Tips on EV maintenance .....and on how to purchase a used one!

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Overview

1) EV Maintenance

- How to prepare with safety in mind
- Visual inspection points
  - What's under the hood
  - What's underneath the car
  - On the outside
  - Best Practices

2) Tips on Buying a Used EV

- *Are they for me?*
- CARFAX / Visual Inspections / OBD
- Wear / Tear Patterns
- Drive Test
- Original Equipment

3) Summary

4) Q&A

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EV Maintenance - Safety

1) Owner's manual
   - Maintenance / inspection points
   - Warning Labels
   - Frequency of inspections
   - Specific fluids

2) Let it cool!
   - Burn potential
   - Inaccurate readings

3) Equipment
   - PPE
   - Level ground
   - Jack / Jack stands

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EV Maintenance – What's Under the Hood

1) Warning flags / Orange Cabling
   - First Responders
   - High Voltage / High Current

2) Coolant Reservoirs
   - Levels within specifications
   - Connected hoses
     - Cracks / Dryness – Vehicles that sit / in heat
     - Dry coolant marks
   - Power Electronics
     - Check connectors for leaks / dry coolant

3) Brake Fluid Reservoirs
   - Water / Moisture
   - Levels
   - Dirt / contaminants

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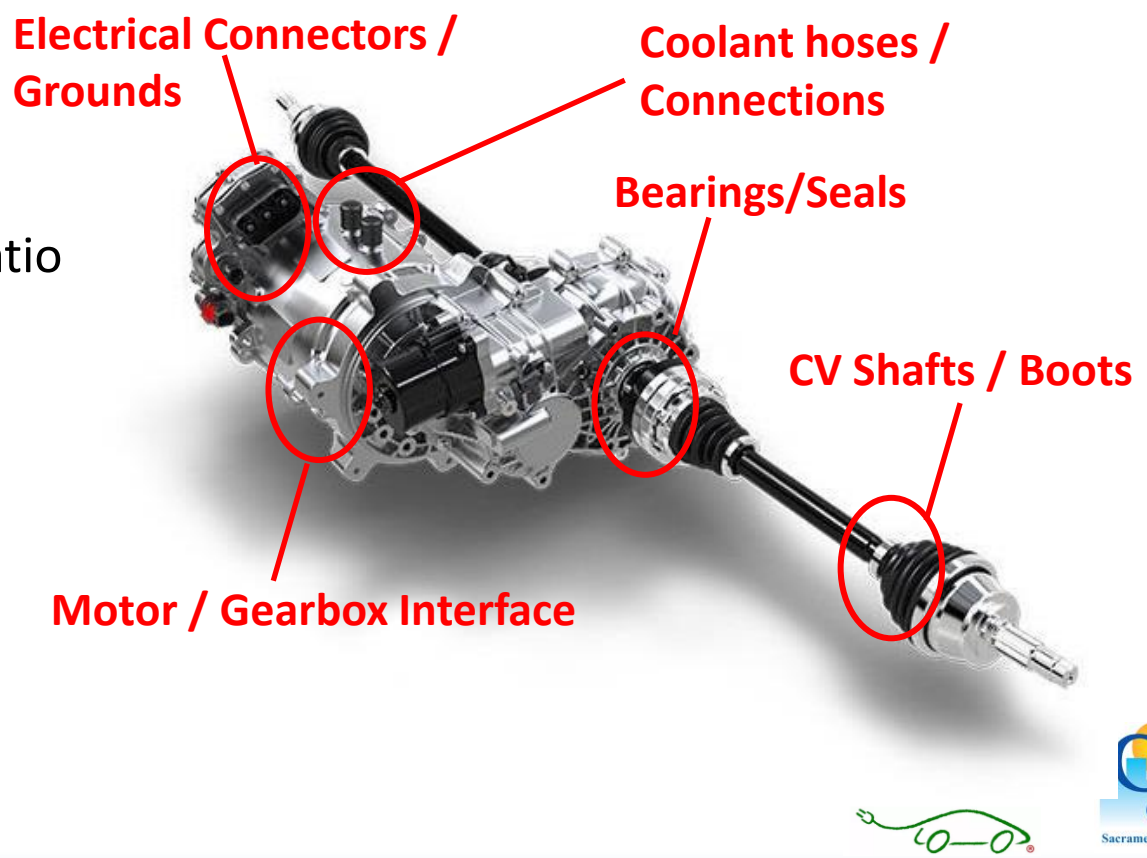
EV Maintenance – What's Under The Car

1) Suspension / Steering
    - Bushings
    - Ball Joints / Tie Rods

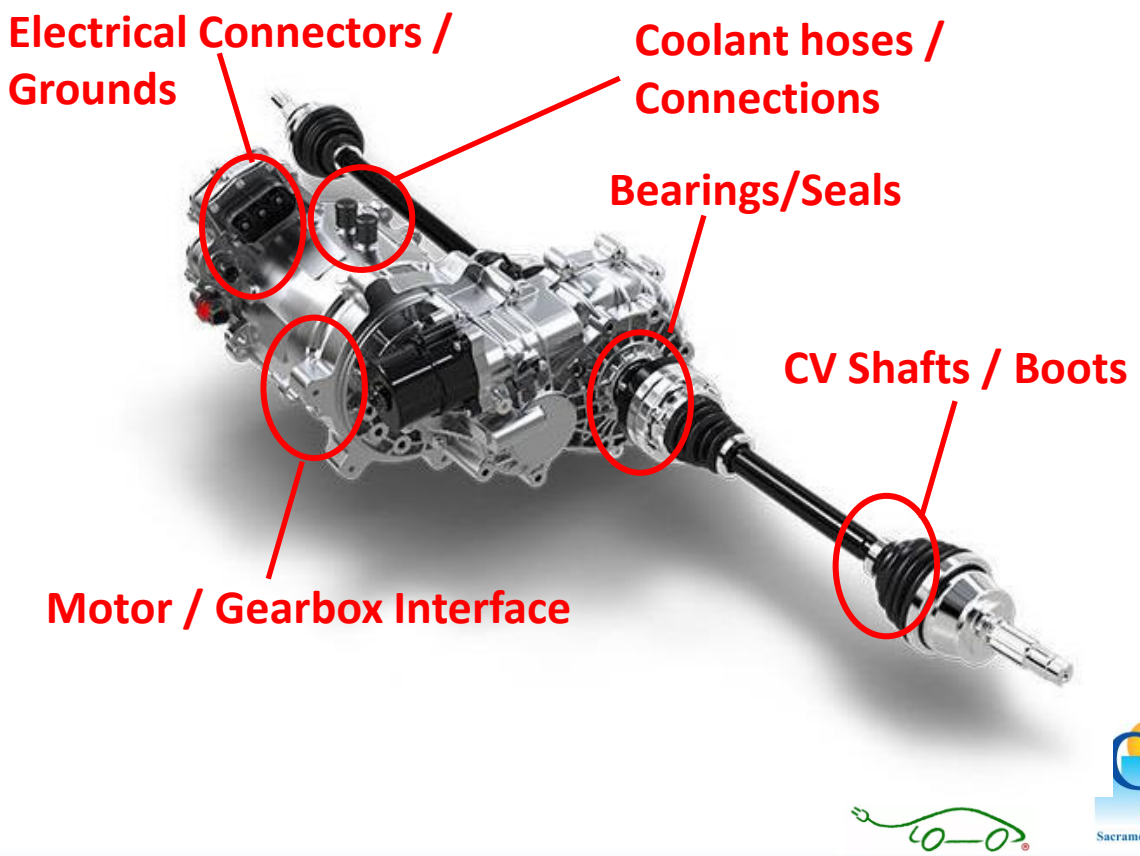
2) Driveline
    - Motor
        - Check seams for fluid leaks / mud accumulatio
        - Check dynamic seals
            - Noises
            - Leaks
    - CV / Boots



EV Maintenance – What's Under The Car

3) Connectors – "Connector-centric"
   - Coolant Ports
     - Dry coolant / leaks
   - Electrical Connectors
     - Position
     - Plastic condition
   - Grounds, Grounds, Grounds!
     - Corrosion / Rust
     - Contamination

4) Brakes
   - Even with Regen:
     - Check brake pads
     - Fluid Levels



EV Maintenance – On the outside

1) ICE Engine Cars Turned EV:
    - Aerodyamic add-ons
        - Side skirts
        - “Underbelly” covers
        - Front / Rear air dam / spoiler
    - Ducts / Ventilation: Dirt / Mud

2) Tires - *“where the rubber hits the road”*
    - Low Rolling Resistance Tires:
        - Check Pressure
        - Check alignment
    - Follow rotation for non-staggered wheels

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EV Maintenance – Best Practices

1) Follow Owner's Manual for Charging Frequency
   - "Always on" – may require plug-in
   - Unique battery management
   - 12V chassis battery support
     - Long term storage

2) Follow a traditional ICE Engine plan:
   - EV's do need similar inspection / maintenance
     - Tires / Brakes / Suspension
   - Fluids – 3 to 6 months based on driving / weather
   - Connectors / Grounds : Look, but don't touch!
   - Seals / Bearings

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Used EV's– Are they for me?

1) Great alternative to your ICE
   - Potential lower cost of ownership
   - Great selection of used / lease returns to meet consumer needs
     - Sedans / SUVs / City

2) Understand your driving cycle
   - Primarily freeway driving? City driving?
   - How much fuel do you consume vs. electricity
   - Determine ideal battery pack capacity range

3) Understand your resources
   - Dedicated outlet / breaker for Level 1 / Level 2 Charging
   - Utility incentives

4) The things you didn't think about:
   - Vehicle / home insurance
   - Service access / support

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Used EV's– Inspections

1) Know your source
   - Auction: *May have missing or equipment*
   - Lease Return / Dealership: *Access to service tools*
   - Private party: *Trust!*

2) CARFAX
   - All vehicles >~'85
   - Vital service / repair work
   - Title clouds / owner history

3) Visual inspection
   - Tires: Mismatched brands / condition
   - Paint differences between panels
   - Misaligned panels – signs of accidents

4) OBD: On-Board Diagnostics
   - Freeway vs. City driving correlates to cycle counts on battery
   - Factory service tool can gather proprietary info:
     - Battery health
     - Degradation

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Used EV's– Wear / Tear

1) Driver seat wear
   - High use cases generally represent cases where drivers come in / out of vehicles, common in city driving atmospheres
     - Could factor into general battery health
     - General trigger to check the maintenance of brakes / tires

2) Software
   - Manufacturers frequently update electric vehicle software. It is important to make sure all service updates have been completed

3) Charge tests
   - Perform plug – in charge, to determine operation or any issues
     - 5-10 minutes: Strike up a conversation while watching any vehicle displays of any errors in your peripheral vision. Ensure any contactors engage and EVSE is operational

4) Operation of all accessories:
   - Check operation of all power accessories, radios, A/C, Heat, Windows, Doorlocks. Defrosters, lights/highbeams, any special creature comforts/options

(-based on observations of buying many, many, many cars)*

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Used EV's– Drive Test

1) Parking Lot
   - Lock to Lock turn test:
     - *Determine if any unusual sounds from CV / Driveline*

     - *Condition of steering components*

   - Acceleration: Safely check for any whining or high-pitched noises
     - *Representative of worn seal, low fluid*

     - *Bearing damage from heat*

Used EV's– Drive Test

2) On the Road –
   - Lots of sounds!
     - ***Tires:*** *Any "humming" or noticeable noises could be imbalanced or low pressure, resulting in uneven wear (common with non-staggered)*

     - ***Seals:*** *As you drive, listen to any wind noises. If you hear anything, check condition of seals around the area*
       - *Doors, windows, sun/moonroofs, tailgates*

       - ***Could also allow for moisture if seal is compromised. Check for any moisture accumulation.***

     - ***Linings / air deflectors:*** *If you hear any excessive rocks hitting the wheel well, or undercarriage, when safely pulled over:*
       - *Check for condition / loose / missing panels or guards – which may be used to direct air to critical components like batteries / brakes*

       - *Check for excessive mud / dirt, as these could also block air passages*

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Used EV's– Drive Test

2) On the Road –
   - Lots of sounds!
     - ***Bearings / Seals:*** *Like your engine, your electric motor / gearbox has sensitive seals and bearings, which if damaged, can result in:*
       - *High pitched sounds while accelerating*
       - *Wobbly feel or sporadic sounds*

       If not repaired or assessed:
       - *Extensive damage to gears / motors from heat damage / no lubrication*
       - *Contamination from dust / dirt*
       - *$$$$$ and TIME!*

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Used EV's– Drive Test

3) Extended Freeway / City Driving -

- *Observe any rapid loss of available mileage*
  - *High current discharges may alter capacity, factor of health*

    - *Torque = "Hey, check out what happens when I stomp the pedal!"*

If you really want to nerd-out

Take Before / Alter measurements:

- *Odometer*
- *Battery State of Charge (%)*
- *Estimated mileage range*

Take Values to determine "true" range, to compare with your requirements.

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Used EV's– Original Equipment

1) Based on the vehicle source:
    - *Check for any potential hardware that the vehicle came with from the factory:*
        - *EVSE: Electric Vehicle Supply Equipment (Level 1)*
        - *Tire Repair*
        - *Safety Equipment*
        - *GPS / Removeable electronics*
        - *Owner's Manual*
2) Extended / 3rd party / transfer of warranty

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Summary: Maintenance

1) Owner's manual
2) Coolant Levels
3) Brake fluids / moisture accumulation
4) Driveline/Suspension: CV Shafts, bushings, brake pads
5) Driveline bearings / seals
6) Excessive dirt / mud

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Summary: How to Buy a Used EV

1) Carfax
2) General wear and tear
3) Visual Inspections
4) Unusual road / wind noises
5) Driveline noises: Bearings / seals
6) Battery Health
7) Recalls / Service Bulletins have been addressed
8) Factory hardware (J1772 EVSE, etc) have been retained
9) 3rd Party or Dealer Provided Warranty: Make sure critical parts like battery and drive system are covered

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Q&A

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The ADHD Shop: Always Dreaming, Hardly Driving