# melling's motocross

## Is there a future for four-strokes in motocross?

### By Frank Melling

■ The one aspect of motocross that has caused me more trouble than any other is the subject of four-strokes. Over the last three or four years I have dared to suggest that there might be a place for the valve engine in motocross, and I have been accused of displaying unprofessional bias toward British bikes and reactionary attitudes more befitting an old veteran than someone involved in modern motocross. The alleged felony was compounded, it has been said, by the fact that not only have I argued in favor of four-strokes when I felt they deserved it, but gave public witness to these feelings by purchasing a four-stroke of my own and by racing it regularly. In doing so, I was labeled a "four-stroke enthusiast" (which is not the same as being enthusiastic about four-strokes) and conversely, "anti-two-stroke."

Not surprisingly, I have become very reluctant to enter into discussions regarding four-stroke However, the correspondence that has appeared in our "Chain Reactions" column has finally goaded me into making some comments. Initially, I propose to discuss facts and give a minimum of personal opinion. I believe that the statistics I quote are accurate, and they are presented in good faith from personal experience. I mention this because they may well annoy some four-stroke fanatics and two-stroke zealots.

As of this writing, the only four-stroke motocross machine offered for sale is Triumph's T. 50 Avenger, a not-too-inspiring production line version of the old 1971 Grand Prix BSA. During the transition from competition shop to production line, the bike gained 80 or so pounds and lost four or five bhp. This means that the Avenger is grossly overweight for modern motocross and is also slightly underpowered.

Since the BSA/Triumph machine has been the only four-stroke dirt racing bike offered for sale, a lot of American riders and writers have considered it a fair representative of the breed. This is

quite understandable and no one can be criticized for such an assumption since competitive four-stroke machines are rarely, if ever, seen in America. However, such phrases as "Thumpers," "ancient designs" "four-stroke dinosaurs" and "old-timer's bike" are not justified. Amazingly, these terms of condescension even carry over to Honda's ultra-modern designs, which must be very insulting to the brilliant Japanese engineers who conceived the XL range.

To describe a single cylinder four-stroke engine in these terms is wrong, simply because the motor not only does not need more sophistication but would probably be the worse for it. The BSA engine, when built properly, is a really good racing unit, producing the right sort of power and with good reliability as a bonus. Its design faults are mostly minor, and if the gearbox selector mechanism were improved and the crankcase breathing modified, nothing could prevent it from winning races when housed in the right chassis.

The Honda is even more attractive, not for its four-valve head (which many pundits consider to be an advertising stunt) but rather for its light weight and longevity, both of which are better than the BSA's.

Weight is the key problem with all four-stroke motocross machines and particularly those sold to the public. Perhaps it is best to begin by looking at two-strokes and then comparing the two types of machine. Most motocross machines at present weigh over 230 pounds ready to race. Some time ago I owned a works Bultaco that tipped the scales at 238 pounds even with the substitution of magnesium hubs for full-width alloy ones. Now it is possible, with a little bit of thought, to get a Pursang down to around 215-220 pounds, which is still a long, long way from the 200 pounds that some optimists claim. With a big bike, such as the 400 Husky, the weight will be 245-250 pounds complete with fuel.

Having accepted the fact that a two-stroke weighs in excess of 230 pounds, then with the addition of valve gear, a heavy flywheel to spin the big piston over compression and four pints of oil, a racing weight of 245 pounds for a four-stroke becomes realistic. My own Cheney BSA, even though equipped with an electron rear hub, weighs 248 pounds and it really is difficult to determine how weight could be

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trimmed without resorting to magnesium castings and titanium nuts and bolts. Thus it can be said with some certainty that any BSA-engined machine will be slightly—but not noticeably—heavier than most open class motocross machines.

The Honda engine opens a whole new vista, for with the alternator removed and a lightweight total loss electronic ignition system put in its place, the XL is a light engine in either its 250cc or 350cc form. Eric Cheney has just completed a new cantilever-framed bike using the 250 XL as a power unit, and this tips the scales at 212 pounds complete with oil and fuel. Now that really is a competitive weight for a production machine. Better still, the 350cc version, now in the last stages of completion, weighs only four pounds more and should give a similar sort of power output to the BSA engine, which has won innumerable races throughout the world.

However, while the Cheney is a production bike in that replicas will be made for general sale, it is still a hand-built work of art in which every ounce of weight is carefully watched. This is possible when the designer is also the works manager and every one of the employees a motocross enthusiast, but the exercise becomes very much more difficult in a factory where motocross machines are just units of production, containing so much steel, so much alloy and so much profit. Whether a mass-produced four-stroke could ever be made sufficiently light is a matter of conjecture.

If we accept that a four-stroke could be competitive in weight, then there are many advantages to be gained from this type if engine. The first is increased drive. A four-stroke will always give better drive than a two-stroke at the same rpm because it has only one power stroke in every four revolutions. This means that for three revolutions there is decreasing power being applied to the back wheel and this gives better drive, much in the same way that a trials rider will close the throttle on a muddy climb to gain extra grip. In practical terms, the four-stroke is much easier to race—particularly if the rider is not an

expert—because it finds grip so much more easily.

This increased drive explains why a four-stroke engine can be competitive while apparently producing less power than its two-stroke contemporaries; that is, it converts far more of its power into drive, and hence acceleration, than does a two-stroke, which has a natural tendency to produce wheelspin. Thus, a figure of 36-38 bhp is normally considered adequate for any use up to and including the Grands Prix, providing there is a good spread of power. When I raced a factory BSA, my engine gave just over 35 bhp at 5,250 rpm and this was dynamite at the amateur level. Certainly in the two years that I owned the bike, I was never once beaten for speed (although countless times was found lacking in skill!) on a wet or loose track, and only the then-new and all-conquering Maicos would out-accelerate the BSA on a dry track providing perfect traction.

It would seem that it is easier to tune a four-stroke single to give good torque at low revs and produce maximum power low down than is the case with a two-stroke engine. The works BSA engines produced maximum torque very low in the rev band and peak power often came in under 6,000 rpm, but the motors were reluctant to rev much above this. When they do rev, the good pulling characteristics are often lost and the power delivery can become harsh and unpleasant. It is possible to produce an engine which is both pleasant to ride—having a good spread of power—and will rev freely, as Cheney proved with John Banks' 1973 Grand Prix bike, so no doubt it would be possible to manufacture an engine from the drawing board up with good motocross characteristics, if someone were sufficiently interested.

The final advantage of the valve engine is in engine braking. A four-stroke single simply stops dead in its tracks when the throttle is closed, and with good brakes speed can be reduced at quite a remarkable rate. Engine braking also provides a useful method of steadying the bike when things get a trifle exciting, and can be of great help in momentarily reducing speed—for example, when lapping a back marker who is getting in the way.

Finally, since the four-stroke does not normally belch out clouds of oil in the exhaust fumes (unless, of course, the motor is ill), it is possible to get a far lower hydrocarbon emission rate than is possible with even the best two-stroke engines. And the way emission laws are shaping up, this could be an important factor in the not-too-distant future. Added to this is the four-stroke's exhaust note, which while not inherently less noisy than that of the two-stroke is far more pleasant on the ear and somehow manages to sound much quieter.

I hope that in this initial discussion I have laid out some of the pertinent facts that will influence the future of motocross in the years to come. In the next issue I will discuss the future of the four-stroke engine and throw in some of my own opinions for good measure. ●