

AMERICAN BOSCH PRODUCTS

CORRECT COUPLING APPLICATION



TRADE MARK AMERICAN BOSCH

For a good many years it has been standard practice to use, for nearly all installations, magnetos having 35° timing range and impulse couplings having 37° automatic retard; and until recently this practice has been satisfactory because a majority of engines have required an ignition advance of 30° to 35°.

However, the increasing use of high turbulence cylinder heads, high compressions, etc., has greatly reduced the average degree of ignition advance that is required by modern engines. Many engines now need a spark advance of only 15° to 25°. Among our own manufacturing customers, a large number specify magnetos having fixed ignition (0° timing) or a timing range of 20° to 25°, in place of the old standard 35°. In these cases the impulse coupling automatic retard has been reduced correspondingly from 37° to only 23° to 32°.

Serious attention should be given to this situation of changed timing characteristics because it is extremely important that the magneto and impulse coupling timing features be appropriate for the engine. Many instances have been reported of unsatisfactory magneto performance due entirely to the use of too much timing range or too much coupling retard. Other cases of trouble have been brought about by the use of a wrong combination of timing range and coupling retard on the same magneto. The whole matter has not received enough attention, or has not been sufficiently understood, in general field practice.

Unfortunately, it is not possible to formulate definite rules to govern a service man in determining what timing range and impulse coupling characteristics should be incorporated in a magneto for any given engine. In their absence, it is necessary that certain principles be kept in mind and that straightforward reasoning based upon those principles be applied in each individual case. It is the purpose of this bulletin to supply pertinent facts and to offer practical suggestions, which we hope may be helpful.

First of all, let us keep in mind the following general rules or principles:

Rule 1—

A magneto should be operated on an engine so that the normal running spark occurs with the timing arm of the magneto at, or very near, the fully advanced position. REASON: The magneto produces its best spark with the timing arm fully advanced as it is then operating at maximum efficiency.

Rule 2—

The impulsive spark of a magneto, or in other words the spark produced by the tripping of the impulse coupling at starting speeds, should occur AT or JUST AFTER dead center. REASON: If it occurs before dead center, the engine may "kick back" and injure the operator cranking it; if it occurs long after dead center, the great retard will result in a very much weakened explosion within the cylinder, causing hard starting or inability of the engine to pick up speed and rise out of the impulsive range.

Rule 3—

The automatic retard feature of the impulse coupling should not be less than the timing range of the magneto to which it is applied. As a matter of fact, to allow for production variations the automatic retard of the coupling should be at least 2° greater than the timing range. REASON: If the automatic retard is less than the timing range, no impulse spark will be produced with the timing arm of the magneto fully retarded.

Rule 4—

A fixed spark magneto is a magneto with 0° timing range. The spark is always fixed at the position which would be the fully advanced position if the magneto had a timing range. REASON: This is the position in which the best spark is produced, as mentioned in Rule No. 1.

Rule 5—

When the desired timing range for an engine is known in terms of the number of degrees as measured on the flywheel, the corresponding proper timing range of the magneto can be obtained by multiplying this figure by the ratio of the magneto speed to the engine speed. For instance, on a 4-cylinder 4-cycle engine the magneto is driven at crankshaft speed and the ratio of magneto speed to crankshaft speed is 1. Therefore 30° timing range measured on the flywheel would be equivalent to 30 x 1 degrees measured on the magneto. But in the case of a 6-cylinder 4-cycle engine, the magneto is driven at one and one-half times crankshaft speed, in which case 30° timing range measured on the flywheel would be equivalent to 30 x 1½ degrees measured on the magneto, or in other words 45 degrees.

The application of the above rules to different types of magneto installations can be well illustrated in the following cases, which are typical of those that may be encountered in field service work.

Case A—

A portable compressor powered by a conventional 4-cylinder industrial engine is equipped with a fixed spark magneto. The operator of the compressor complains that the unit is very hard to start, although it behaves satisfactorily when once running. Investigation discloses that the impulse coupling spark, when the engine is turned over slowly by hand, is occurring at a position which is five inches later than the dead center marking on the rim of the flywheel. This five inch distance is equivalent to about 20°. The position of the

impulsing spark cannot be changed by changing the timing of the magneto to the engine because this would also vary the position of the running spark, which has been reported to be entirely satisfactory. The deduction is that the impulse coupling has too much automatic retard. The cam of the coupling is changed, and a cam producing about 15° less automatic retard substituted. This results in moving the position of the impulsing spark up to within one inch after the dead center marking. This increases the power of the initial cylinder explosions and eliminates the hard starting trouble.

Case B —

A portable compressor identical with the above has been giving trouble because of "kicking back" during the cranking operation. Investigation reveals that the impulsing spark is occurring ahead of dead center. Since the running performance of the magneto is satisfactory, no change in the magneto timing is required. It is only necessary to increase the automatic retard of the impulse coupling by exchange of cams. This brings the impulsing spark to its proper location, just after dead center.

Case C —

A 4-cylinder truck equipped with a magneto having an impulse coupling starts very satisfactorily but cannot be operated at working speeds with the timing lever fully advanced because of severe "knocking". The best results at running speeds seem to be obtained when the timing lever is half way between the fully advanced and fully retarded positions. Investigation shows that the magneto was timed to the engine by means of the tripping position of the impulse coupling, and that the impulse coupling is therefore producing the starting spark at the correct time. However, the impulse coupling has too much automatic retard, for the running spark is so far ahead of the impulsing spark that the operator cannot fully advance the magneto without trouble. The result is constant operation in a semi-retarded location, which brings excessive wear on the contact points. The remedy is an impulse coupling cam producing less automatic retard, which reduces the amount of advance of the

running spark and therefore permits the truck to be operated with the spark timing lever in more nearly the advanced position.

Case D —

A 6-cylinder truck is equipped with a 6-cylinder magneto having a timing range of 25°. The magneto is timed to the engine by setting the piston on top dead center when the contacts are just opening with the timing arm in the fully retarded position. The starting performance is satisfactory but the truck is sluggish at normal running speeds and seems to have very little power. The lack of power is overcome when the magneto is retimed and set further ahead, but the starting performance is then bad because the engine "kicks" the operator who is cranking it. Obviously the magneto has too little timing range. The 25° measured on the magneto is only about 16° measured on the flywheel. A magneto having a timing range of 35° or more should be substituted.

These cases illustrate the conditions most frequently found which are due to the use of improper timing range or coupling retard.

To obtain the proper results it is always best to replace a magneto or coupling with one having identically the same characteristics as the one removed. Care should also be used to replace parts of couplings with identical parts. A careful study of the Impulse Coupling Instructions in the American Bosch Manual will reveal how the various types of American Bosch Impulse Couplings can be identified and how a change of type may be obtained by changing the position of the weights and substituting various cams. **NEVER REPLACE A SPECIAL IMPULSE COUPLING WITH A STANDARD TYPE.** Special types of couplings are always available and can be obtained from the factory.