The Crank Calls

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

President.....Ken Hurst.....(707)257-2481.....kwh1588@aol.com
Secretary.....Bob Kradjian.....(650)343-7585.....bkradjian@aol.com
Treasurer.....Lewis Throop.....(650)941-8223.....throop@aol.com
Editor.....Jim Piazza.....(408)446-4825...jpiazza@ix.netcom.com
Tech Topics..Scott Overstreet.(650)941-3714...scott@becklawfirm.com

June 2002
www.baemclub.com

NEXT MEETING
15 June, 2002
AT 10 AM
AT
Robert Schutz's Shop
366 40th St.
Oakland, CA

Ladies and Gentlemen
Start you engines! This is a "Run your engine" meeting. Bring your engines big and small. Let's run them all.

BAEM Meeting Notes
May 18, 2002
Bob Kradjian, Secretary

My deepest thanks to Carl Wilson who produced the following excellent report in my absence. I am sure that you will agree that he did a terrific job. Thanks Carl!

The guests at our May meeting were the featured speakers for Tech Topics, Jim Duncalf and Giovanna Villanueva of enEco, Inc. The Tech Topics column will have a report on their newly developed engine.

Our financial wizard, Lew Throop, has parlayed our paltry dues into a respectable portfolio of $1800. He didn't mention any vacations planned for the near future, but maybe we'd best think about buying those canopies soon! Last month's raffle brought in $87 which is a significant portion of one of those canopies. The guys who represent our club at the concours and auto shows would like to buy two of 'em keep the sun off of their heads. Getting a little thin up there? Thanks for your support of this project.

Ken Hurst reported briefly on the Hillsborough Concours d'Elegance. He liked the Doble steamer. Thirty four of these condensing flash steamers were built and sold at about $5900 in the 1930's. There is a web site on these cars: . Bob Kradjian, Dick Pretel, Pat O'Connor, George Gravatt, Steve Myers, and Steve Jasik represented our club at this event. See Bob's report for more details.

Pat O'Connor brought his model of the Bourke engine. Although this engine is finished it has not yet celebrated its first pop. Pat says that he has not yet put in the time to sort out the various problems. The Bourke engine is a 2 cylinder 2 stroke design, with the pistons connected by a solid rod which drives the crankshaft via a Scotch yoke. It utilizes under piston compression for scavenging the exhaust and inducing the new fuel charge into the cylinder, so there is probably a rod gland seal at each side of the crankcase. The fuel charge does not go through the crankcase so there is no dilution of the oil. But the piston lubrication would have to be by an oil fuel mixture. Of course both pistons move simultaneously in the same direction, so the engine was probably difficult to balance. Quite extravagant and unsubstantiated claims were made for the performance of this engine: "The exhaust is so cool that we run it through the block to cool the water!" Fifteen to twenty of the original engines exist today. They were 30 cubic inches displacement and produced a claimed 114 hp. This model was a fine accompaniment to our featured engine in Tech Topics because it had some similar features and Jim Duncalf studied this engine during the development of his. More information on the Bourke engine at: http://bourke-engine.com/index1.htm

Carmin Adams showed his model of a 25 hp Fairbanks-Morse hit-n-miss engine made from a kit by Tom Stuart. This is his first igniter engine; his others used spark plugs. After making igniters for this engine and for his two 3 cylinder engines he comments "I think that spark plugs are here to stay." Soft iron such as nails are frequently recommended for the contact points in igniters because they have better sparking characteristics but Carmen used tungsten points and increased the current through the ignition coil by increasing the voltage. He is now using 12v. Remember that the ignition points are inside the cylinder and also function as the spark plug, and that the coil has a single low tension (voltage) winding, so the problems encountered in ignition for these engines is a bit different than for the high voltage systems. Tom Armstrong uses a ballast from a small fluorescent light for a coil and someone else suggested using a doorbell transformer.

Chris Leggo brought the auxiliary engine and pumps for his steam tugboat. This engine had one steam cylinder driving two pump cylinders via levers. The air pump maintains the vacuum in the main condenser so that the main engine is always exhausting into a vacuum. The boiler feedwater pump returns the condensed water to the boiler to be reused. All this was built into a nicely designed, compact package.

George Gravatt had the two Upshur 4 stroke farm engines made by Dwight Giles. He has improved the performance of these engines by fitting OS carburetors. There is, of course, no prototype for this modification. It is not scaled from anything that was seen in the 1920"s. The carburetors of the time were a bit crude. This then is part of the venerable hot rod tradition. Want better performance?: work weekends at the local gas station, save your money, buy a kit and bolt it onto your engine. What's next for this one? Mallory ignition and Iskenderian cams?

Irv Stevenson's engine is distinctive: It has 6 cylinders and only 5 moving parts and goes up and down and 'round and 'round on steam or air. The plans for this engine were in Popular Mechanics many years ago and a similar engine was in one of the hobby magazines, probably Home Shop Machinist. Irv also told about seeing Doble steam engines being installed in Chevrolet cars by Bessler, the builders of the flash steam boilers. VW's also got the treatment, but none of these ventures were a commercial success. This was probably being done in the 50's or 60's.

John Palmer calls his 4 cylinder engine the Round Engine, that being all that he knows of its history. He got it from Mel Cotton's surplus store in 1947. Two of these were pushed off the end of a truck onto the ground and John bought the one that didn't break. The woman who sold these as junk told a sad story about an inventor husband who developed these in the late 1930's to early 1940's and promised her a fortune when Detroit learned of what he had made. The fortune never materialized. He had probably spent a lot of money on the project then inconveniently died or disappeared and the wife wanted those engines gone. Her loss was John's gain, but he sure would like to know more about the designer. A lot of work went into those engines but the design looks very impractical. John says they will probably never run.

John Palmer also showed a connecting rod from his third full size copy of the Wright brother's Model B engine. The rod is assembled by threaded connection of a tubular shank to bronze bearing castings. The tubular shank was machined from the solid by drilling and boring. No problem you say? Try boring a 1 1/16" by about 7" long hole through an entrance hole of 3/4" diameter: that is the hole through the two ends is 3/4" diameter by about 1" long and the hole through the rest of the shank, all 7" of it, is 1 1/16". Add a radius at both ends where the large hole blends into the 3/4" hole and you have a problem. John says that just getting rid of the chips was difficult. Both ends of the rod are threaded, so the procedure is to assemble one bearing casting with a thread locking compound and then trial assemble the other end. The bores of the castings will probably not be parallel so the threaded boss of the second casting is faced off until all is well. The rod shown in the picture has not been babbitted.

TECH TOPICS

by Scott Overstreet

Carl Wilson was having such a good time taking notes for Bob Kradjian that after I asked Steve Jasik to introduce our speakers-I just couldn't bare to take over his position as scribe. Then you know how it goes - you let a guy take notes, and he wants to write the article. Well - why not – here is Tech Topics Carl Wilson style.

Steve Jasik introduced our guest speakers for Tech Topics: Jim Duncalf and Giovanna Villanueva, the Engineering and Marketing Depatments of enEco, Inc. Steve met them at Modern Machine in San Jose and, upon learning that they had developed and were marketing an innovative 2 stroke engine, asked them to make a presentation to the club. Jim and Gio talked about the design, construction, and intended market of the enEco engine and then showed a brief video of a proof-of-concept ultra-light aircraft engine running at 2000 rpm.

The major markets for this engine is any application which currently uses 2 stroke engines for their high power-to-weight ratio and which are being threatened by more stringent emission controls. This includes outboard motors and other personal water-craft, scooters, lawn and garden equipment, and ultra-light aircraft with a displacement of over 50cc. Another possible application is the internal combustion side of hybrid automobiles.

The principal claims they make for this engine are:

1. Better efficiency than conventional 2 stroke engines
2. Lower emissions than 2 stroke engines
3. Fewer parts, less weight and cost than 4 stroke engines of same power
4. Less vibration than either type of engine

Let's mentally assemble one of these engines to see how these claims are achieved. This will be like Christmas Eve: Some Assembly Required. But stick around, no tools are required. We were not shown all of the parts because some of them are not yet patented, so some imagination will be required.

The general assembly drawing reveals that this is a round engine much like radial aircraft engines. It is definitely not an in-line design, and it is not a radial engine either because there are always an even number of cylinders evenly spaced around the case. The first parts out of the box are, for our model, the two cylinders. They look very much like regular air cooled 2 stroke cylinders with fins, sparkplug hole, and ports in the cylinder wall. At the bottom of the cylinder by the bolting flange is the mounting surface for the reed plate. We know now that this is a loop scavenged 2 stroke engine. Put one cylinder to the left and the other to the right leaving space for the case.

The next parts are the pistons and now you see that something is very different. There is a hemispherical combustion cavity in the crown, and below that the piston rings: that's OK, but what happened to the wrist pin hole? It's not there. And the piston is much shorter than usual. Where is the skirt that guided the piston in the cylinder? This piston looks much like one from a double-acting steam engine! No, wait a minute! That's the wrong technology. It looks like a piston from the Bourke engine. Just take a regular piston and saw off the bottom below the piston rings and you will have a piston for the enEco engine.

Here are the piston rods. They are round and straight and very finely finished. One end is machined to attach to the piston. The other end has some kind of roller bearing assembly. Well, we know about the roller bearing connecting rods used on the Mercedes-Benz racing engines of the 1930's, or was it the Auto Union? But this bearing is backwards, there is no hole for a crankpin: the inner race of the bearing is fastened to the rod. The outer race is free. Let's not assemble the rod and piston until we see where that bearing goes.

These big aluminum castings are obviously the cases. They almost look like the crankcases for the 500cc BMW motorcycles. The cases are split on the vertical centerline and have mounting surfaces on the side for the cylinders. But the intake and transfer passages to allow the air-fuel-oil mixture into and out of the crankcase is missing. And over here is an oil dipstick. This is definitely not a normal 2 stroke engine. Most 2 strokes do not have closed crankcases with an oil sump.

We've done pretty good so far; we've been able to identify most of the parts and match them with other engines with which we are familiar. But these parts are a puzzler: two annular cylinders with a mounting flange and a shaft seal in the center. Let's try that one again. Imagine a bushing with rather thick walls and not too long.
At one end is a mounting flange and in the bore of the bushing at the same end is a shaft seal. The flange fits inside the cylinder mounting surface in the case and the seal must be for the piston rod. Let's see - the piston rod has to slide through its shaft seal from the inside of the case to the outside, then the piston fastens to the rod, the cylinder goes over the piston and bolts the case. The knee bone connected to the hip bone, the hip bone connected to the .... Now when the piston descends in the cylinder what is going to happen with that annular cylinder? It just fits inside the piston and look where the intake and transfer ports are.

Remember back when 2 strokes dominated motocross racing? Mechanics were stuffing bits and pieces into the nooks and crannies of the crankcase to reduce the unswept volume. This increases the crankcase compression ratio. The fuel-air charge is under higher pressure at the beginning of its transfer into the cylinder and there is better and quicker scavenging of the exhaust gases and filling of the cylinder. This under piston plug in the enEco engine does the same thing: it fills the space under the piston and increases the compression ratio of the pumping volume. The difference is that this space is under the piston but above the case. The rod seal separates the two volumes. No fuel and air ever goes into the cases. Just lubricating oil.

We're getting down to the bottom, the bottom end, that is. The last parts out of our kit box is what should be the crankshaft but isn't. It's the camshaft. Cams in a 2 stroke? Well, of course they don't operate the valves, there are none. The cams control the motion of the pistons and rods. There is an inner and outer cam that are mounted on the mainshaft. Together they form a cam track and the bearing assembly on the inner end of the piston rods ride in this track. The cam mechanism converts the reciprocating motion of the piston and rod into rotary motion of the mainshaft. There is one more detail: the side thrust imposed on the rod by the cam. This force is reacted by system of gibs mounted in the camcase below the cylinder mounting flange. These prevent the inner ends of the rods from moving sideways.

This system of cams controlling the motion of the piston and rod and converting their reciprocating motion into rotary motion of the mainshaft is the key to the enEco engine and makes possible the claims for its advantages:

It requires very much less oil in the fuel than regular 2 strokes, and with the use of ceramic coatings it may be possible to eliminate the fuel-oil mixture. This reduces the emission of pollutants. The next generation engine will use direct injection of fuel into the cylinder and only air will circulate under the piston.

It is inherently balanced. The primary forces cancel because the pistons move opposite to each other and fire at the same time. There are no unbalanced secondary forces because the "big ends" of the rods do not rotate, and there are no rocking couples because the rods lie along a common line.

The combustion is more efficient because the constant acceleration cam allows more time at top and bottom dead center for inducing and burning the fuel.

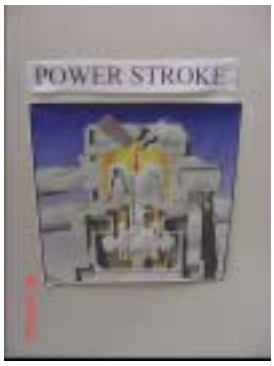
Our thanks to Jim and Gio for their presentation. Scott Overstreet can have the last word: Someday we may be able to say "Well, the designer of that engine told me all about it back in '02"

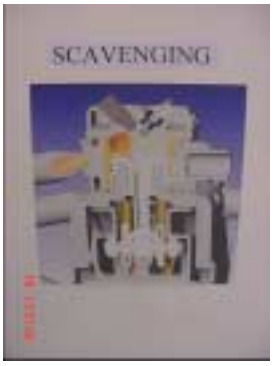
What's on for Tech Topics in June? Nothing, that's what. No formal meeting, no Tech Topics, no set chairs - just engines and the more running the better. Bring in the ones you are building too. Our June meeting is like our Christmas meeting without the eats: engines, fumes, and the roar of exhaust. Some pop - pops too.

The best news is that Gio Villaneuva has agreed to compete for the BAEM Challenge Cup: once around the block with her enEco powered scooter, vs our host Robert Schutz on his electric bicycle. Stay tuned, this one should be fun.

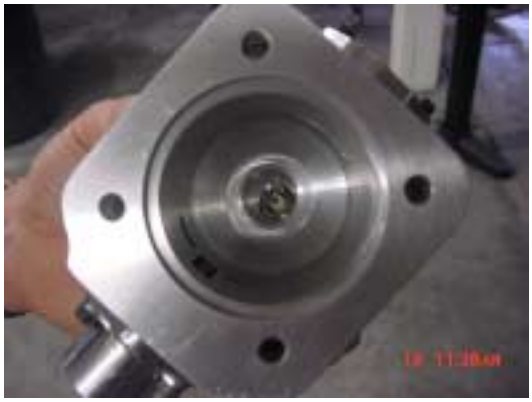
Thanks Carl, very nice job and I sure did enjoyed the break.

Scott





en Eco engine cycle graphics.

Eco head views.

Guests Jim and Gio speaking to the interested club members.

Irv Stevenson's steam engine (above and below)..

George Gravatt's Upshur Farm engine.

John Palmer's Rotary engine.

Bob Haagenson's latest V-8.

Cris Leggo's steam auxilary engine and pumps.

Carmin Adam's
Fairbanks Morse
(t, r and below.).

BAEM Club June 02 meeting.

Bob Kradjian's Seal Minor

John Palmer's Wright con rod (above).

Pat O'Connor's Bourke.