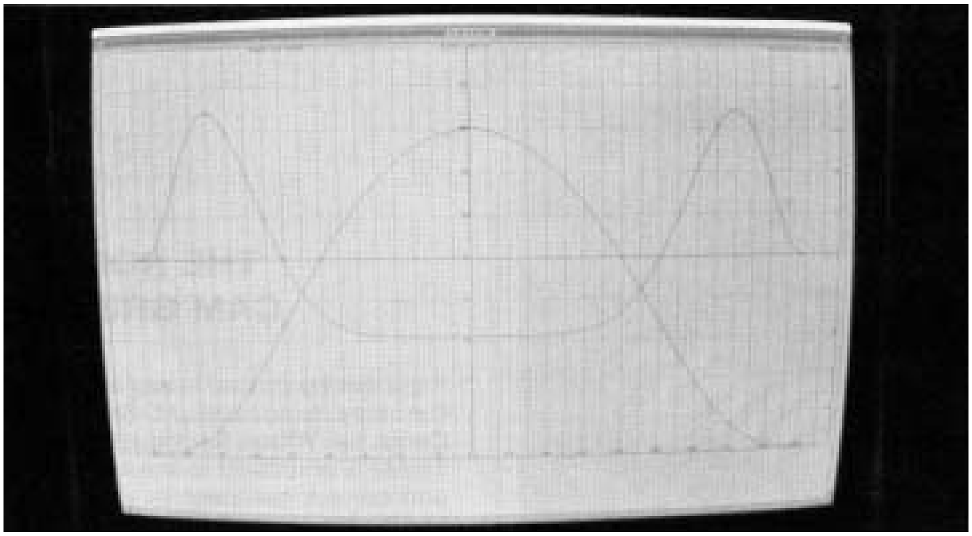
ADVANCED DESIGN TECHNOLOGY



THEN: Isky created the first Computer Designed "Polydyne Profile" Racing Cams over 30 years ago!

NOW: Today's most advanced designs are computer-generated, using Isky's exclusive SLC* Formula

*Strategic Lift Command (Patent Pending)

Basically, the purpose of a camshaft in an internal combustion engine is to open and close the valves in correct sequence. In the Otto four-cycle engine, this sequence is timed in relation to the crankshaft and pistons. The ultimate objective of the cam-shaft function is to "trap" the greatest possible weight of fuel/air mixture in the cylinders to attain 100% volumetric efficiency.

As most everyone knows, nothing starts to move or stop instantaneously. This property of matter is known as inertia. If it were not for the inertia of the fuel/air mixture, all engines would be timed to open the intake valves and to close the exhaust valves at T.D.C. (top dead center), and open exhaust and close intakes at B.D.C. (bottom dead center), and regard-less of what rpm the engine turned, 100% volumetric efficiency would then be attained.The average "hot rodder," of course, knows that this just does not work. He has learned that the exhaust opens before B.D.C. and closes after T.D.C. to take advantage of the inertia of the fuel/air mixture, and to provide greater volumetric efficiency as engine speed increases.

Therefore, a wide variety of camshafts are produced to provide various valve timing combinations for different driving applications. The various camshaft grinds carry identifying designations such as: 3/4-race, full race, track grinds, etc. The process of designing, testing, and manufacturing a camshaft is time consuming and costly. To produce a high performance camshaft, the cam begins as a mathematical computation to which manufacturing tolerances are added. Thus, when a mathematical expression, such as a cycloidal cam, is used for highspeed camshafts, the mathematical computation to which manufacturing tolerances are mathematical contour must not vary more than ± .0003 inch from the true value at any point.

The foregoing information will now be brought into a more direct relationship to camshafts. Inertia, which applies to gas flow through the induction system, also applies to the camshaft. One instant the valve is seated,the next instant the valve starts to move. As it moves off the seat, its velocity increases until it reaches its peak; it then gradually slows until it comes to a stop when fully open.It then enters a reverse procedure in the process of closing. Should the engine be accelerated too fast, separation will occur due to the high frequency inertia forces, and the valves will no longer follow the dictates of the camshaft profile. This phenomenon is known as "valve float." To overcome this,high performance enthusiasts have increased the valve spring pressure to hold the tappet in contact with the cam at all times.This worked fairly well, but as spring pressures increased it was discovered that the possibility of wear on the camshaft and tappets was also increased.

Therefore, the two most important functions that the cam designer endeavors to achieve are: the thermodynamic problem of getting the greatest possible fuel/air mixture charge into the cylinder to drive the piston;and, the equally important kinematic condition of keeping the valve train intact at the higher RPM ranges at which the engine may operate.

Early camshafts were made with contours which belonged to one of two families; the simple polynomial or the trigonometric. It was soon discovered that the polynomial curves were superior to those of the trigonometric. They provided smoother action to the valves, were easier to manufacture, and produced less vibration, wear, stress and noise while requiring less torque to rotate.

The advent of overhead valve engines presented certain problems of its own. It was discovered that in addition to the usual thermodynamic and kinematic problems present in designing an operational camshaft, a dynamic problem also existed. This required intensive research into the masses,accelerations, and elasticity characteristics of the tappets, pushrods, rocker arms and springs.

The Polydyne Profile

In the mid 1950s, with the aid of an electronic computer, the "Polydyne" formula was employed by Iskenderian engineers.This revolutionary camshaft profile combined the advantage of the polynomial equation with the dynamics of the valve train.In the operation of high speed, highly flexible systems, interior performance may be attributed to the difference between what the cam commands the valve to do and what the valve actually does. This erratic action is caused by elasticity, or by the varying degree of stiffness or rigidity of the valve train components. Therefore, the valves do not always follow the dictates of the cam profile under all conditions.

By applying the "Polydyne" formula, it was possible for the first time to design the ca shape to provide the desired valve action. This revolutionary system of cam design recognizes the fact that flexibility cannot be reduced or eliminated but, can be compensated for. However, with the advances through the years in Cylinder Head porting and induction system design, the "Polydyne" Camshafts eventually reached their design limitation.

The SLC Formula

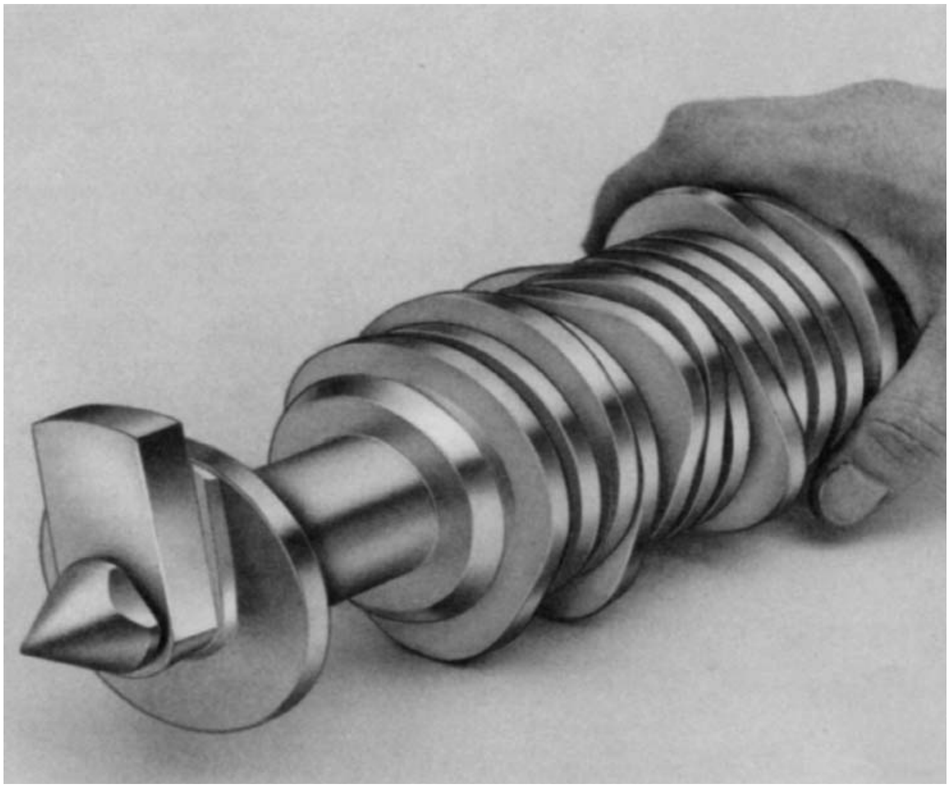
Addressing this problem led eventually to the development by Isky of the SLC* Formula (Strategic Lift Command) -- a cam design program which for the first time made it possible through careful scrutiny of the profile dynamics to achieve a near "Zero-Jerk" Acceleration Curve! The Result: Valve Control over a wider RPM Range while capturing greater area under the lift curve than ever before!

This Revolutionary new cam design program is so computation and memory intensive, for highest 'efficiency it is utilize with Isky's in house state-of-the-art Computer Systems.

Cam profiles designed by Formula SLC are so "Smooth" (higher-revving and easier on critical valve train components) many customers report no more broken rocker arms or bent pushrods as with other so-called "Computer" Cams they had been running.Top Engine Builders too are amazed to discover valve train stability so improved that valve spring problems (breakage, loss of pressure, etc.) are completely eliminated.

The SLC Formula, however, requires one condition to be successfully implemented: A high degree of manufacturing accuracy and the finest camshaft grinding equipment, like the Norton Grinder, to obtain the advantages of the mathematically computed curve. It is, therefore, obvious that any attempt to copy these profiles would be impossible without knowledge of the original mathematical equations.

In conclusion, we would like to point out that our use of computer-technology has advanced camshaft design to the degree that we can truly state that at Iskenderian Racing Cams, "The Cams of the Future are Here Today!"



DESIGN OF THE MASTER CAM

Cam design has come a long way since the old days of the simple harmonic design. This design determined the cam shape by using three separate radii -- the nose radius, the flank radius, and the base circle radius. Today, this simple method is considered primitive because of the difficulty encountered in accurate inspection, and its poor highspeed performance qualities. The simple harmonic has been replaced with a more exacting method of plotting the cam contour, the "polar coordinate" method. This method consists of computing the shape of the cam in 1/10th-degree angular increments to the fifth decimal point (.00001) or the nearest 10 millionths of an inch.

The number of man-hours required to solve the countless mathematical equations necessary to produce the polar coordinate data of the cam contour was realized at Iskenderian,and as a result, Iskenderian pioneered the use of the electronic computer and the Polydyne formula in racing cam design. The data obtained from the computer under-goes scrutinous lift, velocity and acceleration curve study. The lift curve is a graphic chart showing the actual lifting motion applied to the tappet by the cam. The velocity curve is the first differential of the lift curve and shows *the change in lift per degree of cam rotation.* Finally, the acceleration curve is the first differential of the velocity curve and indicates the change in the rate of change of lift per degree of cam rotation. It is this acceleration curve that most demandingly dictates the success of a racing camshaft.

The cam contour, having been properly determined, is now ready for transposing from the blueprint to the master cam. The master cam is a solid piece of Swedish tool steel,containing the exact lobe configuration and angular displacement of the cam lobes of the product camshaft and is the heart of the cam grinding machine. It is this master that controls the shape of a camshaft as it is ground by the grinding wheel.

THE NORTON CAM GRINDER

Rigid quality control in any industry is the secret to success. At ISKY Racing Cams, the Wilson Rockwell Hardness Tester is employed to insure uniform and correct hardness in every camshaft. Its importance cannot be over emphasized as the success or failure of a racing camshaft is totally dependent upon proper hardness.Many cam grinding companies actually "work in the dark" because they do not have this instrumentation and are never really sure of the hardness factor in their camshafts. No other camshafts can compare to those of ISKY, where inspection is an important priority.

VINCO/ADCOLE PRECISION CAMSHAFT INSPECTION

Over 45 years ago, Ed Iskenderian realized that to produce the world's finest racing camshafts required not only the finest Norton cam grinders,but the finest camshaft inspection machines as well. Combining the accuracy of the Vinco master optical dividing head with the technological advancement of the Adcole guarantees accuracy of plus or minus one second of ARC (1/3600 of one degree). It allows ISKY technicians to inspect a cam profile to within 10 millionths of an inch.

RESEARCH & DEVELOPMENT...SPINTRON ENDURANCE TESTING

The demands of Endurance Racing today are such that every manufacturer of critical engine components, (not their customers), should be testing them on a regular basis to guard against the possibility, however remote, of catastrophic failure. This point was brought home recently when a well-known east coast valve manufacturer initiated a massive recall of defective heavy-duty stainless steel valves, after their stems began "snapping off" at the keeper groove. The manufacturer's reputation, already suffering from prior embarassments concerning connecting rod failures,was eroded even further over this unfortunate incident. The lesson to be learned here is that this could have all been avoided had this manufacturer of engine components considered testing to be as important a priority as their advertising campaigns.

We at Isky Racing Cams do recognize the absolute neccesity to regularly test critical engine components such as our Endurance Valve Springs and Roller Lifters. That's why we created the most rigorous real-world endurance test ever established, the grueling Spintron® 1,000 Racing Mile Endurance Test Standard™. The first and only one of its kind in the industry, it's a test with a "Zero" Failure Tolerance, because its either pass or fail for our Racing Valve Springs & Roller Lifters-there is no gray area in between! If they don't measure up,we won't sell them-period! We have to,because we know you're depending on the Iskenderian family name to deliver the absolute maximum endurance possible in all of our valve train components. Your peace of mind and continued customer loyalty are of primary importance to us and you may rest assured we will never "cut corners" in our efforts to bring you the World's Finest Endurance Racing Valve Springs and Roller Lifters. Our reputation rides with every set!

ISKY RACING CAMS