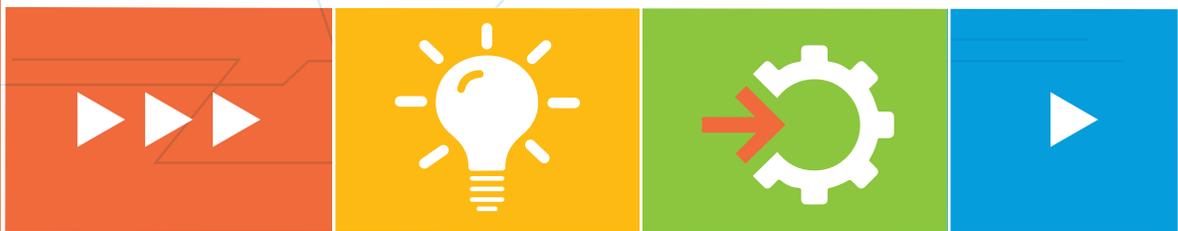


HOW TO BUILD A MOBILE MACHINE



FROM CONCEPT TO PRODUCTION

FROM CONCEPT



CREATE A SCOPE OF WORK

Write down a description of what the machine will look like, what it will do, how you want it to function and a list of functions, its sequence of operations, how the operator will interface with the machine, etc. This will be the foundation that will get you started on development. Do a thorough job on this Scope of Work as it will save you resources down the road.

RETAIN ENGINEERING RESOURCES

to engineer, design, and document a full scale prototype machine. This should be someone with 3D CAD and mobile machine design experience. They will be responsible for the structural design, which is the foundation of the machine. Associated responsibilities will be:

- Structure size, weight, materials, method of construction, etc.
- Movements and linkages.
- Will you hire an engineer to design a proper wiring harness? Doing so will greatly improve the ease of assembly and reliability of your machine.

DETERMINE HOW THE MACHINE WILL BE PROPELLED

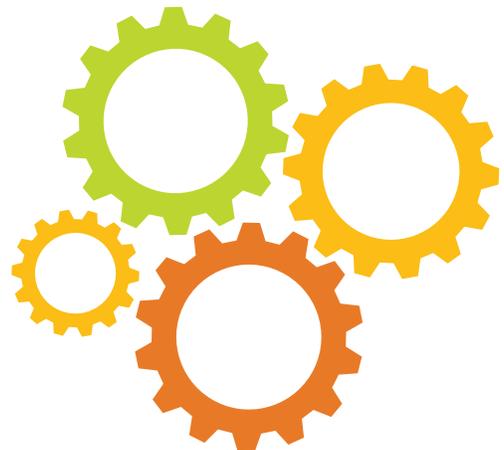
Hydrostatic drive will give you infinitely variable forward and reverse speeds plus dynamic braking. Electric drives will give you infinitely variable speed and may have some advantages. Mechanical drives will be less expensive, but have fewer advantages with fixed gear ratios determining speeds. Discuss your options with your consultant team.

IF FEASIBLE, DESIGN A WORKING CONCEPT MODEL

This can be a small scale version of the basic machine function just to make sure it can work. It's less expensive to do this than to build a full life-size machine first, only to then find out it doesn't work.

DETERMINE POWER SOURCE AND HORSEPOWER

Some options are Diesel, LP, Gasoline, CNG, Electric, and Electric Hybrid. Be aware that many engines today have electronic controls and emissions equipment that have to be considered when designing your machine.



DETERMINE HOW THE MACHINE'S FUNCTIONS AND MOVEMENTS WILL BE POWERED

Hydraulic cylinders and motors are the most common ways of powering functions and movements. They also are capable of providing great amounts of force and torque. If your machine requires small forces, a small compressor and pneumatic actuators might be a better choice. There are also many electrically driven actuators that are now available to consider.

CONSTRUCTION AND ASSEMBLY

After you've done the planning and design, someone must build the structure and assemble the machine. The term "the Devil is in the details" will apply here. Seemingly small items like wiring connectors, fasteners, metal forming, etc. will become important to the execution of your design.

TEST TEST, TEST

The tendency is to watch a machine work for a few minutes and want to ship it to a customer immediately. Remember, this is a prototype. It will have problems that need to be sorted out. It's a lot easier to sort them out in your shop than it would be 500 miles away. Make sure the machine is ready for "prime time" before sending it to the customer.

DETERMINE HOW THE OPERATOR WILL CONTROL THE MACHINE

Will there be a steering wheel or will it be skid steered? Will you use manual levers or joysticks? Will you need video displays, gauges, remote radio control, programmable logic controls, etc.?

Note: All of the steps up to this point will take time and planning. As such, it is tempting to plow through it or skip it altogether. If appropriate investments are made upfront, it will make the total project less expensive and will improve the odds for a successful final machine. In some cases, outsourcing these technical services will be prudent or necessary.

START UP

Because the machine will likely involve electronic devices, software, graphics, etc., they will have to interface with the hydraulics and engine management system. You will need the assistance of the following people for a successful start up.

- The engine vendor will have to witness testing and approve your engine for the application and warranty.
- Someone who is knowledgeable about both the hydraulic system and the electronics/software/controls will need to be present to make sure the control system interfaces properly with the engine management system and that all of the functions operate as intended. In addition, there will likely need to be changes made to video display graphics and/or software at this time, which may require an additional resource.

TO



PRODUCTION