

Technical Service Bulletin

Date: 8/12/2003

Product Description: Slip Lock Differential Additive (ADA)

Subject: Differential clutch chatter

DESCRIPTION:

Standard “open” differential configuration allows the differential to unevenly distribute power to a wheel offering the least resistance. This design, where the differential is essentially acting as a balance arm between both sides of the axle works very well in situations such as making a turn, as the outer wheel of a vehicle must travel faster than the inner wheel. However, should one wheel lose contact with the driving surface, this style of differential causes the suspended wheel to receive all the available power, while the other remains motionless.

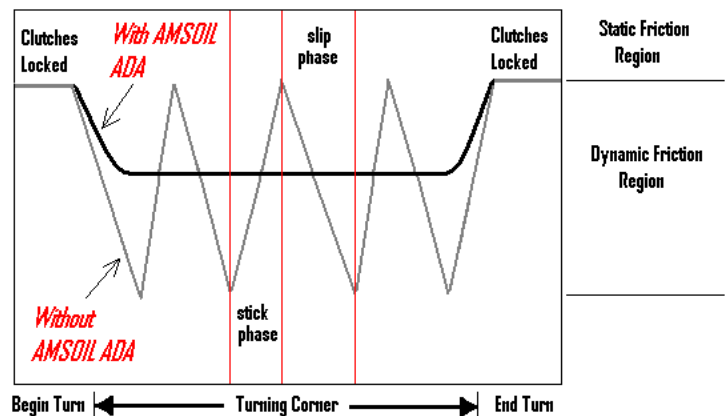
Traction-increasing devices such as limited-slip “positraction,” or locking differentials are alternatives to the “open” differential configuration, and are designed to increase traction to both wheels in any situation. Typically, these differentials contain clutch packs that lock and slip according to the situation. An example would be, when the vehicle turns, the clutches are designed to slip to accommodate for the different rotational speeds experienced by each wheel. When this occurs, it is not uncommon to experience what can be described as “chatter” or “ratcheting” in the differential housing, due to stick-slip. While certainly an annoying characteristic, there is typically no mechanical damage occurring to the differential.

Stick-slip is essentially the buildup and release of energy between the differential clutch packs during operation. This phenomenon oftentimes occurs when torque is transferred between the clutches or when rotational speeds change. During the stick-slip phase, energy is built up to a point where contact between the clutch plates change between static friction (stick) and dynamic friction (slip), resulting in noticeable vibrations. It is this vibration that causes an audible chatter or ratcheting to be heard within the differential.

In an effort to control this chatter, friction modifiers are often used. These additives result in a smoother transition between the two states of friction;

static and dynamic. Static friction occurs when the clutches physically lock together, while dynamic friction occurs as the clutches are slipping.

The chart below illustrates the effectiveness of friction modifiers on the clutch packs, as represented by the curved, horizontal line in the middle.



This line represents the effect a friction modifier has on maintaining the dynamic friction characteristics while in the slip phase and not allowing the resistance to build back up to the stick phase until the unit stops turning. At the same time, it helps to insure maximum power transfer to the wheels. The friction modifier additive can be thought of as a friction “controller,” insuring maximum clutch pack engagement while allowing the conversion from lock to slip to occur gradually.

AMSOIL Slip Lock Differential Additive is an advanced friction modifier designed to eliminate gear-housing chatter in cars, trucks and SUVs equipped with traction-control devices. It is recommended for use with both synthetic and petroleum gear lubricants and safely replaces all manufacturer recommended friction modifiers.

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