Engines, Engines and More Engines

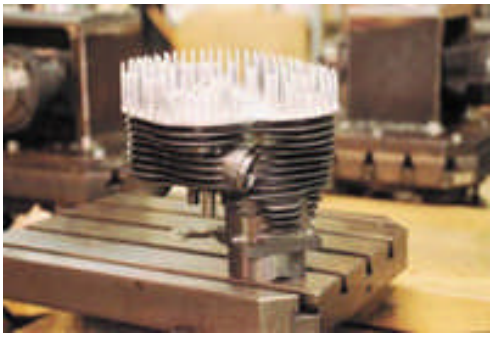
This is a guide to the aftermarket engine market, giving advice and pointing out what is available. It is not a completely comprehensive guide as much more space would no doubt be needed than is available here. There are also some very good books on the market which I shall mention at the end for further reference. Most people who consider purchasing an OEM or aftermarket engine do so for one of a few reasons. These fall into two broad categories: 1. Replacing an existing engine 2. Custom Bike Build The variety of engines is very wide. What I will attempt to do here is to summarize what is on the market and what makes them different. An approximate purchase price may also be mentioned.

Flathead®
Knuckle Head®
Panhead®
Shovelhead®
Evolution®- will be referred to as 'Evo'
Twin Cam®
Panhead Evo
Sportster®
Feuling 3 cylinder motor

Before considering size, type or power characteristics consider what your riding style is. Most riders' thrills come more from lightning acceleration than ultimate top speed. Even if you have a powerful motor capable of taking you to 150mph, how many riders wish to be riding a Softail® at that speed and would they have any teeth left in at the end? One of the many potential benefits a big V-Twin has is the ability to make good mid range power and harnessing that characteristic will give most riders what they need and also makes good sense when trundling round at lower speeds. If most riders are honest (this also applies to the speed freaks among us) the majority will travel at speeds between 0 and 40mph for most of the time and excluding long distance runs on the motorway. If you have a heavy bike or a purely touring bike good mid range torque is even more important. The Harley and its custom variants are basically all touring bikes, however much we try and bastardize them into something else. They were not designed to scratch round corners at breakneck speed and only perform really well in a straight line at moderate speeds. No doubt there are a few headbangers reading this who have some very fast machines, but I would suggest they are a minority and that the majority ride bikes as described. The aftermarket engine choice is quite wide and you can have your chosen engine in capacities in excess of 200cu inch (3000cc) and as low as 74cu inch for shovel and Sportster® engines. Many opt for an S&S 96in engine because of price/power considerations. It is indeed a good buy. However there are many different engines on the market which are more than worthy of consideration. If you are building a custom bike that deems to be 'different' then consider a 'different' engine! Higher power output or larger displacement doesn't automatically lead to a higher price. Whereas a high compression piston won't cost much more to manufacture than a low compression piston, port flowing and more exotic parts will. Two engines both producing 156BHP can have a price difference of £3000 due to the choice of components. The S&S 96in engine can cost less than lower displacement engines due to their greater production volume bringing costs down.

Flathead®

This rather ancient Harley engine went out of production at HD® many years ago. Over the last few years there has been a revival of interest in this engine, led by a company in Sweden called 'Flathead Power' They can be found on the web www.flatheadpower.com



Knuckle Head®

The previous paragraph also applies to this engine too. The name 'knuckle' comes from the shape of the rocker boxes. Picture below is a custom version built by Accurate Engineering.

Panhead

I didn’t have a picture of an original Panhead motor and the picture below is, strictly speaking, a custom built Panhead Evo. Built by Accurate Engineering.

Shovel®

This variety reigned from 1965 to 1984. Although HD® no longer makes this engine (apart from spare parts), there are still many loyal adherents to this engine world-wide, especially in Scandinavia. A few aftermarket manufacturers make cases, cranks, cylinders, heads, cams etc. and complete shovel engines are still readily available at a good price. Advances in materials and manufacturing make the shovel engine a better engine now than in the past when HD® made them. S&S make Shovel® long blocks and S.T.D. make shovel heads and cases. Other aftermarket manufacturers make many other components such as cases, cylinders, cams and big bore kits to give you a bigger shovel. Blue printed engines from 79in to 103in start from around £5000/US$6500/7500 Euro. Shown below is a modern build by Accurate Engineering.

Evolution® or Just 'Evo'

This is the variety of HD® engine which is the one copied and improved on by the aftermarket manufacturers. It has many improvements compared with its predecessor in the area of combustion efficiency, heat dissipation through the use of alloy cylinders, stronger bottom end and a myriad of many minor but valuable changes. Most aftermarket Evo engines use cases of similar dimensions (case wall thickness may be greater, plus other detail modifications). There are two variations to this: a) Big bore engines with bores bigger than 3-13/16in. These have lifter bores moved outwards and require a longer pinion shaft

b) Big bore engines that use a 4 cam case that use Sportster® cams and heads. Rivera sell a RMB case to this specification. One factor to consider before purchasing one of these cases, is that many exhaust systems won't fit!

Twin Cam®

HD® have improved on the Evolution® motor with the Twin Cam®. This comes in 'A' and 'B' versions. The 'A' is fitted to the Dyna® rubber mounted engine frames and the 'B' version has an internal engine balancer which makes for a vibration free installation in the softail® models. Many aftermarket frames can now accommodate this motor. It makes a good basis for a custom bike.

Panhead Evo

This is a hybrid engine made up from a) Evo bottom end b) Shovel cylinders c) Panhead heads with pan rocker covers. d) Panhead shape cam cover having the oil filter mount where the generator would have been located. A long chromed oil filter gives the impression of being a generator. The heads can be flowed and engine made in sizes from 80in to 103in and with various degrees of tune can produce up to 100BHP. It has the looks of a Panhead the greater efficiency from the Evo bottom end and later oil pump and alternator charging for use with modern and custom electrics. One can see from the picture that its retro looks could form the basis of a custom bike. Care has to be taken in selecting an exhaust pipe that will fit both engine and frame.

Pan-Evo

This is basically an Evo engine with a) Pan shape cam cover to take the oil filter mounting b) Aftermarket Pan shape rocker covers that fit straight on to the Evo heads.

Sportster®

The only way to obtain a complete engine easily is to buy a genuine HD® engine from a HD® dealer or an engine specialist. Expect to pay in the region of £4000/US$4000/6000 Euro Some engine builders (especially in the US) will build you an aftermarket engine. Some parts will still be HD® parts, although STD and S&S now make Sportster, cases/complete motors and Axtell make a variety of cylinder & piston kits. Zippers make high flow oil pumps and windage plates to reduce internal oil drag. Other suppliers make longer stroke cranks and stroke/bore increases are possible to take the engine out to 1800cc or thereabouts. One of the most cost effective options to modifying a stock 883 is to get it bored out to 1200cc. You can pay someone to modify your heads using the stock HD® kit or fit Wiseco pistons that require no additional work. Purchasing an aftermarket engine is not as easy and because the demand is low, prices may be relatively high. The Sportster® engine comes complete ready to 'slot' into a custom softail® frame to form the basis of a very cost effective custom bike. Look at the exhaust section to see a good example of a Sportster® based custom bike. If you want a 200cu in – see below.

Feuling 3 Cylinder www.feuling.com

Feuling produce a three cylinder engine that offers as standard a very high power and torque motor that is still fairly new and may yet catch on. Frames to take this motor are rare... Penz Performance in Austria make one. Retail price for this motor is US$24000. It uses standard OEM style transmission/final belt. Look at frame section for details.

MSO - Manufacturers Statement of Origin Make sure this important document accompanies your high priced new engine and don't part with any money until you are sure this will be supplied. You may need this to register your custom bike.

Guarantee - Limited guarantees are usually available with engines. Written ones often have much small print to avoid liability from the seller. The seller on the other hand has no idea how the bike/engine will be used/abused after it leaves them. Nor has the seller any control over further mods that either may take the engine away from its designed use or the engine may just be incorrectly installed. The seller may understandably be very circumspect

about any reported faults. The best guarantee you can get is: a) the engine is built by an established engine builder with a reputation to boot, b) the engine is purchased from an engine specialist who satisfies a), c) 'Blue Printed' engines that can add further guarantees for future reliability, providing the competence of the builder is of a high standard. Beware of builders or sellers who use the blueprinting aspect as part of the sales pitch. Seek some assurance and proof that blueprinting has taken place in the engine build.

Blue Printing - All engines are built from parts that are made within certain tolerances. When parts are made they will end up: a) slightly smaller b) dead on c) slightly bigger. To ensure that all manufactured cylinders all have the exact same bore would push up production costs and therefore the cost to you, much higher. All parts are made to certain minimum and maximum measurements which although not spot on, will still allow your engine to work more than adequately. Blue printing ensures your engine is built from parts with the optimum tolerance between those parts and that the crank and other moving parts have the optimum balancing built in. The effect of this is to a) reduce running in period b) minimize vibration caused by parts being either a bit tight or a bit slack c) increase the engines reliability and longevity. This process will put the purchase price up but it is very worthwhile if you can afford it.

Tuning an existing engine - There is an abundance of bolt on and not bolt performance parts available from a plethora of aftermarket suppliers, most of which are no doubt going to help you achieve extra oomph. How much you spend will depend on how rich you are, but before you proceed to spend your hard earned readies, consider this. A new 96in complete engine costs as low as £4200/US$4200/6200Euro. To sell your 1340 engine would realize £2000/US$2000/3500Euro approx. depending on condition. If you were planning to spend less than you could get from selling your motor it might be cost effective to go this route to more performance. A good set of aftermarket heads would set you back £1200/US$1200/1800Euro and wouldn't give you the 100BHP from a 96inch engine. There are other factors to consider but this is the bottom line - money! So think carefully before you splash out on new heads, cams, pipes, ignition etc. If you are thinking of spending more than £2000/US$2000/3000Euro on your existing engine - don't - consider buying a new engine. However buy with care and be very choosy who you buy from!

Long Block or 'Complete' Engine - A long block is usually an assembled engine which is minus rockers/rocker boxes, pushrods/pushrod tubes, ignition/coils, alternator/regulator, oil filter mount and sometimes the cam cover. Unassembled engines can also be purchased and put together yourself, but unless you are a competent engine builder I would suggest you don't try that route. Penny wise, pound foolish is very apt in this case and could lead to a very costly engine, taking account of future rectification. The assembled long block can also be an unwise purchase for a number of reasons. Firstly to complete it you need to be competent in selecting the appropriate parts to finish it off. Secondly you will need to source the finishing parts at reasonable prices. Going this route could push the final cost above that of purchasing a 'complete' engine. So, do your costing carefully before you spend a penny. An engine excludes the Primary, Transmission and Starter, something although obvious to most people, is sometimes forgotten. Check that your chosen engine will fit into the intended frame and works with the primary/transmission/final transmission/ rear wheel/tyre. Some larger engines are taller and will not fit a stock frame. Custom frames can be specified to take taller engines.

Complete Engine - Before you buy a complete engine find out from your supplier what is included in the package. Headquarters make complete engines without carb, coil, alternator/regulator but with an oil filter mount. Other builders include or exclude certain parts with their 'complete' engines. When comparing prices list all the parts you will need and compare the different builders prices against your specification. If you choose to buy a partially complete engine because of the lower initial cost, you may well pay more eventually than buying a complete engine in the first place. Ask your engine supplier for the prices of additional parts. They may give you a good deal because of the amount you are spending with them.

Supplier - If you are buying from a supplier who buys in from a builder find out who the builder is. You cannot tell from the outward appearance of an engine whether it was built by a competent or incompetent builder. A few engine distributors have engines built in semi third world countries by cheap labour. A few of you may have heard of the engines built in Mexico that have gone up in smoke! Don't forget that any company can obtain good quality parts from companies like S&S and manage to put them together to produce a 'long block' motor. They may not be built in a clean environment or have the correct torque settings used on the bolts. Outwardly they would look identical to a good quality engine. Occasionally there will always be a rogue defective engine part that will fail and maybe cause an expensive problem, but most failures are due to incorrect fitting and assembly of parts, or, incorrect blend of parts. So, ask and find out as much as possible before you hand the readies over. And on no account do a cash deal - with no record of the money transaction you have even less protection if things go wrong. Believe me the engine will go wrong if you go for cheapness against

quality. If you have paid £500/US$500/750Euro less for an engine of dubious quality and origin, you'll pay more for the problems later. If you are in business and buying engines for retail, dissatisfied customers will cost you even more! If you want advice on the most suitable engine go to someone who sells a wide range, otherwise someone with a narrow range may understandably try to persuade you to buy only what they want to sell. Another aspect of engine purchase is price. Generally, engines built up and sold from the US are usually lower priced than engines built and sold here in Europe. I won't go into all the reasons why this should be, but if you want to buy an engine at a good price you have to buy direct from the US or from a supplier who does this. Be extra careful with cheapo deals – there may be a surprise in store a few miles down the road, plus additional unbudgeted costs!

Power Output - Find out about the engines power output. Generally 1BHP per cu inch for an Evo motor is a rough guide. More is easily achievable with the right tuning and blend of components. Make sure the right mix of mid range and top range power to suit your riding requirements is available. A good engine builder will usually be able to supply a range of engines to suit individual needs.

Engine Builders and Manufacturers - The number of engine manufacturers and builders on both sides of the Atlantic is huge and I have selected a few which offer some of the best examples of the variety currently available. Most manufacturers are located the other side of the pond and there are many good engine builders in UK/Europe who make very good engines. The aftermarket engines mentioned incorporate own make parts and have other characteristics which offer a certain distinctiveness. The prices mentioned are only a rough guide and will vary with each supplier. Remember what has been said about buying cheap.

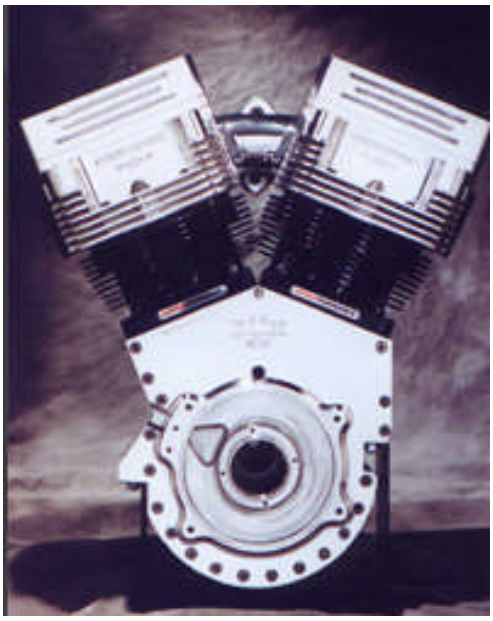
HD - Big Twin & Sportster® - These engines, if you can obtain them, are good value as they come complete ready to slot into a frame. They have been test fired and set up for use. Try your local HD® dealer or a good aftermarket supplier to find a source. Expect to pay in the region of £4000/US$4000/6000Euro for a Sportster® motor and £3000/US$3000/4500Euro to£4000/US$4000/6000Euro for a Evo/TC® motor.

Hyperformance www.kingofcubes.com

Randy Torgeson builds high performance, blue printed, big engines from 116 & 120cu in up to 156cu in (2.6 litre) They are available in assembled or unassembled form. He uses his own Ductile iron 'big jugs' cylinders and 'Mega Heads' CNC carved from billet, although some engines do have S.T.D. heads. They come with either internal or external oil lines. The 116 & 120in come as HyHorse or HyTorque varieties and are without carb/ignition/oil filter mount/alt & reg. These engines are mostly taller than stock and require custom frames. Randy is one of the worlds leading aftermarket engine builders. He also builds up 'Keck' engines and his megaheads are one of the few heads that can be fitted to Keck engines.

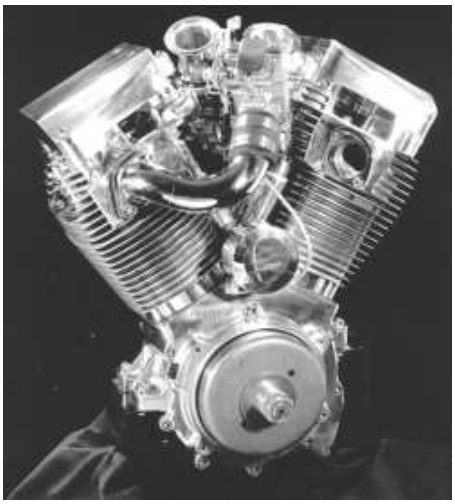
Dux Industries www.duxindustries.de

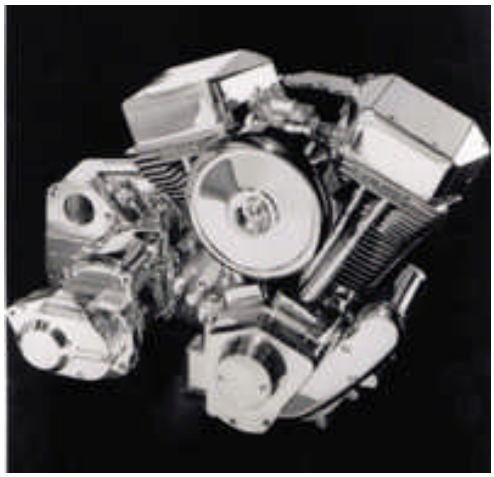
A short stroke motor of 156cu in/2.6 litre is built in conjunction with Hyperformance which has a stroke of 316/16in and a bore of 51/8in. Dux is currently working on a 176cu in/2.95litre and a 3.0+ litre engine which utilizes an SU carb that was formerly used on a supercharged Bentley of the 30's. It has titanium rods and ceramic valves with lifts of 0.800in. The billet cases are by Keck and one of the main development problems is how to make the pistons light enough (each one is nearly 1.5 litre) Dux has plans to go into volume production of a budget price large bore motor in the coming years using a mixture of S & S and Hyperformance parts.



Sputhe www.sputhe.com

This company produces two sizes of engine, 95in and 104in based on their big bore cylinders and cases. Parts that give their engines a 'different' look are their own oil pump bodies, rocker box covers and oil filter mount and together give these engines a distinctive appearance. They are blueprinted and because the extra size is due to an increased bore, the power delivery is smooth and the comfort level in use is high. These engines fit into stock frames and are an excellent choice for replacing a stock engine. Price for both engines is the same at £6000/US$6000/9000Euro. Big bore kits comprising cylinders/pistons/cases are a very cost effective means of increasing your engine size to 95in or 104in. Don't forget the magic figure of expenditure not to exceed when you are spending to increase your engines performance. These kits are to be seriously considered. They also make an 80 cu in Sportster motor with dual intake. Picture on the left is their own design 60 deg motor with dual intake.





Axtell Mountain Motor www.axtellsales.com

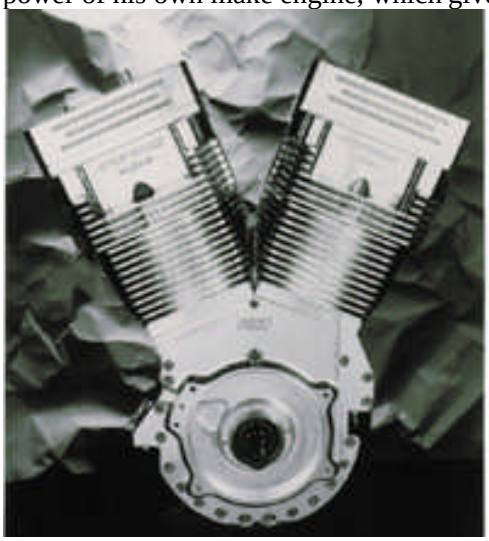
This company is well known for its wide range of cast iron cylinders as stock replacements or for use in monster road engines and track style engines. They make 97in & 106in performance packages to convert a stock motor to a bigger engine without the need to go as far as replacing the complete engine. 4 in bore kits and 'Shovolution' kits to convert a shovel to use Evo heads are available with many variations too numerous to mention here. This company's products deserve a serious examination before you think of replacing your existing engine! They also build blue printed complete engines utilizing their own cylinders, Delkron cases, Jim's tappet blocks, Edelbrock heads and Mikuni carbs. No oil filter mount or alternator/regulator, but complete in every other way make this a very good engine that will fit into either a stock or custom frame.

TP Engineering www.tpeng.com

This company assembles engines using all their own parts. Prices start at £6146/US$6995/9219Euro for a complete motor. They make their own CNC machined cast cylinders which are a cheaper alternative to billet and a smarter alternative to cast. This company is mentioned because it is a volume producer of good quality engines and is typical of the kind of company you can be sure will produce a reliable and long lasting motor. See Engine and Transmission section for more information about purchasing one of these motors.

Keck Engineering www.keckengineering.com

Ray Keck makes high tensile billet cases and cylinders out of an unspecified alloy which has qualities far superior to that used by other manufacturers. The cases have 3/4in higher decks and look very beefy indeed. His engines are square with a 41/4 x 41/4 bore and stroke to make a 120in motor. They make big bore kits which if used with stock HD® components can produce a high quality, high power 120cu in engine giving 120BHP plus, in stock form. His engines with nitrous can go up to 220BHP. These are blue printed engines and are the 'Rolls Royce' of the aftermarket engine scene. Their big bore kits include cases, cylinders and Patrick Heads. You will not be disappointed with this engine. Keck engined bike owners in the US describe it as the smoothest and strongest pulling engine they have ever experienced. Engines are taller and must be fitted into custom frames. An interesting story for all those people who insist on aftermarket components to go with a high power engine is that Ray's own bike uses a stock HD® primary and transmission to handle the increased power of his own make engine, which gives some proof that HD® stock gear is pretty strong.

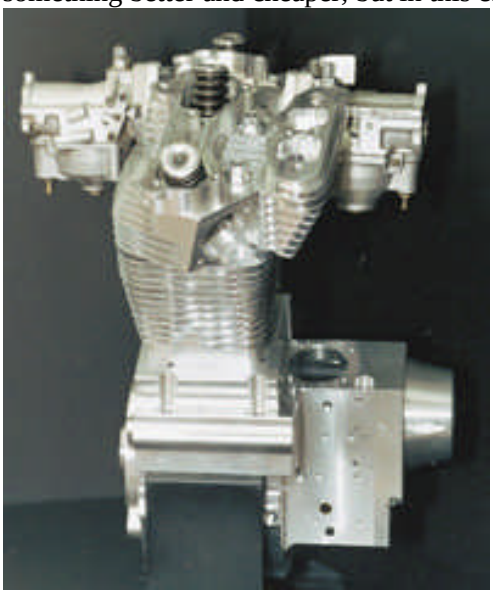


Merch Performance

A relative newcomer, this Canadian company started with cases and heads and made complete motors of high quality in sizes from 97cu in to 131cu in and power outputs up to 160BHP. Long block and complete engines came in assembled or unassembled form and have no ignition/carb/alternator/ regulator. They were all based on the big bore principle and needed custom frames with additional clearance for the heads. This company had big plans to meet S&S head on in product range and price. Unfortunately this company has recently closed for financial reasons and will be badly missed.

Shumaker Racing

This company has a history in the US drag racing scene that goes back many years. John Shumaker has tuned engines for Jim McClure and the late Elmer Trett and other big names in the business and can be classed amongst the 'greats' in the Harley engine tuning business. They make billet cylinders from 31/2in to 41/2in bore and billet heads to fit same. They also do dual intake billet Sportster® heads and build blueprinted motors from 80cu in to 153cu in. One version is a 120cu in all billet motor with dual intakes, and producing in excess of 120BHP. This has a 'square' bore/stroke of 41/4in and has been tested to 183BHP and is a very smooth motor. This engine retails for £9000/US$10800/13500Euro and is cheaper than the motors built by Keck. All their products are the highest quality and also aim to sell at prices below the opposition. It's not often you can get something better and cheaper, but in this case you can!



Accurate Engineering www.accurate-engineering.com

Although this company produces any type of engine, their specialty is the Panhead Evo, Knuckle and Shovelhead. The picture included on page 8 comes from them. Their engines come in different sizes and are tuned to a high level of power. This is a custom motor made for Cyril Huze

S & S Cycle Inc. www.sscycle.com

Many engines from the other engine builders contain S&S parts to a greater or lesser extent. Due to their high and consistent quality and competitive pricing and wide product range this company is the market leader in the aftermarket engine business. They produce nearly everything an engine needs. Complete engines and long blocks with the bits missing are available. Unassembled long blocks are often bought up by distributors to build into long blocks for reselling on. Some of these long blocks are built up without the care and skill normally required to ensure only a high quality product reaches the customer. I have referred to this aspect earlier. If you have any doubts about the history of your intended purchase, don't part with your money. S&S parts in the hands of a good builder are an excellent buy. The opposite is also true! They have in production a big bore range with a 4in bore and stroked to make either a 97in or 107in or 113in engine. Up to 124cu in is made as well as Sportster, and Shovel, motors. I predict that big bore engines will take over the aftermarket engine scene in a very big way very soon!

Mid-USAwww.mid-usa.com

Their 'Powerhouse' 114cu in motor has a 41/4in bore x 4in stroke with Carillo rods/roller rockers/2 plug flowed heads and many other detail improvements on other existing designs. This is a strong and powerful motor capable of enhanced longevity. Power of up to 135BHP with high torque across a wide rev range make this an excellent riders motor.

Mid-West Motorcycle Supply www.midwest-mc.com
This US distributor makes some of the best value, quality Evo style motors form 80 to 127 cu in. They are USA made, there is nothing too special about them, they are available in various finishes and should be top choice for any serious custom build. Check them out before any other engine on the market

Conclusion
Be careful, do your homework, decide on your budget and how to spend it, don't spend more than you have to, and look further than an S&S 96in and ask advice from someone who has everything on offer. If you are building a custom motorcycle check that your chosen engine /transmission has a frame that fits. You will certainly find plenty of choice of parts in our brochure.

Written by Alistair Harley who is the main force behind 'A R Harley & Sons Ltd' They have the widest and biggest range of aftermarket engines available in Europe and will be happy to advise on any engine purchase. Many thanks to the manufacturers mentioned who have kindly given me photographs of their wares.

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