simple and may be jury rigged for the job at hand. Their operation is simple and intuitive but the trial and error method may take time. Dynamic balancing machines are more complex, require more training and experience to operate but offer the advantages of being able to balance both short and long rotors to a high degree of accuracy.



I talked at length about these two graphs and as I'm running out of room in the newsletter I will only summarize what they show. The top graph shows amplitude of movement of an unbalanced rotor plotted against rpm for a dynamic balancing machine. The motion builds from slight at slow speeds to violent motion at some speed – this speed is the critical rpm for this rotor and the condition is known as resonance. As the rotor speed increases, the motion declines rapidly and eventually settles at nearly constant amplitude.

The lower graph shows an even more interesting phenomenon: at speeds below the critical the rotor runs heavy side out. As the rpm transits through resonance the angle of the heavy spot changes from zero, passing through 90º, and eventually settles at 180º, i.e., the light side runs out. These effects place limits on the effectiveness of trial and error methods that rely upon marking the high spot with chalk or another medium.

Dynamic balancing machines of this type must run at rpm's considerably above the critical and each run must be made at the same rpm. More on this next month.