



SUCCESS STORY: **REPURPOSING STRATEGY FOR THE TRANSITION FROM INTERNAL COMBUSTION ENGINES TO ELECTRIC POWERTRAINS**

INTRODUCTION

Governments across Europe have a deadline to end the manufacture of diesel-gasoline engines within the next 10 years in order to meet CO2 emission targets. Companies working in the manufacture of internal combustion engines (ICE) will be heavily affected by these changes. As part of the E:PrIME project, HSSMI has been helping Ford Motor Company assess its ability to repurpose the facilities, that until now have been used for the production of internal combustion engines, for the manufacture of electric powertrains.

THE CHALLENGE

Managing a smooth transition to electrification is a significant challenge, involving changes in production processes and testing. The E:PrIME project aims to investigate the feasibility of reusing existing machinery, equipment, and infrastructure for the production of electric powertrains, establish a repurposing strategy and aid the creation of an electric vehicle (EV) powertrain manufacturing facility.

THE APPROACH

HSSMI worked with Ford to develop a repurposing strategy, evaluating the suitability of repurposing the currently installed ICE Bill of Process (BOP) machining and assembly production lines and facilities to produce equivalent EV components.

The methodology followed to develop this repurposing strategy was:

Analysis of an ICE BOP.

Having determined the engine plant to be assessed, the HSSMI technical team created a thorough analysis of the ICE BOP gathering key information in an Equipment Repurposing Comparator (ERC) sheet. The information captured included: workplace detail and layout, component complexity information, key facility requirements, error proofing and an equipment list.

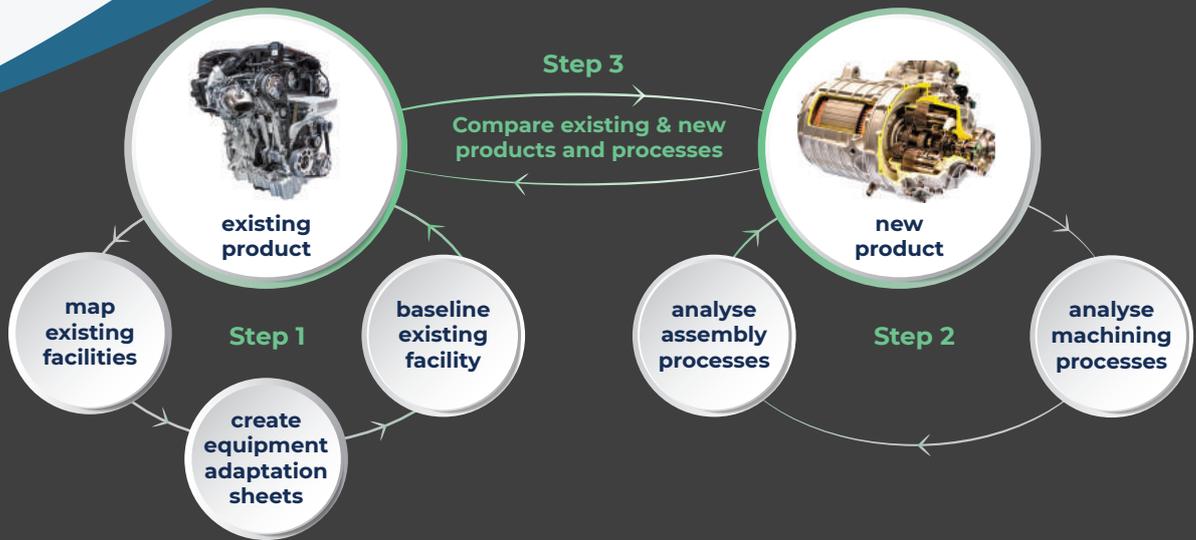
Analysis of an EV BOP.

The maturity of the EV BOP was not at the same level as the ICE BOP. Therefore, CAD models, bill of sequence (BOS) and benchmarking information was used to complete the EV comparator sheets.

Comparison of ICE BOP to EV BOP.

The ERC sheets enabled comparison of the machining and assembly processes between the various ICE and EV components and final assemblies, making it possible to evaluate the re-use potential of ICE equipment with respect to EV production against 3 categories:

- Re-use minimal re-tool required.
- Re-use further work required.
- ICE specific major re-tool.



THE RESULTS

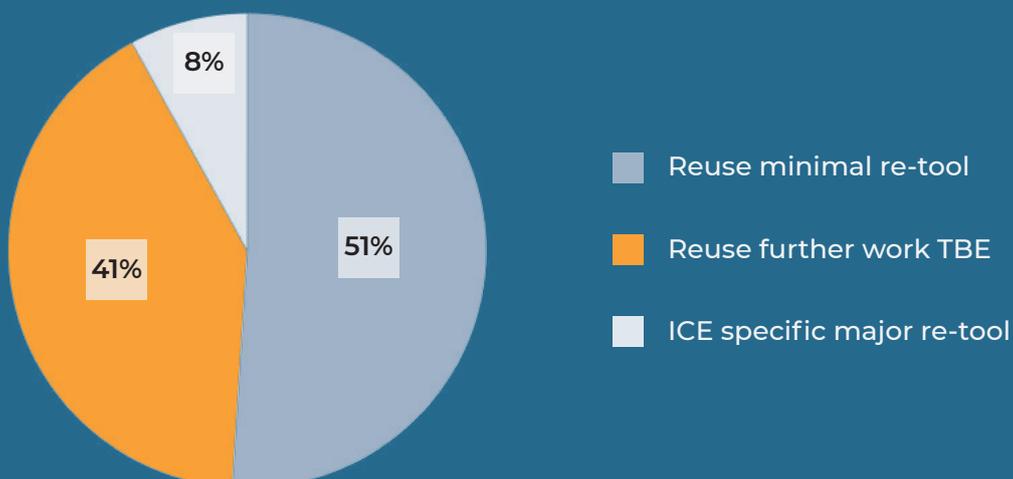
This work resulted in a comparative analysis between ICE and E- Motor component manufacturing processes which identified certain ICE BOP machinery, equipment, and facilities with obvious potential for EV motor related repurposing.

Each ICE production line was assessed, and the key pieces of equipment were classified against the following categories:

- Re-use minimal re-tool required: Those pieces of equipment deemed flexible enough to accommodate major component change easily e.g. Robots/CNC machines
- Re-use further work required: Equipment which possesses re-use potential but feasibility needs to be established e.g. Test Equipment
- ICE specific major re-tool: Equipment which would require modification to the fundamental base machine e.g. Honing Machines

This approach enabled the following chart to be created, which show the percentage split of each ICE production line.

Manufacturing Line 1



In this example it can be seen than only 8% of the total equipment across the line is deemed unsuitable for EV conversion. Same Study was made for all the ICE manufacturing lines.