16° Encontro Internacional com o Mercado América do Sul
2026

Power Transmission Systems: History, Emerging Trends, and Strategic Portfolio Priorities

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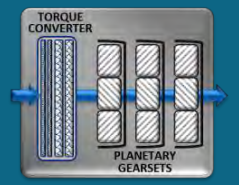
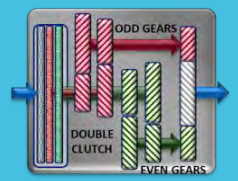
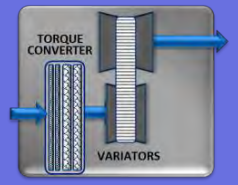
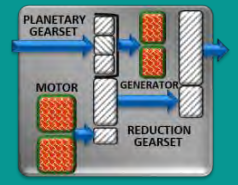
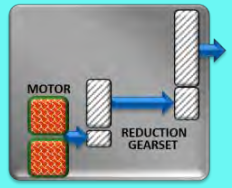
Rio de Janeiro, June 17th, 2026

Agenda

1. Hardware and fluids evolution
2. Global X local markets
3. Portfolio priorities for oil companies

Sophisticated hardware with specialised needs

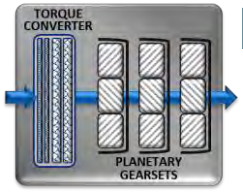
Power transmission type comparison

Transmission Type -	Stepped Automatic [AT]	Dual Clutch [DCT]	Continuous Variable [CVT]	Dedicated Hybrid [DHT]	Reduction Gear [RED]
Basic Schematic -					
2021 MY Examples -	Toyota Camry 2.5L 8-speed 32 mpg	Hyundai Veloster 7-speed 30 mpg	Toyota Corolla 2.0L CVT 34 mpg	Toyota Prius LE 1.8L 52 MPG	Chevy Bolt 118 MPG equiv.
Fuel Efficiency relative to MT -	-5% to +3% [with more speeds]	0% to +5%	CVT: -5% to 0% Engine: +5% to 10%	+10% to 50%	+70% to 80% [battery electric]
Weight vs. MT -	Up to +50%	+15% to 30%	+10% to 15%	Up to +30%	less
Shift time [ms] -	400 – 800	100 – 300	n/a	n/a	200 – 400 [with gears]
PROS -	+ Smooth launch + Driver comfort + Torque capacity	+ Sportiness + Fuel economy + Torque capacity	+ Comfort w/o shifts + Overall drivetrain fuel efficiency	+ Fuel economy + Optimized drive	+ Simplicity + Fuel economy
CONS -	- Weight and size - Fuel economy with <6 speed	- Low speed drivability, worse with dry clutch - Weight	- Torque capacity - Cost	- Motor cost - Weight	- Motor cost

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



DCT

CVT

DHT

RED

1930 - 1950

1937: GM launched the Automatic Safety Transmission
Clutch disc and a Clutch pedal for starting and stopping, but the shift was automatic

Planetary gearset and clutch packs to shift gears

Motor oil used initially as lubricant

1940: GM presented the 'Hydra-Matic four speed', used in many Oldsmobile models in the 40's and 50's

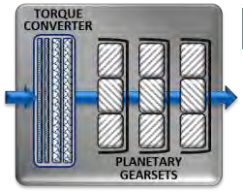
Liquid Coupling: Turbine and Impeller ➡ generates heat!

GM developed the TRANSMISSION FLUID N.1 for OLDSMOBILE HYDRA-MATIC DRIVE
Lubrication / Hydraulic medium / Cooling / Friction control

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



DCT

CVT

DHT

RED

1930 - 1950

1948: Buick presented the '**Dynaflow Transmission**'
Two speed AT
Lighter and cheaper, BUT hard to accelerate

New component: Stator to multiply torque within torque converter

Stator generates even more heat!

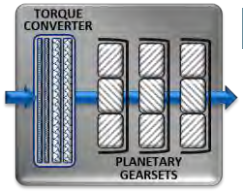
In 1949 GM developed the **Type "A"** fluid specification
Whale oil used as a friction modifier

Stator
Multiplication factor of ~2.6

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



1950 - 1970

DCT

CVT

DHT

RED

1957: Second Generation of Hydra-Matic Transmission, used a Controlled Coupling System
(a second and smaller fluid coupling system inside to improve gear change)

GM presented **Type "A" Suffix "A"** fluid specification also known as TASA
Improved oxidation resistance and viscosity stability

This fluid was widely used, including by other OEMs until they launched their own Specifications:

1959: Ford ATF Type A

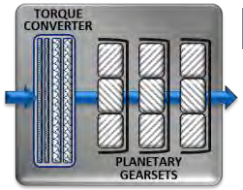
1967: New GM Fluid Specification: DEXRON® ➡ Improved Friction Performance
Red dye for leak detection

Ford released Ford Type F specification ➡ Not compatible with GM specs
No friction modifiers

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



DCT

CVT

DHT

RED

1950 - 1970

1969: Ford Galaxie LTD was the first model produced in Brazil fitted with Automatic Transmission

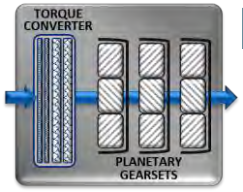
Equipped with Ford-O-Matic 3 speeds transmission, coupled to the V8 292 engine (4.8 liters, 190 cv.): Ford Type F Fluid

Créditos: @garagemdobellotetv

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



DCT

CVT

DHT

RED

1970 - 1990

1970s: GM DEXRON®-II, Chrysler ATF+ and Ford Type CJ specifications released

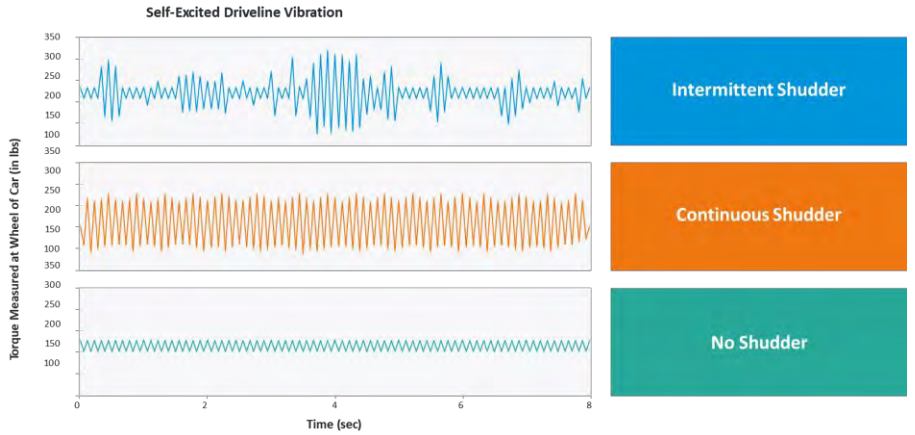
1978: CAFE (US Corporate Average Fuel Economy standard) was implemented for passenger cars
Need to reduce fuel consumption

1979: TCC - Torque Converter Clutch and overdrive gear used to improve FE ➡ New challenge: Shudder

1980s: Development of electronic controls
Solenoids - Electronic shifts
Partial clutch lock up when cruising to reduce NVH

Fluid evolutions mainly on Friction Control

- Chrysler ATF +2
  - Ford Type H
    - Ford MERCON® trademark
      - Toyota Type T
        - Nissan Matic D



Sophisticated hardware with specialised needs

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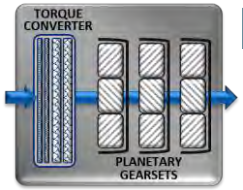
AT 

1990s

DCT

Evolution to electronically controlled slip systems using TCC

Low speed frictional characteristics of the ATF became fundamental

CVT

GM DEXRON®-III and Ford MERCON® V were developed in this period, along with many other specifications:

- Chrysler ATF +3/+4
- Toyota Type T-IV
- MB 236.1
- ZF Lifeguard 5
- Nissan Matic J/K
- Honda Z-1
- Hyundai SP-III

DHT

RED

High Viscosity Fluids
KV100 >6.5 cSt

Sophisticated hardware with specialised needs

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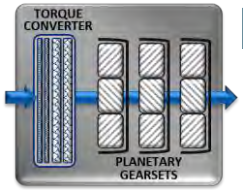
AT 

2000s

DCT

CVT

DHT

RED

Increased number of speeds, better shift performance, durability & fuel economy

ATs become increasingly popular over MTs, even in cost driven markets like Brazil

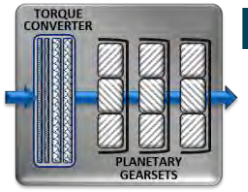
Predominant use of API Group III base oils with trend to lower viscosities:

- DEXRON®-VI
- MERCON® LV
- Toyota WS
- MB 236.12
- ZF Lifeguard 8
- Nissan Matic S
- Honda DW-1
- Hyundai SP-IV

Low Viscosity Fluids
KV100 at <6.5 cSt

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT 

2010 - Today

DCT

CVT

DHT

RED

9 & 10-Speeds ATs introduced
Growth of hybridized transmissions models

2014: Ultra Low Viscosity Fluids introduced

- DEXRON® ULV
- MERCON® ULV
- MB 236.17
- AISIN AW-2 (3.2 cSt)

Ultra Low Viscosity Fluids
KV100 ≤ 4.5 cSt

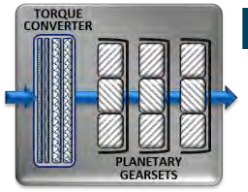
Precisely tuned friction curves

Backward compatibility no longer guaranteed

Sophisticated hardware with specialised needs

STEPPED AUTOMATIC TRANSMISSION (AT)

AT



2000

2038

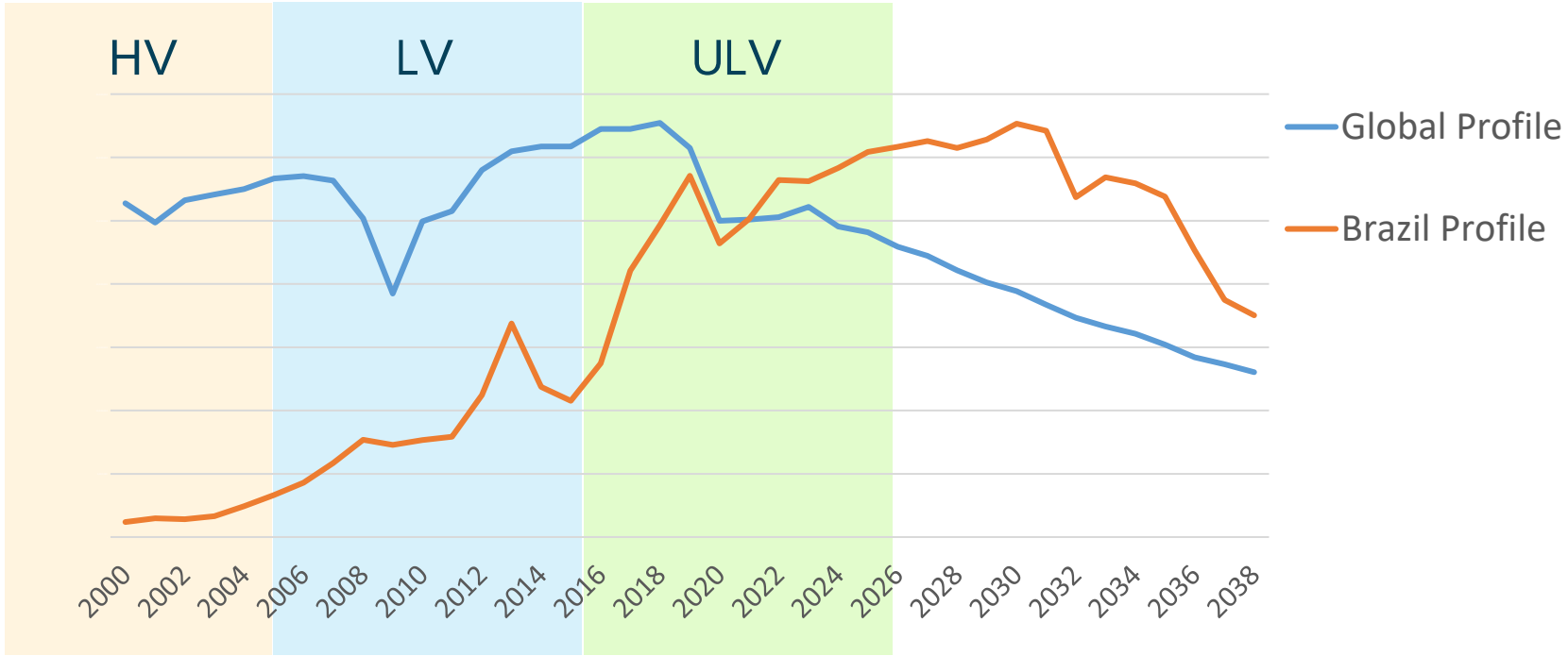
DCT

CVT

DHT

RED

Stepped Automatic Transmissions Installations



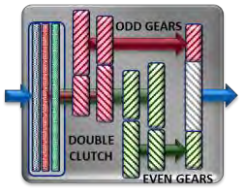
Source: S&P Global, Transmission Installation Forecast, March 2026.

Sophisticated hardware with specialised needs

DUAL CLUTCH TRANSMISSION (DCT)

AT

DCT



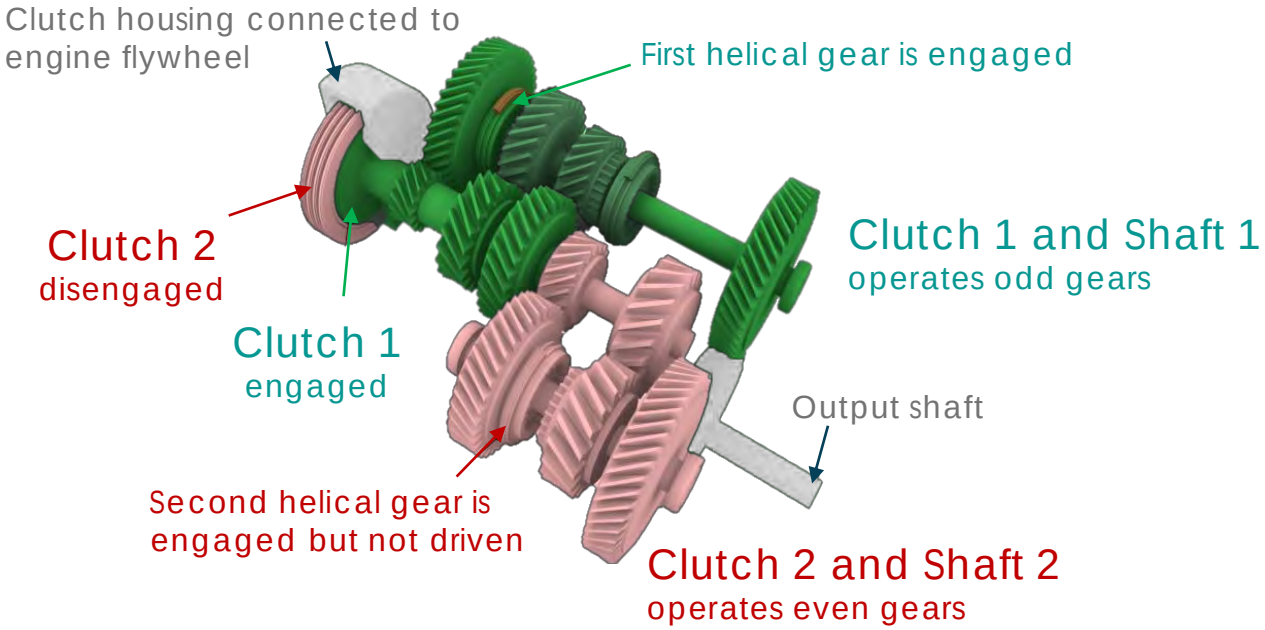
CVT

DHT

RED

DCTs have two sets of gears that are always engaged which provide quick shifts

A simplified DCT schematic with Concentric Dual Clutches (Most common)



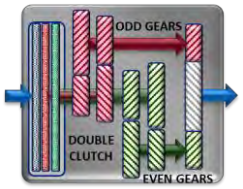
When shaft 1 is driving one gear, shaft 2 pre-selects another gear to get ready.
When it's time to change gear, clutch 1 disengages, clutch 2 engages.

Sophisticated hardware with specialised needs

DUAL CLUTCH TRANSMISSION (DCT)

AT

DCT



CVT

DHT

RED

1980s – 1990s

Initially used in
Motorsport & Prototypes
Electro-hydraulics,
Porsche PDK
No mass-production

2003 – 2008

Start of
Mass-Production DCTs
VW Group DSG

2008 – 2013

Expansion period with
interest from many
other OEMs

2013 – 2018

Refinement &
Performance Focus
BMW, Mercedes-AMG

2019 – 2023

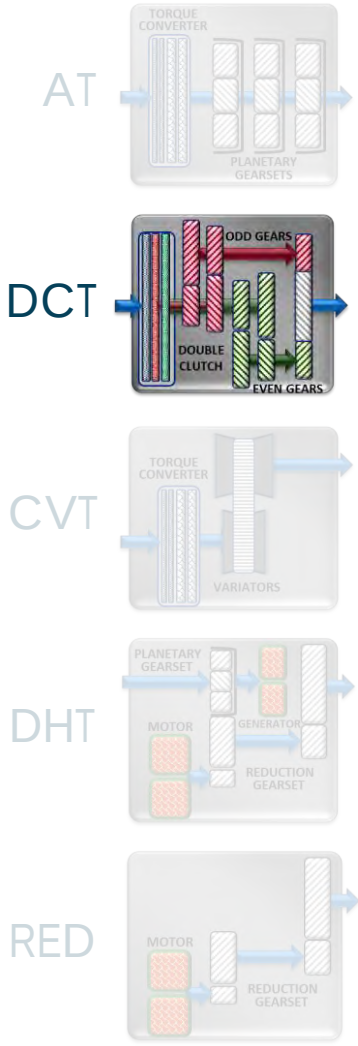
Electrification Interface
Hybrid integration:
Hyundai-Kia, Mercedes-Benz

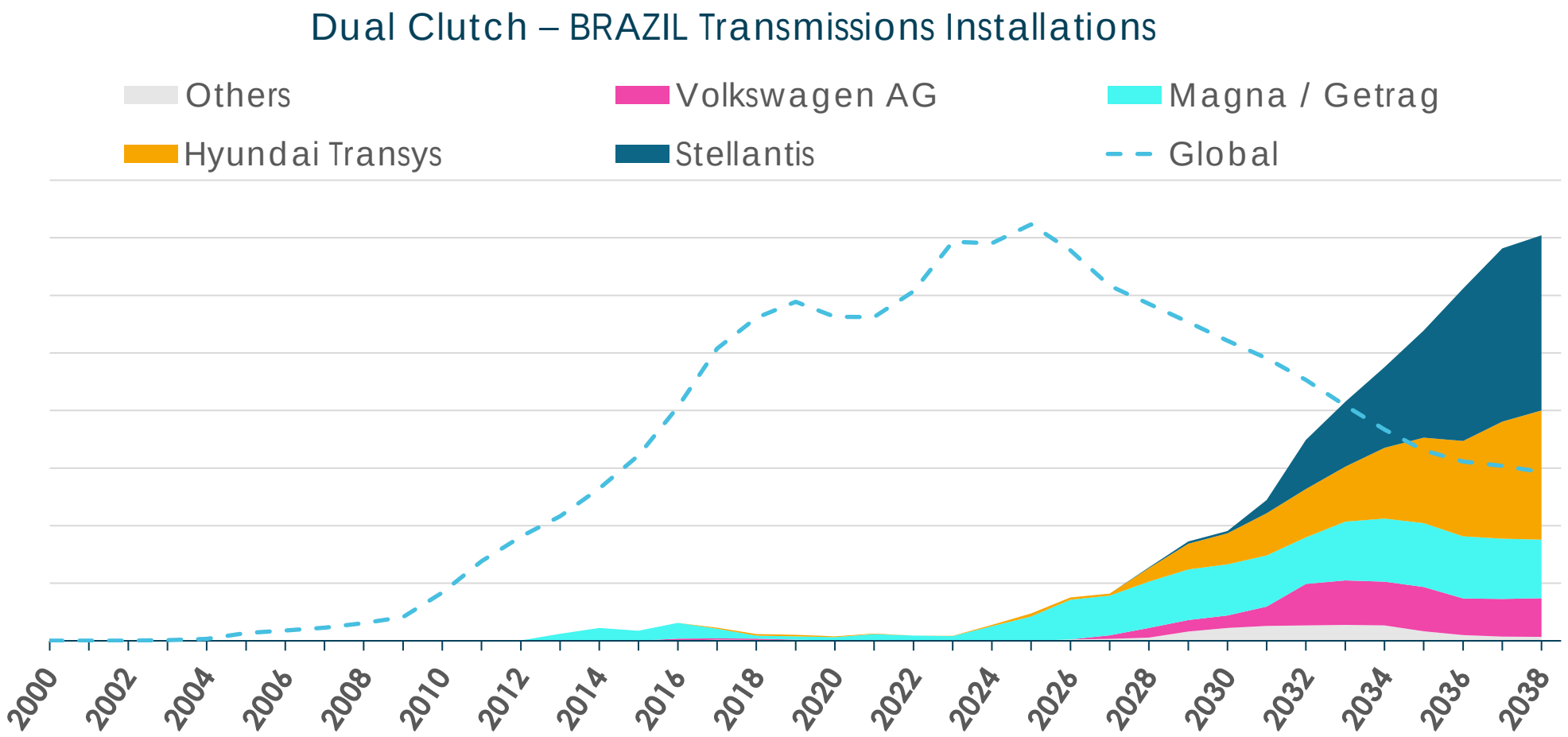
2024 – Future

Selective Use
Decline in Pure ICE
Hybrid focus

Sophisticated hardware with specialised needs

DUAL CLUTCH TRANSMISSION (DCT)

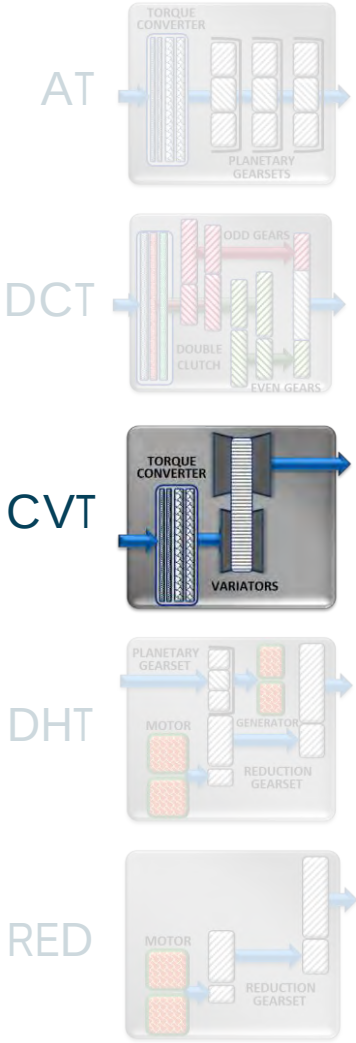


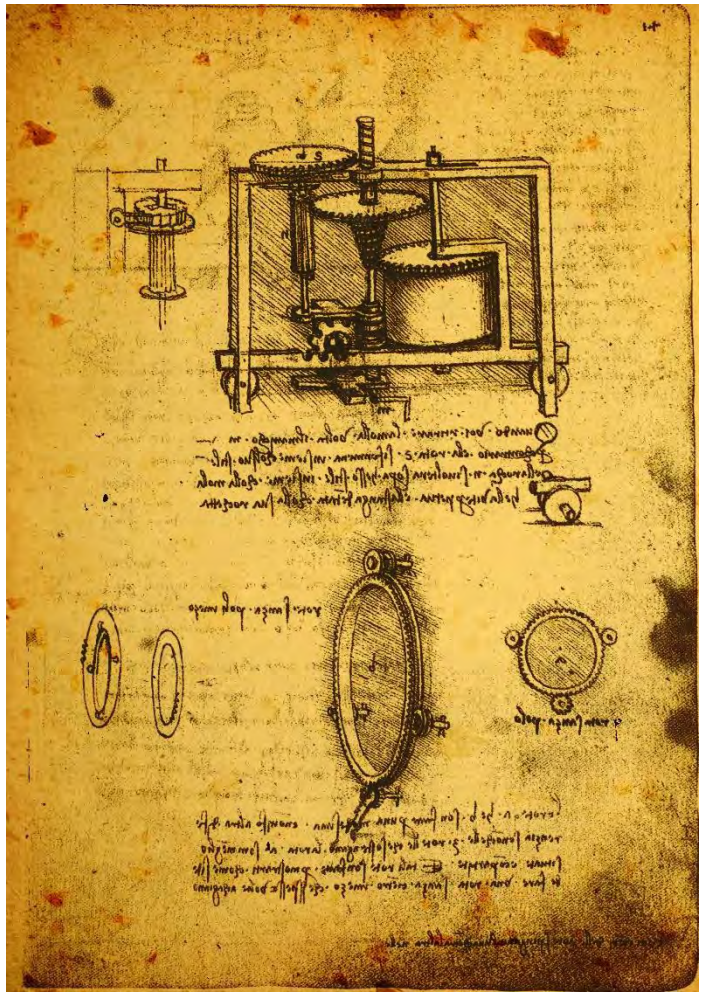


Source: S&P Global, Transmission Installation Forecast, March 2026.

Sophisticated hardware with specialised needs

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)





Leonardo Da Vinci - 1490

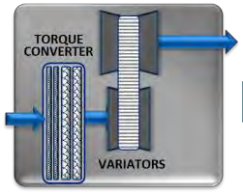
Modern chain CVT

Sophisticated hardware with specialised needs

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

AT

DCT

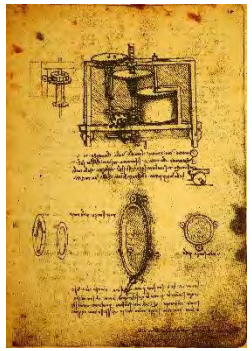


CVT

DHT

RED

1490



1958

Dutch DAF 600
First mass production vehicle
Rubber Belt

Source: https://www.flickr.com/photos/harry_nl/27660660991/in/photostream/
Author: Harry_nl

1990s – 2000s

Advancements on metallurgy and additive technology allowed the transition from rubber to Steel Belt / Chain

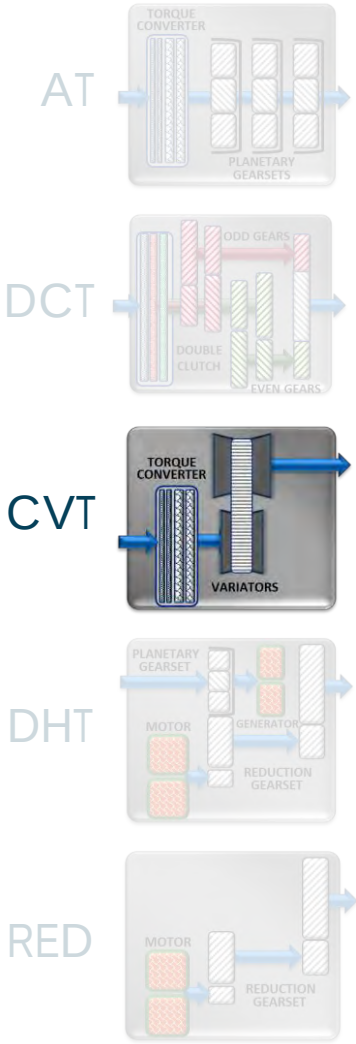
2010 - Today

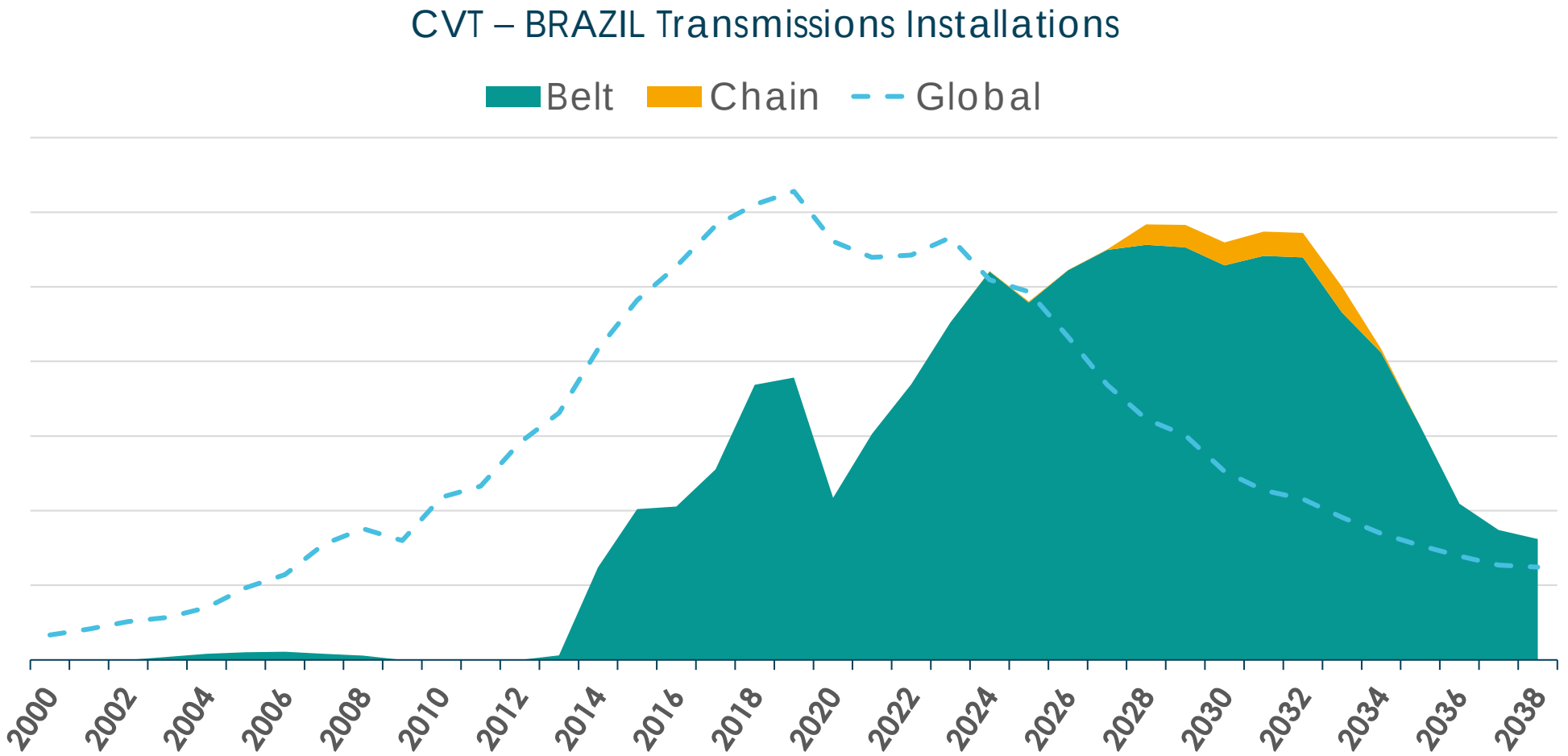
Improved performance
Low viscosity
Hybridization

Steel-on-Steel friction requirement

Sophisticated hardware with specialised needs

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)





Source: S&P Global, Transmission Installation Forecast, March 2026.

Sophisticated hardware with specialised needs

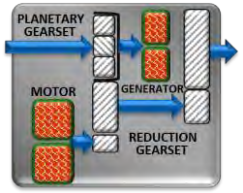
DEDICATED HYBRID TRANSMISSION (DHT)

AT

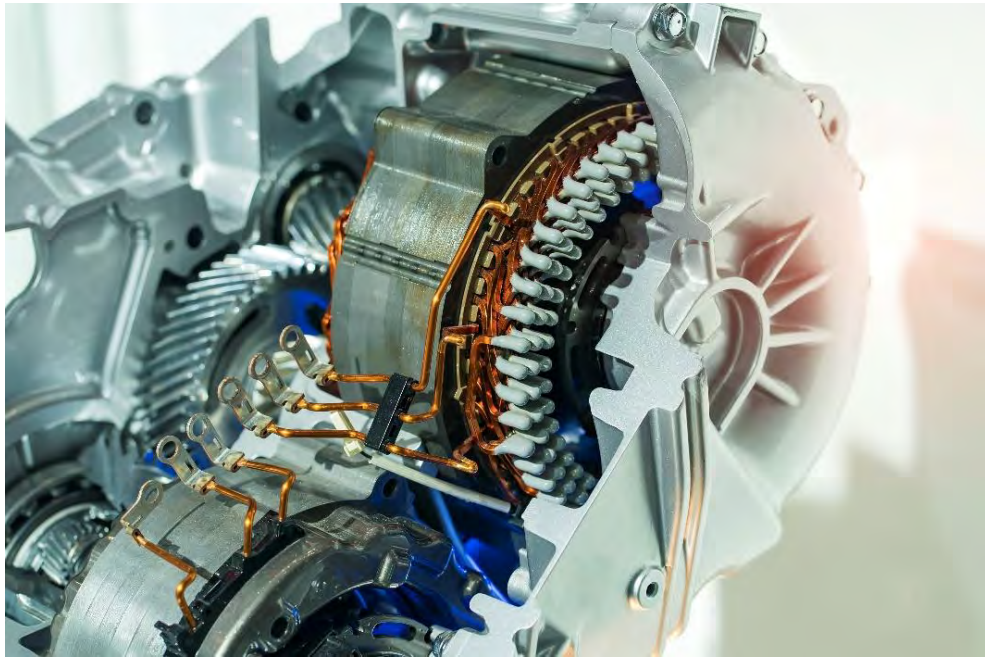
DCT

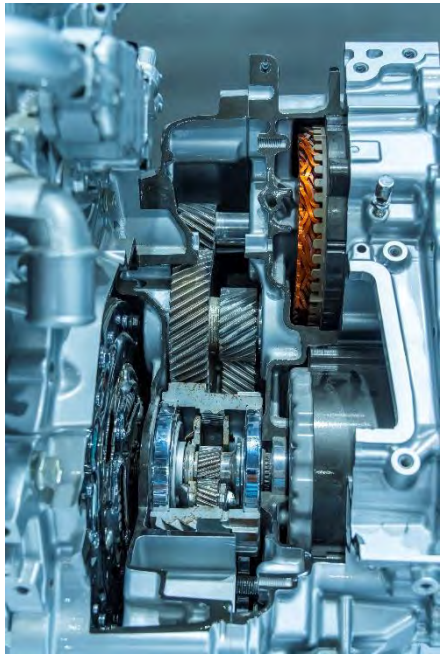
CVT

DHT



RED





Also known as:

Hybrid Power Split Device Transmission
Electronic Variable Transmission [EVT]
E-Continuously Variable Transmission (E-CVT)

Steel-On-Steel Friction is not required

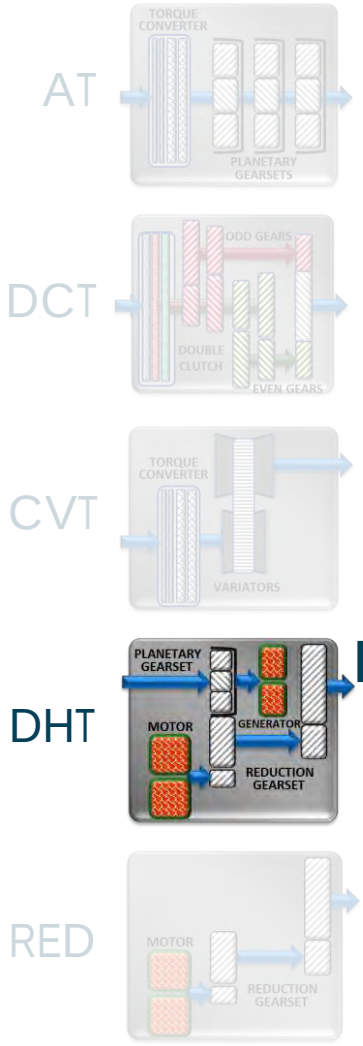
New Challenges to Fluids:

- Heat transfer efficiency
- Material compatibility
- Electrical Properties

Design Based on planetary gearset and clutch packs

Sophisticated hardware with specialised needs

DEDICATED HYBRID TRANSMISSION (DHT)



1997

Launch of Toyota Prius equipped with the first generation of DHT, presented as Hybrid Synergy Drive with one single planetary gear set

Source: https://www.flickr.com/photos/harry_nl/48003142872/in/photostream
Author: Harry_nl

2007

GM, Daimler-Chrysler and BMW introduced the innovative two-mode Power Split EVT, with two planetary gear set and improved energy management

2021 - 2023

Second-generation DHTs, generally, feature 2 to 4 physical gears, allowing the electric motor to operate in its peak efficiency zone

Present - Future

DHTs are evolving into highly integrated systems with multi-speed, multi-mode capabilities

Sophisticated hardware with specialised needs

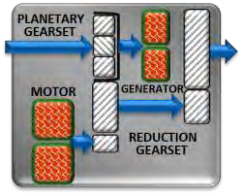
DEDICATED HYBRID TRANSMISSION (DHT)

AT

DCT

CVT

DHT



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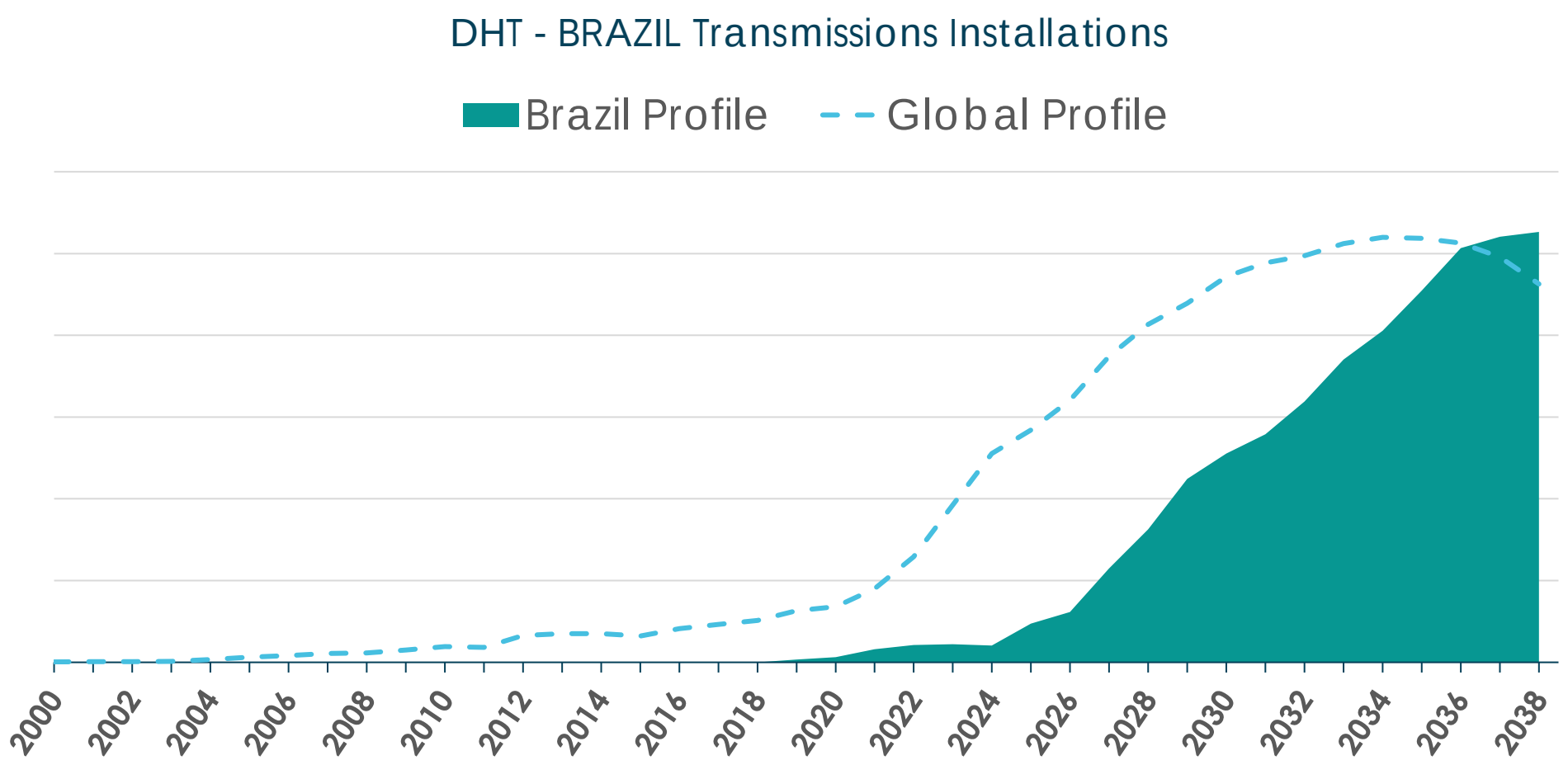


Source: S&P Global, Transmission Installation Forecast, March 2026.

Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

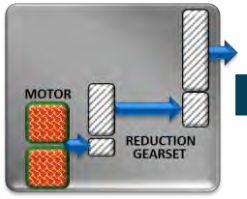
AT

DCT

CVT

DHT

RED



1996

GM EV1 First modern EV fitted with a single-speed reduction unit

(1100 units produced)

Source: https://www.flickr.com/photos/rightbrainphotography/2223283465/in/set-72157603803274612/
Author: RightBrainPhotography (Rick Rowen)

Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

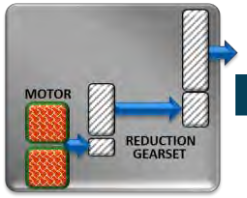
AT

DCT

CVT

DHT

RED



1996

GM EV1 First modern EV fitted with a single-speed reduction unit

(1100 units produced)

2010s

Mass production starts with Nissan Leaf

Single speed dominance simplicity, lower cost, and high reliability, single-speed reduction gearboxes became the industry standard.

By Tom Raftery - The Nissan Leaf, CC BY-SA 2.0, https://commons.wikimedia.org/w/index.php?curid=12184680

Infineum

Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

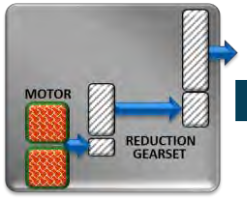
AT

DCT

CVT

DHT

RED



Conventional

Power Inverter

Gearbox

E-Motor

Image: GKN Automotive CC0

2010 - Today

Integrated Approach
Power Inverter + Gearbox + E-Motor
turning into the
Electric Drive Unit (EDU)

Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

AT

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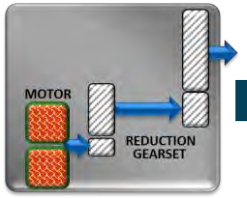


Integrated Electric Drive Unit (EDU)

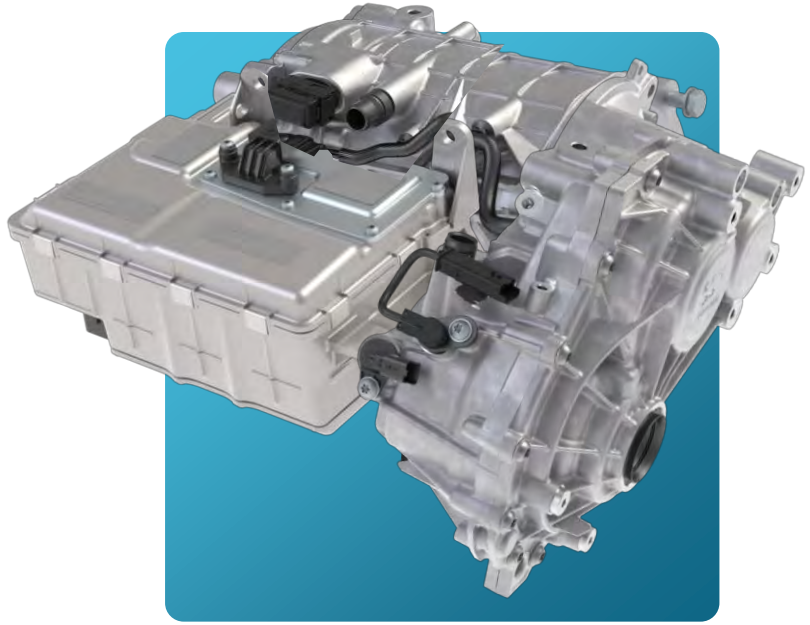


Image: GKN Automotive CC0

2010 - Today

Integrated Approach
Power Inverter + Gearbox + E-Motor
turning into the
Electric Drive Unit (EDU)

Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

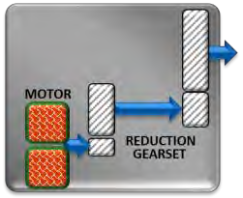
AT

DCT

CVT

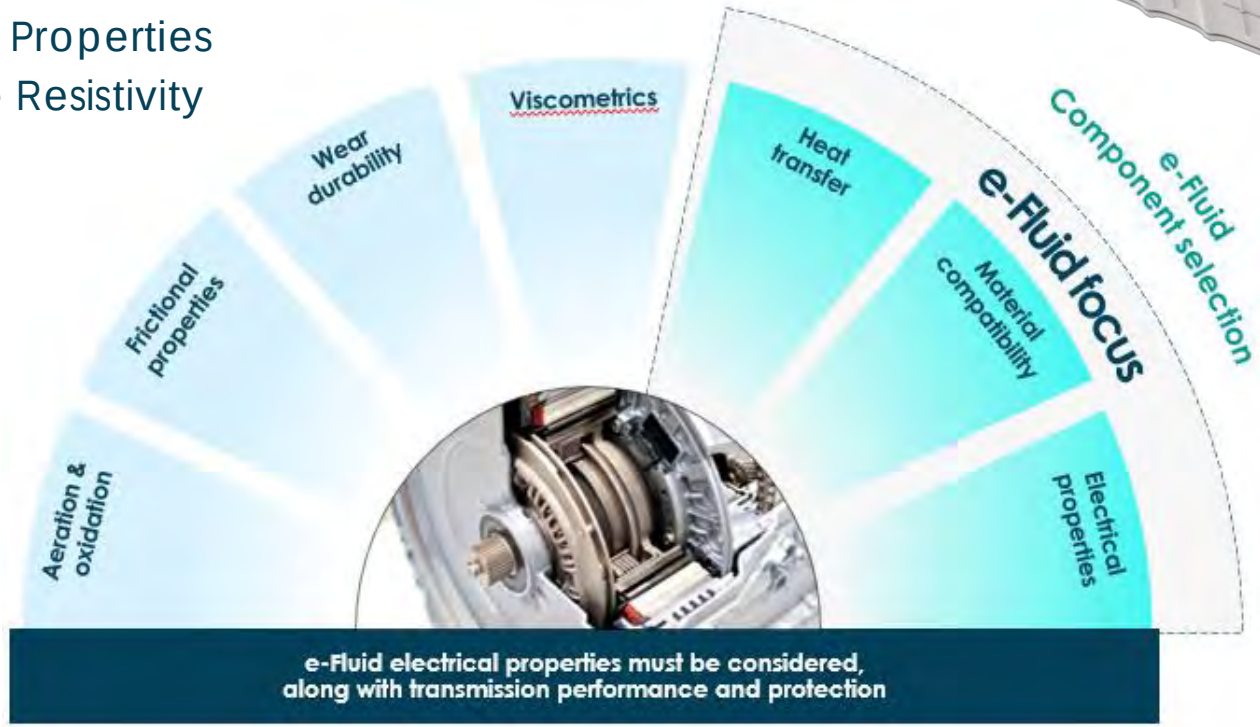
DHT

RED



Challenges to Fluids:

- Heat transfer efficiency
  - Ultra Low Viscosities and its associated challenges
- Material compatibility
  - Copper Corrosion X Wear
- Electrical Properties
  - Volume Resistivity



Sophisticated hardware with specialised needs

REDUCTION GEAR (RED)

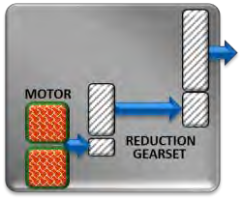
AT

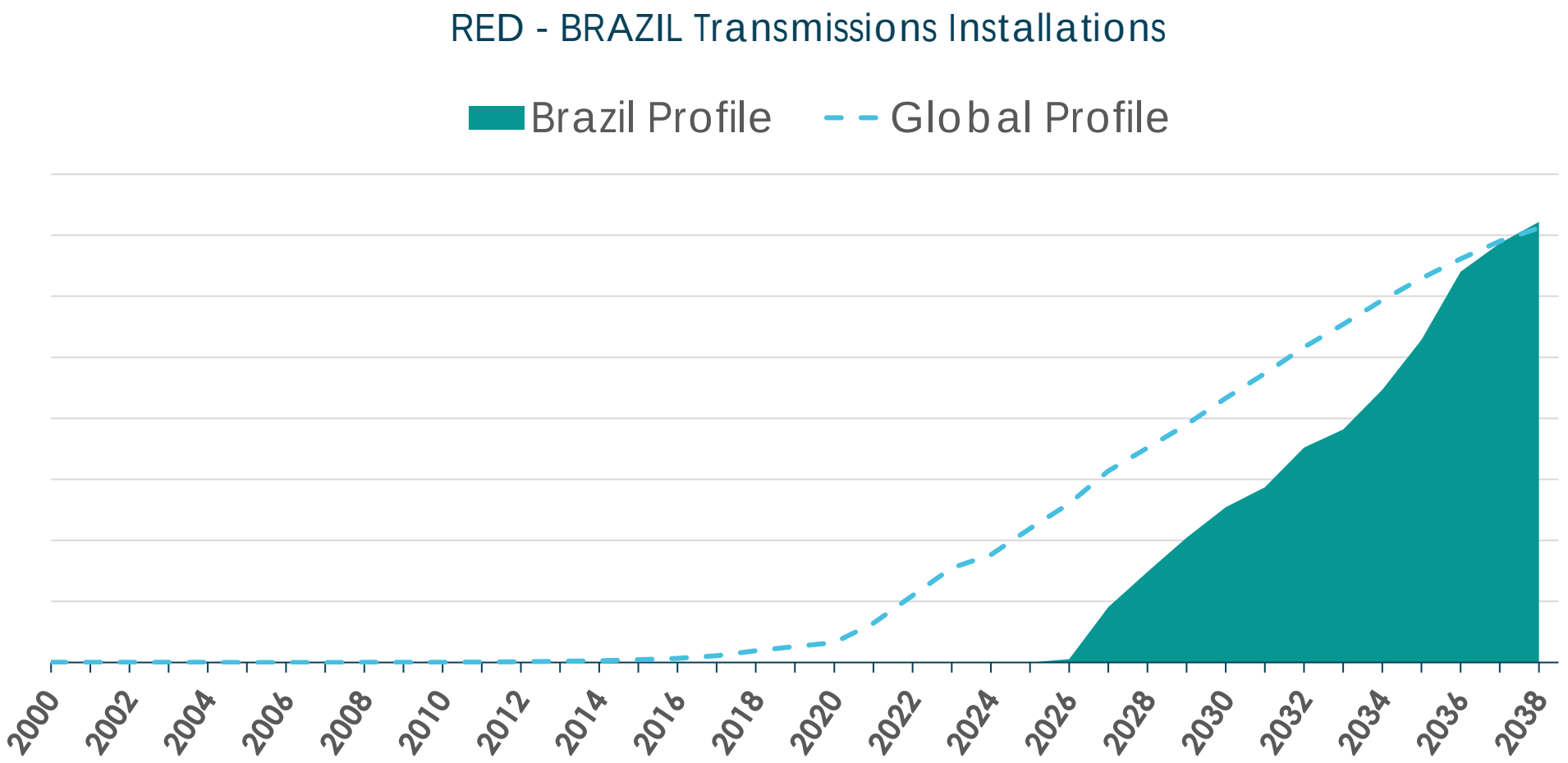
DCT

CVT

DHT

RED





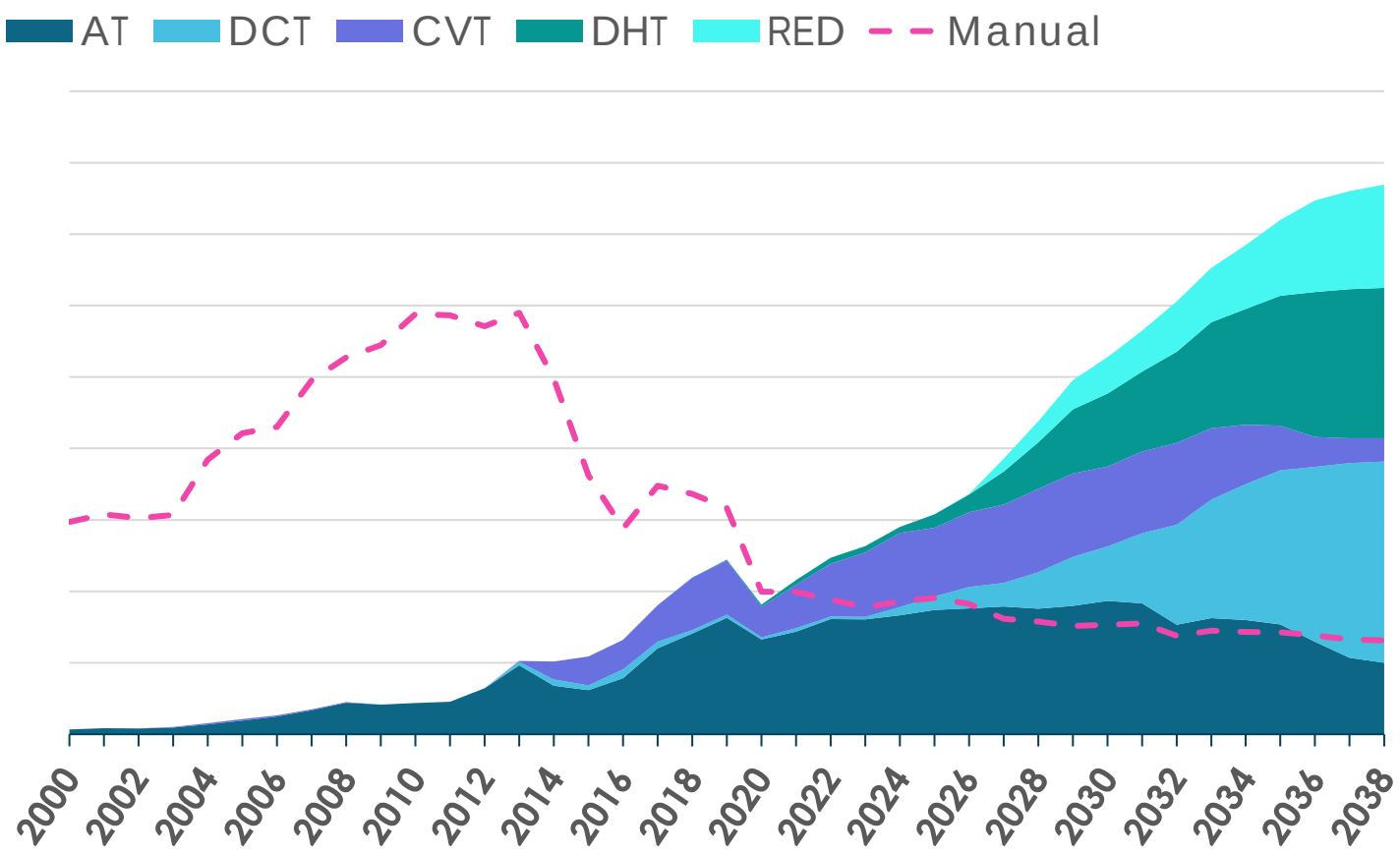
Source: S&P Global, Transmission Installation Forecast, March 2026.

Stepped Automatic | Dual Clutch | Continuously Variable | eMobility

Sophisticated hardware with specialised needs

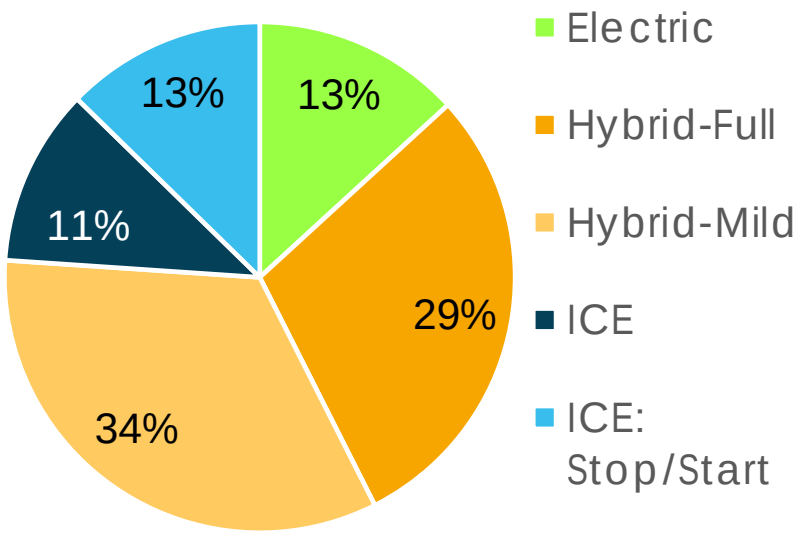
PRODUCT PORTFOLIO

BRAZIL - Transmissions Installations



Source: S&P Global, Transmission Installation Forecast, March 2026.

BRAZIL
Powertrain share in 2038

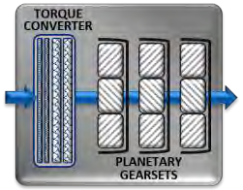


Source: S&P Global, Transmission Installation Forecast, March 2026.

Sophisticated hardware with specialised needs

PRODUCT PORTFOLIO

AT

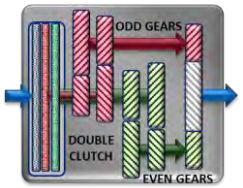


AT Fluid:

Key product in the current portfolio

Focus on Low Viscosity Multivehicle | Must prepare for Ultra Low Viscosity

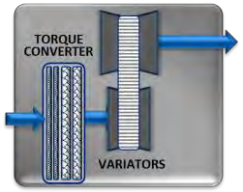
DCT



DCT Fluid:

Key product for your future portfolio – Invest now to gain market authority

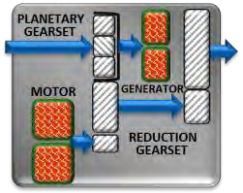
CVT



CVT Fluid:

Relevant product that will continue to grow for many years

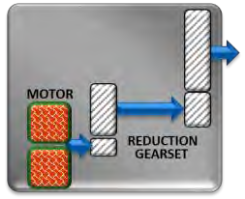
DHT



DHT Fluid:

This is another key product for your future portfolio

RED



RED Fluid:

Reduced service fill opportunities (most are fill for life)

Thank you

Formulating tomorrow together

Permissions, contact, call to Action