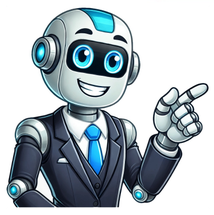
I'm not a robot



First of all, CVT transmissions significantly differ from other automatically-shifted transmissions (standard automatics or dual-clutch transmissions) in terms of design. Thanks to its design features, this transmission ensures smooth shifting without jolts, delays, or slippages. A car with this transmission accelerates easily without jerks, which to some extent can be experienced when driving cars equipped with automatic or dual-clutch transmissions. Other advantages of CVTs also include fuel efficiency (compared to automatic transmissions), better load distribution on the engine and transmission, which allows not to overload the transmission and to increase its service life. Taking into account all advantages of CVTs, it may seem that this type of transmission can easily replace a conventional automatic transmission on the automobile market, but that’s no entirely true. The thing is that that many drivers with the experience of driving a CVT-equipped car complain about a noticeably smaller operational resource of CVTs compared to automatic transmissions, low maintainability of CVTs, high repair costs, and a wide range of limitations during operation. Design basics of CVT transmissions When it comes to design, CVT transmissions are quite simple. The structure of this type of transmission is based on two sliding pulleys. One pulley is connected to the engine, while the second one is attached to the driving wheels. The pulleys operate with the help of a special belt (or a chain). Each pulley is V-shaped, and its halves can smoothly converge and diverge. When both halves diverge, the belt (or chain) goes to a smaller radius, and at the converging stage the belt starts operating at a larger radius. The role of the clutch is performed by the torque converter or by the pack of disks, operating in the oil bath. Learn more about a CVT transmission and its principle of operation More advanced CVT solutions can emulate the operation of a traditional automatic transmissions – the control software forces the pulleys to converge and diverge not smoothly (as in standard CVTs), but in steps. Such a transmission shifts as an automatic transmission, making a driver to feel more comfortable when driving. This concept was successfully implemented in Lineartronic CVTs used in Subaru models. Peculiarities of driving CVT-equipped carsDespite numerous debates about its operational peculiarities and repairability characteristics, the CVT transmission technology has already gained popularity on the automobile market and some manufacturers of transmissions, such as Jatco, have high hopes for this type of transmission. At the same time, it is necessary to bear in mind that owners of cars have to comply with particular operation rules, which stem from CVT design peculiarities. Cross-section JF011E- one of the most popular CVT units on the market High Loads and Warm-up necessity First of all, it is necessary to understand that CVT transmissions are not intended for high loads. To put it simply, when starting off the car equipped with the CVT transmission, you have to accelerate smoothly, gradually raising the engine speed. Otherwise, you’ll face CVT problems very soon. In practice, there are many cases when owners of CVT-equipped cars, who like rapid accelerations from traffic lights, started having transmission issues after travelling only 50-60 thousand kilometers. In addition, it is strongly recommended to warm up the CVT unit in cold weather. CVTs require sufficient lubrication (oil starvations are damaging for CVTs). At low temperatures transmission fluid distribution takes more time. It should be noted that CVTs cannot be warmed up the same way as conventional automatic transmissions (engaging all gears with a few seconds delay), as CVTs constructively differ from hydromechanical automatics. When it comes to the CVT warm-up, firstly it is necessary to warm up the engine and to engage the N gear for a few seconds. Then, you can start moving, at the same time minimizing the load on the transmission unit during the first 3-5 kilometers. It the temperature drops to -30 °C, then it is better to refrain from driving a CVT-equipped car. Maneuvering and cornering When driving a car equipped with a CVT, do not forget that this type of transmissions is very sensitive to increases of the engine RPM rate. In practice, first of all drivers increase the RPM rate by pressing the gas pedal, then the transmission control system will flexibly change gear ratios in accordance with the engaged gear and ensure that the engine operates in the most efficient manner. But this adjustment takes some time. If you make a maneuver while driving, you have to bear in mind the abovementioned peculiarity of CVTs operation. First of all, make sure that you achieve the necessary RPM rate and then perform a maneuver. The same applies to cornering: you have to press on the gas pedal at the moment when starting to turn the steering wheel. Off-roading CVTs are generally not intended for regular off-road use. Even if you are an owner of the SUV equipped with the CVT transmission, you should not get carried away with off-roading. Otherwise, you can easily damage the transmission getting into a road hump. If the mechanical damage occurs in the transmission unit, you may have to deal with serious consequences: from fluid leakages to the breakdown of main components. In any case, reckless off-road driving will result in costly repairs. The wheel slipping also can lead to rapid wear of CVT components. If you get stuck in dirt or a snowdrift, it is not recommended to try to get out of trouble by frequently shifting between D and R gears. Transportation and towing Passenger cars and SUVs equipped with CVTs are poorly adapted for towing and transportation of heavy loads. For this reason, it is not recommended to use a CVT-equipped car for towing of other cars; otherwise, it may lead to rapid wear of transmission components and complete damage of the unit. If the car manufacturer allows towing, be sure to examine its peculiarities in the manual. But in practice, towing of other cars leads to the transmission damage, especially when it comes to “old” CVTs. As for driving with a trailer, it is important that the trailer weight does not exceed permissible limits specified in the car manual. There may also be limitations on speed and distance to be travelled when using a trailer. If your car broke down in the middle of the road, it can be towed over short distances with the running engine. If the engine does not start, then towing can be performed only when the axle shafts are disconnected from the drive wheels. But ideally, in such cases it is desirable to call a tow truck in order to avoid additional risks. Great video from Engineering Explained on things you should never do when driving a CVT-equipped car CVT maintenanceWhen it comes to CVT maintenance, the main point is the transmission fluid status. It is critical to regularly check fluid condition and its level. CVTs operate with special types of transmission fluid ensuring lubrication of the interacting surfaces and preventing slippages. CVT fluids must be changed more often than in automatic transmissions. It is also recommended to use CVT fluids specified by the car manufacturer. According to manuals, it is necessary to change CVT transmission fluid once every 60 thousand kilometers, but in practice it is desirable to perform this procedure every 30-35 thousand kilometers. If we talk about possible failures of electronic components, it is necessary to pay close attention to the state of separate EECS sensors. Problems with these sensors may lead to additional loads on the CVT unit, resulting in its failure. Constant monitoring of sensor operating condition is a must. One faulty sensor can lead to the failure of the whole unit. If the speed control sensor is damaged, the control unit automatically switches the transmission belt to the emergency position, the engine starts braking urgently. In this case, there is a high risk of the belt deformation (or even its damage when driving at high speeds). For those who buy a used car equipped with the CVT transmission, the first thing to do is to replace the speed sensor (it is desirable to buy the original part from the manufacturer). The same applies to oil level and pressure sensors. The entire set of sensors must be in good operating condition. SummaryTo sum it up, it can be assumed that CVT transmissions can ensure more comfortable and fuel efficient driving compared to classic automatic transmissions. However, it should be borne in mind that this type of transmission is not intended for high loads and severe conditions (overheating is lethal for CVTs). To put it simply, CVT-equipped cars are more suitable for the use on good urban roads and for drivers with a calm driving style (without abrupt starts, slippages, frequent overtakings). To keep the CVT transmission in perfect operating order you have to do the following: Ensure timely maintenance servicing; Monitor transmission fluid level and its condition; Warm-up the transmission before taking off; Avoid excessive loads. When complying with these rules, your CVT transmission will accurately operate during the entire service period specified by the manufacturer. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. Your transmission is, with the exception of the engine itself, the most important and expensive system on your car. It’s what allows the power from the engine to be transferred into the wheels – and it’s extremely complex.If your transmission is damaged due to neglect or improper repairs, it can easily cost $2,000-$4,000 for a full rebuild or replacement. It means that, to ensure that your car remains operational for the longest possible time, you should be doing everything you can to preserve your transmission.Wondering how you can keep your car in great shape? Here are our top 5 tips that can help you preserve your transmission.1. Check Your Transmission Fluid Regularly Just like most of the systems in your car, your transmission uses a specialized fluid to minimize friction and ensure the proper operation of the delicate gearbox – and though it usually lasts between 50,000-100,000 km, this fluid does not last forever.However, it’s quite easy to check your transmission fluid on most cars. Simple pull out your owner’s manual and locate the transmission fluid receptacle under the hood. While your engine is idling, pull out the dipstick. Then, wipe off the dipstick, insert it again, and pull it out after a few moments. You should see a bright red, clear fluid that smells slightly sweet. Dark or murky transmission fluid, or transmission fluid with a “rotten” smell should be replaced. See a transmission repair specialist right away to have your car fluid changed.2. Avoid Heat Damage By Following The “Severe Use” Replacement ScheduleHeat transmission due to old transmission fluid is responsible for most wear and tear on transmissions. If you are using your car in extreme conditions, you should check your transmission fluid more often. Extreme conditions are usually defined as:Driving heavily in city trafficRegularly driving in temperatures of 33C or higher (50% or more of driving time)Towing heavy loads and trailers regularlyIf your driving habits conform to these factors, consider having your fluid and filter changes about every 30,000 kilometers. 3. Keep Your Engine’s Cooling System In Good ShapeYou probably already know that your radiator and cooling systems prevent your engine from overheating. But did you know that your cooling system also helps cool the transmission fluid that pumps through your gearbox?Your transmission is delicate, and you must avoid overheating it. Make sure that you have enough coolant, and that your cooling system is in good overall shape – both to preserve your engine and your transmission.4. Be Careful About Changing Gears (And Use That Parking Brake) Your car’s transmission is quite delicate, and the gearbox can be damaged if you change gears improperly – for example, if you accidentally shift the car into reverse while driving, or you tend to put your car into park before it comes to a complete stop.Over time, these kinds of behaviors can put additional wear and tear onto your transmission, which could lead to a mechanical failure. Don’t ever shift into park or reverse when your car is moving – wait for it to come to a complete stop.In addition, you should use your parking brake when parked on any kind of incline. While most automatic transmission cars have a “pawl” (a type of pin) that prevents them from moving backward when parked on an inclined surface, this pin is not extremely sturdy – and if you do not use your parking brake, it could become worn and eventually fail.So make sure you use your parking brake whenever you are on an incline. It’ll save your transmission quite a bit of wear! 5. Invest In An Annual Inspection And Transmission Check An ounce of prevention is worth a pound of cure! You should have a comprehensive car inspection performed at a reputable car repair shop every year, and this should include a transmission check.Regular inspections let you catch any potential problems with your transmission early, allowing you to save money and ensure your car is in good condition.Need A Transmission Check? Come To Ride Time! If you’re in Winnipeg, and you need your transmission to be serviced or checked, come to Ride Time right away! At our service centre, we offer professional repairs and inspections at great rates. Schedule online now, and come in today! The CVT or continuously variable transmission works differently than a conventional automatic gearbox. Instead of having a fixed number of gears, the CVT provides an infinite number of gear ratios via pulleys connected to the engine and the driving wheels. Combining the two pulleys is a flexible belt, and the width of the pulleys will change depending on how much power is applied by the driver.What are the advantages of a CVT?The advantages of a CVT are aplenty, like:CVTs are lighter and more compact than a regular automatic.There are fewer moving parts inside a CVT.CVTs deliver better fuel economy since the engine is constantly maintaining the ideal torque ratio.The CVT is smoother and operates with virtually zero “shift shock.”CVTs offer faster acceleration and no gear hunting when driving over inclined roads.What are the disadvantages of a CVT?The CVT has a few disadvantages, but the pros outweigh the cons. Some drawbacks include:Depending on the vehicle, some CVTs could produce a loud, droning sound under heavy acceleration.According to some drivers, CVT-equipped vehicles are less engaging to drive due to the absence of physical gear ratios.Similar to other automatic transmissions, CVTs are expensive to repair or replace.CVT Car Care TipsLike the engine, the CVT in your vehicle requires periodic maintenance. Most of the long-term problems associated with CVTs have something to do with inadequate fluid maintenance. Similar to conventional automatics, the CVT needs regular fluid replacement to function efficiently.1. CVT fluid is different from ATF.Conventional automatic transmissions use ATF or automatic transmission fluid. ATF functions similarly to synthetic engine oil in that it reduces or prevents friction while cooling the entire transmission unit.On the other hand, CVT fluid is different. Since a CVT has chain-driven pulleys or rollers that rely on friction to function perfectly, CVT fluid has friction modifiers that provide adequate friction while protecting the unit from excess heat.Mixing fluid types is a bad idea since you’ll end up damaging your CVT if you end up using ATF. The same rule applies if you happen to pour CVT fluid inside a standard automatic transmission. If you want to be doubly sure about what type of CVT fluid to use in your car, check the owner’s manual.2. Replace the CVT fluid periodically.Here’s another reason to consult the owner’s manual of your CVT-equipped vehicle. Not all cars are the same, but all vehicles require periodic transmission fluid changes. Check the owner’s manual to see the required maintenance interval. If the manual prescribes draining and replenishing the CVT fluid every 50,000 kilometers or 100,000 kilometers, follow it. Regular fluid changes will not only extend the life of your CVT but allows the unit to perform flawlessly in every drive.3. Check the transmission dipstick.If the engine has a dipstick, the transmission has a dipstick, too. However, not all CVT-equipped vehicles have a transmission dipstick. Some cars (like particular Subaru models) have no dipstick and may require a visit to the service center to check the fluid’s condition. Check the owner’s manual to determine if your vehicle has a CVT dipstick and to know the dipstick’s location in the engine bay.The CVT dipstick is an easy way to know if the unit has sufficient fluid. The dipstick will also tell you if the fluid needs replacement. Most CVT fluids have a reddish hue. If the oil in the dipstick is dark brown, black, or has a burnt odor, replace the fluid immediately.4. Avoid heavy towing.Unless you have a heavy-duty pickup truck, you should avoid towing heavy loads with your CVT-equipped car. Towing puts undue stress on the transmission and may cause it to overheat under constant duress.5. Take it easy on the gas pedal.Although some performance cars come with CVT gearboxes (like the Honda Civic RS Turbo, for instance), the CVT is most common in affordable and fuel-efficient practicars. Although you can flog a CVT like a conventional automatic, applying light pedal inputs will pay dividends in the long run. Not only will you save more fuel, but you are prolonging the useful life of the CVT.ConclusionAlthough CVTs are lighter and more compact, it does not mean they are cheaper to replace when damage occurs. On the other hand, CVTs are more expensive, and not all mechanics or service centers have the inclination or expertise to repair a CVT.If you notice anything unusual with your CVT – whether it be excess noises, vibrations, or an illuminated check engine light – drive the car to a mechanic as soon as possible for a thorough diagnosis. 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Explore our latest gallery of Editors’ Picks.Browse Editors' Favorites Monday, 21 April 2025 06:55 Learn how to protect your car's CVT transmission and avoid common mistakes that can shorten its lifespan. Discover driving habits to maximize efficiency and longevity, ensuring a smooth and enjoyable ride for years to come. A CVT, or Continuously Variable Transmission, offers a unique driving experience. It provides smooth acceleration and improved fuel efficiency, but like any sophisticated system, it requires proper care to maximize its lifespan. One common driving habit can significantly impact the longevity of your CVT – aggressive acceleration.Why Aggressive Acceleration Can Harm Your CVTCVT transmissions operate through a steel belt and two pulleys. When you accelerate rapidly, the drive pulley spins quickly, causing increased friction between the belt and the pulley. This friction leads to accelerated wear and tear on the belt, potentially shortening the lifespan of your transmission. Read Also: Car Tapping Noise: Causes & Fixes - What to Do Imagine it as constantly pushing a belt to its limits. Over time, the belt can weaken, causing problems like slipping, jerking, and eventually, premature failure. This is why understanding and avoiding aggressive acceleration is crucial.Signs of a Worn CVT: Recognizing the Warning SignsRecognizing the signs of a worn CVT early on can prevent further damage and costly repairs. Be on the lookout for the following symptoms: Vibrations: Feeling noticeable vibrations while accelerating is a strong indicator of a worn CVT. Slipping: If your car slips while accelerating, as if it's losing power, your CVT may be showing signs of wear. Jerking: Hesitation or jerking during acceleration can be a sign that the CVT is not working properly. Heavy Acceleration: You might notice that your car accelerates sluggishly or slowly, indicating a problem with the transmission. If you experience any of these symptoms, it's advisable to take your car to a mechanic for a diagnosis and potential repair.Driving Habits That Extend Your CVT's LifespanHere are some simple driving habits that can significantly extend the life of your CVT transmission: Smooth Acceleration: Instead of slamming on the gas, accelerate gradually and smoothly. This minimizes the stress on the belt and reduces wear and tear. Avoid Holding the CVT in High RPMs: While CVTs offer seamless acceleration, holding the transmission at high RPMs for extended periods can lead to increased strain. Shift to higher gears when possible to allow the CVT to operate more efficiently. Regular Maintenance: Keep up with routine maintenance, including oil changes, and follow the manufacturer's recommended maintenance schedule. This ensures proper lubrication and protects the transmission from wear and tear. Don't Tow Heavy Loads: CVTs are not designed for heavy towing. If you need to tow, consult your car's owner's manual or a mechanic to determine the transmission's towing capacity. Avoid Driving in Extreme Conditions: Excessive heat or cold can affect the CVT's performance. If possible, avoid driving in extreme temperatures for prolonged periods. Conclusion: Drive Your CVT With Care for a Smoother, Longer RideBy adopting these simple driving habits and keeping up with regular maintenance, you can ensure a smoother, more enjoyable ride for years to come. Remember, a healthy CVT translates to optimal fuel efficiency and performance, enhancing your overall driving experience. On the maintenance side, a continuously variable transmission (CVT) requires more or the same frequency of fluid and filter changes as a conventional automatic transmission, and many of the basic procedures are the same. On the diagnostic side, a CVT transmission is less complicated internally than a six- or nine-speed transmission. Like any automatic transmission, the condition and level of fluid in a CVT unit will determine the performance. The color of the fluid for some CVTs is green or yellow. The fluid can darken over time as it is oxidized, just like the red stuff. CVT fluids are different than automatic transmission fluids for three reasons. First, a CVT fluid must protect against wear to the belt or chain. Second, the fluid has high shear stability due to the high-pressure requirements to operate the variators and pump. Third, the fluid must work with and protect the friction materials of the forward and reverse clutches along with the start clutch, if so equipped. Temperature is another unique requirement of constant velocity transmission fluid. The fluid should be up to temperature for the variators and clutches to work as intended. Many of these transmissions use a warmer that uses engine coolant to get the transmission fluid up to temperature faster. The warmer can also be a cooler when the fluid is lubricating and cooling the internal components. Some CVT systems can have a complex system with thermostats to keep the fluid at the correct temperature. For example, there could be a combination of oil/coolant and oil/air coolers. As for the condition of the fluid, you might be alarmed when you pull the pan on some CVT units. On the magnet and pick-up screen, you might see a lot of metal debris during the first fluid change. This is normal for a CVT. The metal is from the chain or belt. The path of the fluid is designed so this debris is captured by the magnets, pick up and probably an inline filter. The fluid level is critical for a vehicle with a CVT. If there is too little fluid, the transmission will not shift properly, and air can enter the valve body of the variators. An overfilled CVT can cause the fluid to be aerated by coming into contact with moving parts. The air can change how the pulley and solenoids control the position of plates. This can cause slipping and incorrect ratios codes. Also, the lack of lubrication can damage the belt or chain. CVT Transmission Belt Setting the fluid level is critical after a fluid or filter service or any repair where fluid was lost. To check and set the fluid level, you will definitely need a scan tool and maybe a dipstick. Any transmission fluid will increase in volume as it is heated. Many CVT fluid manufacturers have a recommended temperature range to check and set the level. This temperature needs to be checked using the sensor mounted to the valve body. Guessing the temperature or using an infrared thermometer is not an option. The other reason for a specific temperature is regarding the cooler for the transmission. Most coolers are controlled by a thermostat and will not circulate fluid until a specific temperature is reached. Some CVT systems will have a dipstick, while others will require a special dipstick tool that can be inserted into a port. But, some transmissions will use an overflow tube in the pan to set the final level. Not following the recommended procedures can lead to an under- or over-filled transmission. Often, this mistake is realized when the driver leaves the shop. The symptoms could be poor shift quality and noise. Due to the higher pressures inside a CVT, you are going to need a new pressure gauge that is rated for 1,000 PSI or higher. What can pressure readings tell you? A lot. The typical CVT will have pressure ports after the pump, variators and forward and reverse clutches. In addition, some CVTs will have ports for the torque converter lock-up and start clutch. What can you test with pressure readings? Just like an automatic transmission, pressure readings can confirm the mechanical operation of the actuators, the accuracy of the pressure sensors and if there are any internal leaks. In the service information, you can find the specifications for the pressure readings for the different hydraulic circuits; the hold and release pressures for a given circuit. In the case of the variators, the pressures can vary with the commanded ratio by the TCM. Even if you have a reading of the line pressure, you still need to verify the electrical operation of the solenoids. This article was originally written for our sister site, Import Car. Automotive transmission technology Pulley-based CVT Automotive transmissions Manual Sequential Non-synchronous Preselector Automatic / Semi-automatic Hydraulic Manumatic Dual-clutch Continuously variable Automated manual vte A continuously variable transmission (CVT) is an automated transmission that can change through a continuous range of gear ratios, typically resulting in better fuel economy in gasoline applications.[1] This contrasts with other transmissions that provide a limited number of gear ratios in fixed steps. The flexibility of a CVT with suitable control may allow the engine to operate at a constant angular velocity while the vehicle moves at varying speeds. Thus, CVT has a simpler structure, longer internal component lifespan, and greater durability. Compared to traditional automatic transmissions, it offers lower fuel consumption and is more environmentally friendly.[2][3] CVTs are used in cars, tractors, side-by-sides, motor scooters, snowmobiles, bicycles, and earthmoving equipment. The most common type of CVT uses two pulleys connected by a belt or chain; however, several other designs have also been used at times. This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources in this section. Unsourced material may be challenged and removed. (July 2020) (Learn how and when to remove this message) Belt-driven CVT for a motor scooterA PIV chain driveCVT in a Claas Mercator combine harvester. The pulley's effective diameter is changed by pushing the two conical discs either towards or away from each other. The most common type of CVT uses a V-belt which runs between two variable-diameter pulleys.[4] The pulleys consist of two cone-shaped halves that move together and apart. The V-belt runs between these two halves, so the effective diameter of the pulley is dependent on the distance between the two halves of the pulley. The V-shaped cross-section of the belt causes it to ride higher on one pulley and lower on the other; therefore, the gear ratio is adjusted by moving the two sheaves of one pulley closer together and the two sheaves of the other pulley farther apart.[5] As the distance between the pulleys and the length of the belt does not change, both pulleys must be adjusted (one bigger, the other smaller) simultaneously to maintain the proper amount of tension on the belt. Simple CVTs combining a centrifugal drive pulley with a spring-loaded driven pulley often use belt tension to effect the conforming adjustments in the driven pulley.[5] The V-belt needs to be very stiff in the pulley's axial direction to make only short radial movements while sliding in and out of the pulleys. The radial thickness of the belt is a compromise between the maximum gear ratio and torque. Steel-reinforced V-belts are sufficient for low-mass, low-torque applications like utility vehicles and snowmobiles, but higher-mass and -torque applications such as automobiles require a chain. Each element of the chain must have conical sides that fit the pulley when the belt is running on the outermost radius. As the chain moves into the pulleys the contact area gets smaller. As the contact area is proportional to the number of elements, chain belts require many very small elements. A belt-driven design offers approximately 88% efficiency,[6] which, while lower than that of a manual transmission, can be offset by enabling the engine to run at its most efficient RPM regardless of the vehicle's speed. When power is more important than economy, the ratio of the CVT can be changed to allow the engine to turn at the RPM at which it produces the greatest power. In a chain-based CVT, numerous chain elements are arranged along multiple steel bands layered over one another, each of which is thin enough to easily bend. When part of the belt is wrapped around a pulley, the sides of the elements form a conical surface.[7][8] In the stack of bands, each band corresponds to a slightly different drive ratio, and thus the bands slide over each other and need sufficient lubrication. An additional film of lubricant is applied to the pulleys. The film needs to be thick enough to prevent direct contact between the pulley and the chain, but thin enough to not waste power as each chain element enters it.[citation needed] Some CVTs transfer power to the output pulley via tension in the belt (a "pulling" force), while others use compression of the chain elements (where the input pulley "pushes" the belt, which in turn pushes the output pulley).[9][10][11] Positively Infinitely Variable (PIV) chain drives are distinct in that the chain positively interlocks with the conical pulleys. This is achieved by having a stack of many small rectangular plates in each chain link that can slide independently from side-to-side. The plates may be quite thin, around a millimeter thick. The conical pulleys have radial grooves. A groove on one side of the pulley is met with a ridge on the other side and so the sliding plates are pushed back and forth to conform to the pattern, effectively forming teeth of the correct pitch when squeezed between the pulleys. Due to the interlocking surfaces, this type of drive can transmit significant torque and so has been widely used in industrial applications. However, the maximum speed is significantly lower than other pulley-based CVTs. The sliding plates will slowly wear over years of usage. Therefore the plates are made longer than is needed, allowing for more wear before the chain must be refurbished or replaced. Constant lubrication is required and so the housing is usually partially filled with oil.[12][13] Toroidal CVT used in the Nissan Cedric (Y34) Toroidal CVTs, as used on the Nissan Cedric (Y34),[14][15] and those built by CVTCORP,[16] consist of a series of discs and rollers. The discs can be pictured as two almost-conical parts arranged point-to-point, with the sides dished such that the two parts could fit into the central hole of a torus. One disc is the input, and the other is the output. Between the discs are rollers, which vary the ratio and transfer power from one side to the other. When the rollers' axes are perpendicular to the axis of the discs, the effective diameter is the same for the input discs and the output discs, resulting in a 1:1 drive ratio. For other ratios, the rollers are rotated along the surfaces of the discs so that they are in contact with the discs at points with different diameters, resulting in a drive ratio of something other than 1:1.[17] An advantage of a toroidal CVT is the ability to withstand higher torque loads than a pulley-based CVT.[18] In some toroidal systems, the direction of thrust can be reversed within the CVT, removing the need for an external device to provide a reverse gear.[19] A ratcheting CVT uses a series of one-way clutches or ratchets that rectify and sum only "forward" motion. The on-off characteristics of a typical ratchet means that many of these designs are not continuous in operation (i.e. technically not a CVT), but in practice, there are many similarities in operation, and a ratcheting CVT is able to produce a zero-output speed from any given input speed (as per an Infinitely Variable Transmission). The drive ratio is adjusted by changing linkage geometry within the oscillating elements so that the summed maximum linkage speed is adjusted, even when the average linkage speed remains constant. Ratcheting CVTs can transfer substantial torque because their static friction actually increases relative to torque throughput, so slippage is impossible in properly designed systems. Efficiency is generally high because most of the dynamic friction is caused by very slight transitional clutch speed changes. The drawback to ratcheting CVTs is the vibration caused by the successive transition in speed required to accelerate the element, which must supplant the previously operating and decelerating power-transmitting element. The design principle dates back to before the 1930s, with the original design intended to convert rotary motion to oscillating motion and back to rotary motion using roller clutches.[20] This design remains in production as of 2017, for use with low-speed electric motors.[21] An example prototyped as a bicycle transmission was patented in 1994.[22] The operating principle for a ratcheting CVT design, using a Scotch yoke mechanism to convert rotary motion to oscillating motion and non-circular gears to achieve uniform input to output ratio, was patented in 2014.[23] A hydrostatic CVT uses an engine-driven, positive-displacement pump to deliver oil under pressure to one or more hydraulic motors, the latter creating the torque that is applied to the vehicle's driving wheel(s). The name "hydrostatic CVT", which misuses the term "hydrostatic", differentiates this type of transmission from one that incorporates a hydrodynamic torque multiplier ("torque converter") into its design. In a hydrostatic CVT, the effective "gear ratio" between the engine and the driving wheel(s) is the result of a difference between the pump's displacement—expressed as cubic inches or cubic centimeters per revolution—and the motor's displacement. In a closed system, that is, a system in which all of the pump's output is delivered to the motor(s), this ratio is given by the equation GR = Dm ÷ Dp, where Dp is the pump's effective displacement, Dm is the motor's displacement, and GR is the "gear ratio". In a hydrostatic CVT, the effective "gear ratio" is varied by varying effective displacement of the pump, which will vary the volume of oil delivered to the motor(s) at a given engine speed (RPM). There are several ways in which this may be accomplished, one being to divert some of the pump's output back to the reservoir through an adjustable valve. With such an arrangement, as more oil is diverted by opening the valve, the effective displacement of the pump is reduced and less oil is delivered to the motor, causing it to turn more slowly. Conversely, closing the valve will reduce the volume of oil being diverted, increasing the effective displacement of the pump and causing the motor to turn more rapidly. Another method is to employ a variable displacement pump. When the pump is configured for low displacement, it produces a low volume of oil flow, causing the hydraulic motor(s) to turn more slowly. As the pump's displacement is increased, a greater volume of oil flow is produced for any given engine RPM, causing the motor(s) to turn faster. Advantages of a hydrostatic CVT include: Capacity scalability. A hydrostatic CVT's power-transmission capacity is readily adapted to the application by using a correctly-sized pump and matching hydraulic motor(s). Flexibility. As power transfer from the engine-driven pump to the hydraulic motor(s) is through the medium of flowing oil, the motor(s) can be mounted in otherwise-inconvenient locations by using hoses to convey oil from the pump to the motor(s), thus simplifying the design of all-wheel drive articulated vehicles. Smoothness. As the effective "gear ratio" of a hydrostatic CVT is infinitely-variable, there are no distinct transitions in torque multiplication, such as produced with conventional, geared transmissions. Simplified control. Operation through the full range of forward and reverse speeds can be controlled using a single lever or a foot pedal to actuate a diversion valve or variable-displacement pump. Arbitrarily slow crawl speeds. The potential for high torque multiplication at very low speeds allows for precise vehicle movement while under load. Disadvantages of a hydrostatic CVT include: Reduced efficiency. Gears are one of the most efficient methods of mechanical power transmission, with efficiencies as high as 90 percent in many cases. In contrast, few hydrostatic transmission systems achieve more than about 65 percent efficiency. This is due to a combination of internal losses in the pump and motor(s), and losses in the piping and valves. Higher cost. For a given level of power-transmitting capacity, a hydrostatic CVT will be more expensive to produce than an equivalent geared transmission. In addition to the pump and motor(s), a hydrostatic system requires the use of an oil reservoir, piping and in many applications, an oil cooler, this last item being necessary to dissipate the waste heat that results from hydrostatic power transmission's relatively low efficiency. Greater weight. Due to the high oil pressure at which a hydrostatic CVT operates, the pump and motor(s) are under considerable mechanical stress, especially when maximum power and loading is being applied. Hence these items must be very robust in construction, typically resulting in heavy components. Additional weight will be found in the oil reservoir and its oil load, as well as the piping and valving. Uses of hydrostatic CVTs include forage harvesters, combine harvesters, small wheeled/tracked/skid-steer loaders, crawler tractors, and road rollers. One agricultural example, produced by AGCO, splits power between hydrostatic and mechanical transfer to the output shaft via a planetary gear in the forward direction of travel (in reverse, the power transfer is fully hydrostatic). This arrangement reduces the load on the hydrostatic portion of the transmission when in the forward direction by transmitting a significant portion of the torque through more efficient fixed gears.[24] A variant called the Integrated Hydrostatic Transaxle (IHT) uses a single housing for both hydraulic elements and gear-reducing elements and is used in some mini-tractors and ride-on lawn mowers. The 2008–2010 Honda DN-01 cruiser motorcycle used a hydrostatic CVT in the form of a variable-displacement axial piston pump with a variable-angle swashplate. Evans Variable Speed Countershaft A cone CVT varies the drive ratio by moving a wheel or belt along the axis of one or more conical rollers. The simplest type of cone CVT, the single-cone version, uses a wheel that moves along the slope of the cone, creating variation between the narrow and wide diameters of the cone. Some cone CVT designs use two rollers.[25][26] In 1903, William Evans and Paul Knauf applied for a patent on a continuously variable transmission using two parallel conical rollers pointing in opposite directions and connected by belts that could be slid along the cones to vary the transmission ratio.[27][28] The Evans Variable Speed Countershaft, produced in the 1920s, is simpler—the two rollers are arranged with a small constant-width gap between them, and the position of a leather cord that runs between the rollers determines the transmission ratio.[29] In an epicyclic CVT (also called a planetary CVT), the gear ratio is shifted by tilting the axes of spherical rollers to provide different contact radii, which in turn drive input and output discs. This is similar in principle to toroidal CVTs. Production versions include the NuVinci CVT.[30] Several hybrid electric vehicles—such as the Toyota Prius, Nissan Altima, Mitsubishi Outlander PHEV, and Ford Escape Hybrid—use electric variable transmissions (EVTs, sometimes eCVT) to control the contribution of power from the electric motor and the internal combustion engine. These differ from standard CVTs in that they are powered by an electric motor in addition to the engine, often using planetary gears to combine their outputs instead of a belt used in traditional CVTs. A notable example is the Toyota Hybrid Synergy Drive. Friction-disk transmissions were used in several vehicles and small locomotives built in the early 20th century, including the Lambert and Metz automobiles. Used today in snow blowers, these transmissions consist of an output disk that is moved across the surface of the input disk upon which it rolls. When the output disk is adjusted to a position equal to its own radius, the resulting drive ratio is 1:1. The drive ratio can be set to infinity (i.e. a stationary output disk) by moving the output disk to the center of the input disk. The output direction can also be reversed by moving the output disk past the center of the input disk. The transmission on early Plymouth locomotives worked this way, while on tractors using friction disks, the range of reverse speeds was typically limited.[31] Still in development, the magnetic CVT transmits torque using a non-contact magnetic coupling.[32] The design uses two rings of permanent magnets with a ring of steel pole pieces between them to create a planetary gearset using magnets.[33] It is claimed to produce a 3 to 5 percent reduction in fuel consumption compared to a mechanical system.[33] This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources in this section. Unsourced material may be challenged and removed. (February 2023) (Learn how and when to remove this message) Diagram of an IVT Some CVTs can also function as an infinitely variable transmission (IVT) which offers an infinite range of low gears (e.g. moving a vehicle forward at an infinitely slow speed). Some IVTs prevent back driving (where the output shaft can freely rotate, like an automotive transmission in neutral) due to providing high back-driving torque. Other IVTs, such as ratcheting types, allow the output shaft to freely rotate. The types of CVTs which are able to function as IVTs include epicyclic, friction-disk, and ratcheting CVTs. The idea for a Continuously Variable Transmission (CVT) originated with Leonardo da Vinci in 1490. While he didn't patent it or mass-produce it, his design was a concept for a step-less variable speed transmission.[34] Later, in 1879, Milton Reeves invented a CVT (then called a variable-speed transmission) for use in sawmilling. In 1896, Reeves began fitting this transmission to his cars,[35] and the Reeves CVT was also used by several other manufacturers. The 1911 Zenith Gradua 6HP motorcycle used a pulley-based Gradua CVT.[36][37] A year later, the Rudge-Whitworth Multigear was released with a similar but improved CVT. Other early cars to use a CVT were the 1913–1923 David small three-wheeled cyclecars built in Spain,[38] the 1923 Clyno built in the U.K., and the 1926 Constantinesco Saloon built in the U.K. See also: List of automobiles with continuously variable transmissions 2000–present Toyota K CVT In 1958, the Dutch DAF 600 became the first mass-production car to use a CVT.[39] Its Variomatic transmission was used in several vehicles built by DAF and Volvo until the 1980s.[40] In 1987, the ECVT, the first electronically controlled steel-belted CVT, was introduced as an optional transmission on the Subaru Justy,[41][42] Production was limited to 500 units per month due to Van Doorne's limited production output. In June of that year, supplies increased to 3,000 per month, leading Subaru to make the CVT available in the Rex kei car.[43] Subaru has also supplied its CVTs to other manufacturers (e.g., the 1992 Nissan Micra and Fiat Uno and Panda).[44] Also in 1987, second-generation Ford Fiesta and first-generation Fiat Uno were introduced with steel-belted CVTs, which are called CTX and Unomatic in Ford and Fiat, respectively. The 1996 sixth-generation Honda Civic introduced a pulley-based Honda Multi Matic (HMM) CVT which included a multi-plate clutch, not a torque converter, to prevent idle creep.[45] Use of CVTs then spread in the following years to models including the 1998 Nissan Cube, 1999 Rover 25 and 1999 Audi A6.[46] The 1999 Nissan Cedric (Y34) used a toroidal CVT—unlike the pulley-based designs used by other manufacturers—marketed as the Nissan Extroid, which incorporated a torque converter. Nissan then switched from toroidal to pulley-based CVTs in 2003.

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We have often heard about CVT transmission but do we really know what it actually is? We may be able to differentiate what an automatic and manual transmission is but when it comes to CVT, we may only have a vague idea. Here’s a little bit of history for starters. The forefather of a CVT application is a chap by the name of Leonardo Da Vinci who made the invention way back in 1490. Yes, the Italian Renaissance polymath who introduced many inventions and ideas as well as paintings. Over the years there were many variations to what we know now as CVT. It is actually an automatic transmission that does not have the number of gears like majority of cars, but instead, the transmission can change seamlessly through a continuous range of effective gear ratios. A heavy duty belt or chain runs between two grooved pulleys with a system of hydraulic actuators allowing the effective ratio to be ‘infinitely’ varied within a range of ratios seamlessly. CVT comes with advantages such as better fuel consumption, improvements in acceleration, flexible suspension system, less greenhouse gas emissions, ability to adapt to varying road conditions and power demands. A video of how CVT works: There you have it – it moves like an automatic transmission but doesn’t have gears, offers better mileage and reduces the carbon footprint. Wouldn’t that be the solution to all real world driving problems? Not quite. Rain and heat play a significant role as do wear and tear. And don’t forget driving characteristics. One of the main problems a lot of manufacturers are having is the low mileage at which the CVT’s are failing. CVT’s are more complex and specialized than standard automatic transmissions so higher repair or replacement costs are needed. Costly strength materials and high-tech lubricants are needed to produce the transmission’s belt or chain to withstand wear and tear from a great deal of torque from the engine. The primary cause of failure is wear and tear on the belt system due to the ever changing position of the belt/chain this can result in a loss of power, slipping, delayed gear engagement, improper shifting, bad odor, hesitation and shuddering. However, we have a solution called the X-1R CVT Treatment. It is a fully synthetic CVT fluid Treatment that is specifically formulated to exceed the performance requirements of a wide range of vehicles that have either a push-belt or chain CVT. Here, we’ve listed the primary benefits of using X-1R CVT Treatment: Extends friction durability by providing superior anti-shudder performance and thus enhanced driver comfort. Balanced torque capacity and anti-shudder performance to provide; Increased safety Longer transmission life Extended service intervals Dramatically improves extreme pressure and anti-wear performance which effectively reduces friction in the transmission. Enhances oxidative stability that gives extended fluid life Seals conditioners to help reduce the chance of leakage Suitable for all continuously variable transmissions allowing for optimized supply chain and reduces operating costs. The use of X-1R CVT Treatment will quieten down a noisy transmission, stop juddering and basically restore an as new feeling to the car. But remember this is a preventative and not a curative. Like X-1R always says – Vitamins for your car. Go to www.x1rasia.com for more information on CVT Treatment and other products.