CLAIMS

What is claimed is:

1. A method of damping torsional vibrations in a drive line including a clutch, the method comprising the steps of:

controlling a clutch slip speed of the clutch, and an output shaft speed of the drive; and

wherein said controlling step includes maintaining a positive slope of a total torque of the drive line versus the clutch slip speed and wherein the maintaining the positive slope of the total torque of the drive line versus the clutch slip speed occurs at a slip speed of less than about 30 rotations per minute.

2. The method of claim 1, the method further comprising:

wherein the controlling step provides an open loop control of the clutch slip speed.

3. The method of claim 2, wherein the controlling step includes:

fully engaging the clutch for a predetermined time; and setting a clutch engagement pressure to a predetermined pressure thereby effecting a predetermined clutch slip speed.

4. The method of claim 3, wherein the controlling step further includes:

monitoring the clutch slip speed wherein the clutch engagement pressure is maintained when the clutch slip speed is equal to or less than the predetermined clutch slip speed; and

increasing, when the clutch slip speed is greater than the predetermined clutch slip speed, the clutch engagement pressure so as to maintain the positive slope.

5. The method of claim 4, wherein the increasing step includes fully engaging the clutch for a predetermined time; and further comprising reducing the clutch engagement pressure to maintain the clutch slip speed equal to or less than the predetermined clutch slip speed.

6. The method of claim 2, wherein a predetermined clutch slip speed provides the positive slope of total torque of the drive line versus the clutch slip speed.

7. The method of claim 1, wherein the controlling step provides a closed loop control of the clutch slip speed.

8. The method of claim 7, wherein the controlling step includes:

fully engaging the clutch for a predetermined time;

setting a clutch engagement pressure to a predetermined pressure thereby effecting a predetermined clutch slip speed; and

continuously adjusting the clutch engagement pressure to maintain the clutch slip speed equal to the predetermined clutch slip speed.

9. The method of claim 7, wherein the controlling step so further includes:

monitoring a clutch engagement pressure; and

wherein, when the clutch slip speed is equal to or less than a predetermined clutch slip speed, the clutch engagement pressure is maintained; and increasing, when the clutch slip speed is greater than the predetermined clutch slip speed, the clutch engagement pressure so as to maintain the positive ratio.

10. The method of claim 9, wherein the increasing step includes fully engaging the clutch for a predetermined time; and further comprising reducing the clutch engagement pressure to achieve the clutch slip speed equal to or less than the predetermined clutch slip speed.

11. The method of claim 7, wherein a predetermined clutch slip speed provides the positive slope of the total torque of the drive line versus the clutch slip speed.

12. The method of claim 1, the method further comprising:

wherein the controlling step provides a closed loop control of the clutch slip speed;

fully engaging the clutch for a predetermined time;

setting a clutch engagement pressure to a predetermined pressure thereby effecting a predetermined clutch slip speed; and

maintaining a constant clutch engagement pressure to maintain the predetermined clutch slip speed equal to the clutch slip speed.

13. The method of claim 12, wherein the controlling step includes monitoring the clutch engagement pressure wherein when the clutch slip speed is equal to or less than the

predetermined clutch slip speed, the clutch engagement pressure is maintained.

14. The method of claim 13, wherein the controlling step further includes increasing, when the clutch slip speed is greater than the predetermined clutch slip speed, the clutch engagement pressure so as to maintain the positive slope.

15. The method of claim 14, wherein the increasing step includes fully engaging the clutch for a predetermined time; and further comprising reducing the clutch engagement pressure to achieve the clutch slip speed equal to or less than the predetermined clutch slip speed.

16. The method of claim 12, wherein the predetermined clutch slip speed provides the positive slope of the total torque of the drive line versus the clutch slip speed.

17. The method of claim 1, the method further comprising:

wherein the controlling step provides the closed loop control of the clutch slip speed;

fully engaging the clutch for a predetermined time;

setting a clutch engagement pressure to a predetermined pressure thereby effecting a predetermined clutch slip speed; and

continuously adjusting the clutch engagement pressure to maintain the predetermined clutch slip speed equal to the clutch slip speed.

18. The method of claim 17, wherein the controlling step includes monitoring the clutch engagement pressure wherein when the clutch slip speed is equal to or less than the predetermined clutch slip speed, the clutch engagement pressure is maintained.

19. The method of claim 18, wherein the controlling step further includes increasing, when the clutch slip speed is greater than the predetermined clutch slip speed, the clutch engagement pressure so as to maintain the positive slope.

20. The method of claim 19, wherein the increasing step includes fully engaging the clutch for a predetermined time; and further comprising reducing the clutch engagement pressure to achieve the clutch slip speed equal to or less than the predetermined clutch slip speed.

21. The method of claim 17, wherein the predetermined clutch slip speed provides the positive slope of the total torque of the drive over clutch slip speed.

22. The method of claim 1, further comprising the step of providing a hydraulic torque converter and wherein the clutch is a lock-up clutch within the hydraulic torque converter.

23. A method of reducing torsional vibrations in a drive line, the method comprising the steps of:

providing a clutch for the drive;

providing a torque converter with an impeller and a turbine within the torque converter configured to engage the clutch;

monitoring total torque including a clutch torque and a turbine torque;

monitoring a clutch slip speed;

continuously comparing total torque with clutch slip speed during operation of the drive line; and

maintaining a clutch slip speed such that the total torque divided by clutch slip speed produces a positively sloped function over time.

24. The method of claim 23, wherein the clutch slip speed is maintained by continuously adjusting a clutch pressure such that an increase in clutch pressure reduces clutch slip speed and a decrease in clutch pressure increases clutch slip speed.

25. The method of claim 23, wherein the clutch slip speed is maintained by setting and maintaining a predetermined clutch pressure.

26. The method of claim 25, wherein the predetermined clutch pressure is predetermined based at least in part on a resonant frequency of the drive line to dampen the torsional vibrations.

27. A system for damping torsional vibrations in a drive line without a use of a vibration absorbing coupling, the system comprising:

a controller that continuously compares a total torque, including a sum of clutch torque added to a turbine torque, and a clutch slip speed during operation of the drive; and

maintains the clutch slip speed such that the continuous comparison of total torque and clutch slip speed produces a positively sloped function of total torque over clutch slip speed.

28. The system of claim 27, wherein the controller is configured to operate in a closed loop mode to maintain clutch slip speed with inputs from at least one of a rotation per minute sensor and a pressure sensor.

29. The system of claim 27, wherein the controller is configured to operate in an open loop mode to maintain clutch slip speed and maintain a predetermined clutch pressure.

30. The system of claim 27, wherein the controller is configured to maintain the clutch slip speed below 30 rotations per minute.

31. The system of claim 29, wherein the predetermined clutch pressure is predetermined based at least in part on a resonant frequency of the drive line to dampen the torsional vibrations.

32. The system of claim 27, wherein the controller is further programmed to fully engage the clutch with substantially a zero slip speed before maintaining the clutch slip speed such that the continuous comparison of total torque and clutch slip speed produces a positively sloped function of total torque over clutch slip speed.