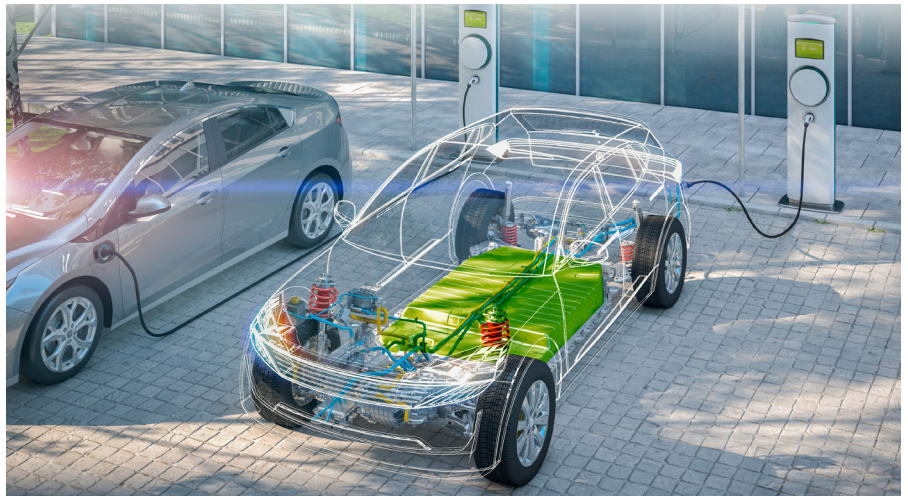


Pressure and Vacuum Solutions for Electric Vehicle Battery Manufacturing

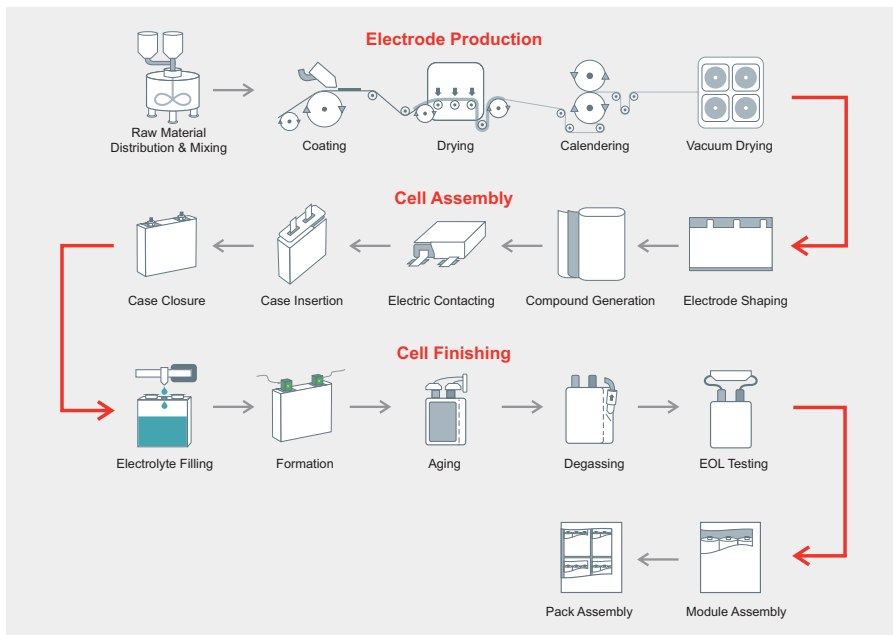
Global Trends in Electric Vehicle Battery Market

Stimulated by factors such as mounting environmental concerns and increasingly restrictive emission standards and regulations that are discouraging the use of highly pollutant petrol and diesel engines, and buoyed by technological advancements that are making green vehicles an increasingly viable and driver-friendly alternative, the global electric vehicle market continues to experience exponential growth. A number of the world's largest carmakers have already expanded into this nascent sector with many others, if not all, expected to do so in the near future.



The lithium-ion battery segment will account for the bulk of this growth in the coming years. Everywhere, the owners of existing and planned battery plants will need to embrace the latest manufacturing

technologies - including those regarding compressed air and industrial gases - in order to boost productivity and efficiency, and thus strengthen their positions in a market that will be ever more competitive in the years to come.



Compressed Air Application in EV Battery Manufacturing

With the industry being defined by a high level of automation, many of the critical manufacturing process steps generate considerable demand for high-quality, clean and dry, compressed air.

The average compressed air consumption of an electric vehicle lithium-ion battery plant with a capacity of 10 GWh totals approximately 200-250 m³/min (depending on estimated

distribution losses). Apart from the applications listed above, compressed air is also needed for the on-site production of nitrogen, an inert gas, used for protecting the welding (eliminates oxygen allowing for a contaminant-free weld) and drying (helps remove moisture) processes at the plant, among others.

Like many other industrial processes, electric vehicle battery manufacturing depends on the quality and reliability of the installed equipment for achieving satisfactory levels of productivity and efficiency, as well as ensuring the desired product quality and costs.

5 things to keep in mind while selecting a compressed air system design for your EV battery plant

1. Maximized uptime/availability of the equipment, MTBF criteria (Mean Time Between Failure). Top tier equipment achieves MTBF > 99.5%
2. The total cost of ownership (TCO criteria) and the investment payback time, with energy consumption of the equipment typically accounting for over 70% of this total cost
3. Optimal redundancy, and ample back-up utilities in order to avoid operations' breakdown and interruption
4. Capacity (output flow) flexibility, enabling processes to be easily scaled up during production ramp-up
5. Stringent compressed air quality requirements for clean and dry air, and designs able to meet the ISO 8573-1:2010 standard (requirements for solid particulate, water and oil respectively).

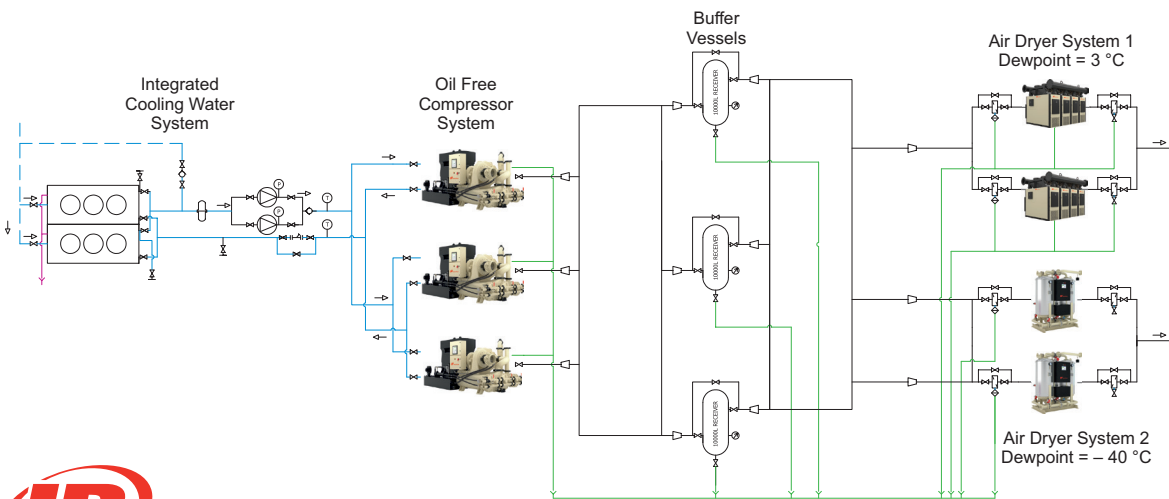
Ingersoll Rand - Your Trusted Partner for Total System Solutions

Ingersoll Rand has extensive experience in providing compressed air, vacuum and pumping solutions for the end-to-end electric vehicle battery manufacturing industry. We offer

a wide range of products that meet the stringent equipment quality and reliability requirements of the sector and include both oil-free and oil-lubricated compressors, as well as numerous ancillary compressed air treatment system elements such as adsorption dryers, buffer vessels, inline filters, gas storage tanks and

nitrogen generating units, with the purpose of delivering the required air and gas purity.

In recent years, Ingersoll Rand has been involved in a number of large electric vehicle battery plant development projects around the world, with dominant players in this rapidly growing industry.



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