Godfrey & Wing

Vacuum and Pressure Impregnation for Optimum Performance

Celebrating 25 Years of success 1988-2013

Empowered by Innovation !

CEE DEE
VACUUM EQUIPMENT PVT. LTD.
AN ISO 9001:2008 CERTIFIED COMPANY

www.ceedeevacuum.net

CEE DEE

ENGINEERING COLLABORATION

GODFREY & WING INC.

Godfrey & Wing was founded in 1948 and is recognized as the worldwide authority in vacuum impregnation.

Based in Aurora, Ohio, USA, Godfrey & Wing designs and manufactures a complete line of innovative vacuum impregnation equipment and sealants. Demonstrated in GW's ground--breaking Continuous Flow Impregnation systems and four sealants approved and listed on the US Military Specification MIL-17563C , GW leads the industry in technology and engineering excellence.

A team of experienced engineers, scientists and factory trained technicians supports GW systems and sealants worldwide, allowing customers to achieve optimized performance and superior results regardless of location.

www.godfreywing.com .
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CEE DEE VACUUM EQUIPMENT PVT LTD

CEE DEE was founded in 1988 in Pune, India and now has multiple manufacturing units specializing in the design and manufacture of vacuum impregnation equipment for sealing transformers and porous castings.

Combining CEE DEE's manufacturing capabilities with Godfrey & Wing's technical expertise in impregnation sealants, application knowledge and modern high speed processing equipment provides a new and strong alliance in the Indian market.

Approved to ISO 9001, CEE DEE has the sales, technical and service capabilities to supply and support customers throughout India.

Our Clients : ABB, JSL ROOTS, CGL, JEMOUNT, Medha Iraction, JST, Indian Railway.

www.ceedeevacuum.in
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'Godfrey & Wing Clients

TRW WABCO metaldyne BOEING DETROIT DIESEL LOCKHEED MARTIN Visteon
SANDEN GM Honeywell DELPHI JOHN DEERE
CATERPILLAR Mercedes-Benz NISSAN CHRYSLER Ford BOSCH Cummins

"Godfrey & Wing has over 60 years experience in vacuum impregnation"

IMPREGNATION ENSURES LEAK FREE CASTING PRODUCTION

The recovery of porous metal castings and powder metal parts by vacuum impregnation is today a well established and widely accepted process. Leaking castings were first impregnated in the 1940's using phenolic resin or water glass (sodium silicate), both off-the-shelf chemicals available at that time. In the 1960's polyester resins mixed with styrene to lower the viscosity and give improved penetration became the preferred impregnation process until, in the late 1970's, a blend of methacrylate monomers was specially formulated for more effective casting impregnation. The resultant sealant was stable under higher vacuums, exhibited low viscosity and low surface tension - all essential for the penetration of micro porosity, and could be washed and cured in water to produce clean and sealed castings. This was all achieved in a much shorter cycle time that was more acceptable to the demands of the automotive industry.



Godfrey & Wing's Standard Top Load Batch Systems from 14" to 60" in diameter. **Cycle time: 30 minutes**.

Today virtually all castings that are required to withstand pressure and contain a gas or liquid are impregnated as an essential part of the manufacturing process. This is partly due to the increased use of aluminium and magnesium castings in the automotive industry with more complex shapes, thinner wall sections and tighter leak specifications. High volume automotive casting production often justifies 100% impregnation of all castings to reduce the risk and the high cost of an engine or other component failing in service due to the leakage of fuel, oil or water through micro porosity. Whatever the volume or application, impregnation is a widely established rectification process for castings that fail on leak test in the automotive, defence, aerospace and general engineering industries.


Godfrey & Wing's Fully Automated High Speed Single Piece Flow Impregnation System. **Cycle time: 60 seconds**.

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IMPREGNATION APPLICATIONS

Automotive engine parts including cylinder heads, blocks, cam covers, bedplates, sumps, oil and water pumps, fuel pumps, oil filters, inlet manifolds and air-conditioning compressors
Transmission and gearbox casings
Truck air braking systems
Aircraft engine parts, fuel delivery systems, landing gear and braking systems
Gas valves and regulators, commercial and domestic
Water meters, valves and irrigation equipment
Hydraulic pumps and pneumatic components
Air compressors, pumps, actuators, control valves
Powder metal (sintered) parts, both for pressure tightness and to seal surface porosity pre-plating
Electrical connectors, cabling assemblies and fuel cell graphite plates
Defence missile propulsion, oil systems and compression systems
Telecommunications equipment

What size porosity can be sealed - The totally variable nature of porosity through the wall of a casting makes it impossible to state what size void can and cannot be sealed by impregnation. The low viscosity and surface tension of the sealant will prevent it from staying in large defects during the draining, washing and curing stages, and as such modern day impregnation sealants can only seal micro-porosity. This can be described as a 'fine stream of bubbles' when castings are tested at 50 psi air under water, or under 300 cc/min when tested by air decay. Gross defects in castings, those that leak in excess of 3000 cc/min, in many cases are structurally unsound and should not be sealed by impregnation.

When is the best time to impregnate – this depends whether machining operations will open up porosity that is not accessible for impregnation in the as-cast state, and which could result in a leak path through the casting wall. This is typically the case with die-castings and therefore the best time to impregnate is after machining. On the other hand impregnation before machining can be effective for sand castings and powder metal parts, which have more open porous structures.

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IMPREGNATION PROCESS

The vacuum impregnation process is governed by US MIL-STD-276A as well as numerous proprietary and customer specifications. The purpose of the impregnation process is to completely fill the porosity of a component with a sealant that when solidified is permanent, durable and suitable for the field of use.

In general, the vacuum impregnation process comprises four steps:

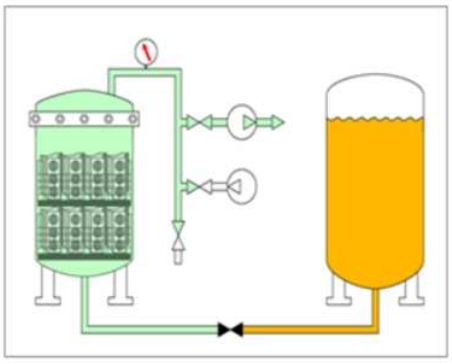
1. **Impregnation** - where the casting is subjected to a high vacuum to remove all the air from within the porosity, the liquid sealant is introduced to fill the evacuated voids and positive pressure is applied to ensure full penetration of the part. This process is called dry vacuum pressure (DVP) and is the most complete and successful impregnation process for sealing micro porosity in pressure die-castings.

2. **Sealant Recovery** - using a tilt, rotation or centrifuge drain to recover excess sealant from the surface of the casting, in galleries and in blind machined holes, which is returned to the impregnation station for re-use. Effective sealant recovery at this stage is essential for an economical process.

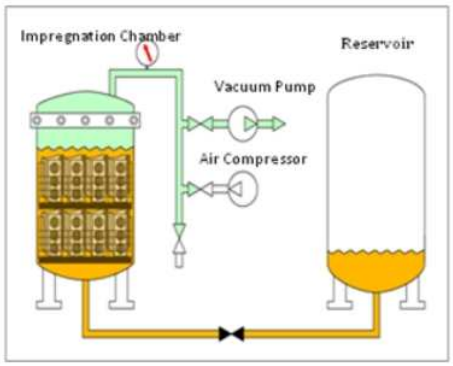
3. **Wash/Rinse -** using stationary cold water, rolling rinse or pump over station to remove residual sealant from all casting surfaces, galleries and holes to ensure a thoroughly clean surface finish before curing.

4. **Hot Cure –** using stationary hot water, rolling cure or pump over station to heat the casting and polymerize the sealant in the porosity, converting the sealant from a liquid to a solid, whilst also maintaining a clean surface finish without corrosion or discolouration.

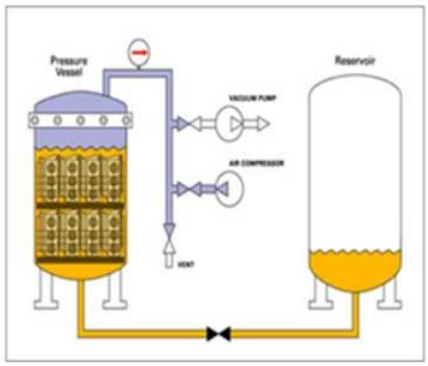
Dry Vacuum Pressure Impregnation Process (DVP):



Dry Vacuum



Sealant Transfer



Pressure Impregnation

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"G&W 95-1000 IMPREGNATION SEALANTS"

The methacrylate based impregnation sealants used today are based on technology developed in the late 1970's. There have been improvements over the years in the sealant stability (pot life), temperature and chemical resistance, flexibility to withstand shock, and washing performance. Systems have also been developed that can remove sealant from the wash water to reduce waste effluent and satisfy environmental demands.

An effective impregnation sealant is required to totally and permanently seal all leak paths through a metal casting caused by porosity (resulting from gas bubbles, shrinkage cracks or inclusions during the casting process) to render the part pressure tight but without leaving any surface residues that could interfere with subsequent finishing, assembly or product performance, and without causing corrosion or discolouration of the part.



"Godfrey & Wing's laboratory in Aurora, Ohio USA"

These sealants are therefore well tried and tested, with a track record of over 30 years in very demanding applications. However, there are now numerous different brands of methacrylate sealants available in the market and choosing one that is up to the required standard can be a risky business for the user. Fortunately, this choice is made much easier following the introduction of the US MIL Specification Accreditation, which lists all the tested and approved impregnation sealants.

Using an unqualified and unapproved sealant could result in component failure. The high cost of rectifying an engine , braking system or other component assembly that has started leaking in the field could be the result of employing a poor quality sealant, ineffective process equipment or not being provided with the proper technical support for your application by the supplier. This is a risk not worth taking.

Godfrey & Wing MIL-I-17563C approved sealants:

- Two Anaerobic sealants (95-1000AC, 95-1000ACP)
- Two Thermosetting sealants (95-1000A, 95-1000AA)

In the liquid state the above sealants have low viscosities and low surface tensions for effective penetration of micro porosity. In the cured state the sealants can withstand temperatures from -40°C to +205°C and have excellent resistance to a wide range of acids, caustics, hydrocarbons and solvents.

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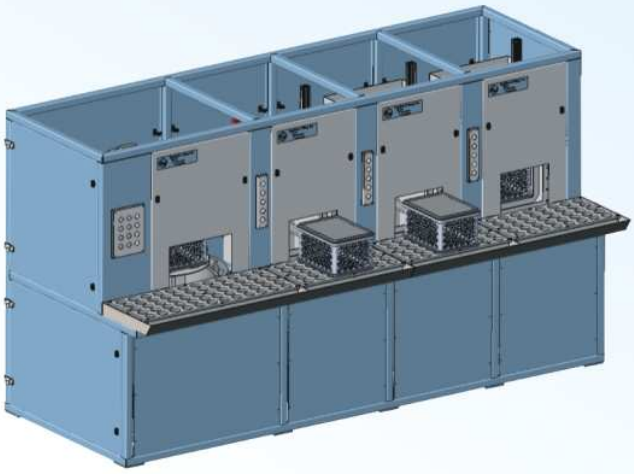
HPi – High Performance Front Load Impregnation System

The new HPi System is a compact and effective vacuum 'pressure' impregnation plant that compliments modern casting and machining lines. This cellular, lean and state of the art impregnation system achieves faster cycle times whilst improving process performance, producing cleaner parts, reducing the risk of damage and minimising work in progress. There are also significant savings in floor space and work handling.



- Ergonomic Front Load System – Operator friendly working height , no need for an overhead gantry/hoist
- Compact – Small footprint saving 75% in floor space compared to top load batch systems
- High throughput – Double the output of equivalent top load batch systems
- High Performance – DVP achieves >98% success on micro porosity in aluminium die-castings in a single pass.
- Economical – Centrifugal draining maximizes the recovery of sealant from the parts for re-use.
- High Capacity – Cycle time of 4 minutes giving an output of 15 cycles per hour.
- Flexible – Can process singular components such as engine blocks, heads or transmission cases, alternatively fixtures containing multiples of smaller components such as fuel pumps and aircon compressors.
- Integration – Compliments modern machine tools and manufacturing processes, placing the impregnation process firmly on the production line unlike traditional top load systems
- Savings – Labour reduced to simply moving the parts between the automated stations
- Enclosed process modules in the HPI system provide extraction at source to reduce chemical fumes and maintain the clean working environment required of modern day production lines

The HPi System is supplied in two sizes to satisfy both small and large manufacturing companies.

The HPi is a smaller version of the proven CFi – a fully automated high speed front load impregnation system. More than 20 CFi systems have been supplied to customers including GM, Ford, Nissan, Honda and Chrysler and more than 10 million powertrain parts have been processed to date.

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CEE DEE

Top Load Batch Impregnation Systems

Cee Dee has a long history and extensive experience in the design and manufacture of Front Load and Top Load Vacuum and Pressure Impregnation Systems with chamber sizes measuring up to 5 metres in diameter and 16 metres in length. Some of these systems are the largest ever produced and are the result of a significant investment in research, development and manufacturing capability that has earned Cee Dee an international reputation and credibility. Cee Dee have supplied more than 300 vacuum and pressure impregnation systems to date.

Employing vacuum and 'pressure' impregnation technology results in deep penetration of micro porosity that in turn produces optimum sealing performance. Most other impregnation companies rely upon vacuum alone to penetrate the very fine porosity that is found in modern day die-castings, but this has proven unsuccessful in many applications with consequently lower pass rates. Therefore, even in the traditional Top Load format, our systems have the ability to optimise sealing performance, resulting in the highest pass rates and the lowest process costs.

Cee Dee can supply a range of standard Top Load impregnation systems with vessel diameters from 350mm to 1525mm and vessel heights from 500mm to 970mm, which will accommodate most casting applications. However, if a special design and size of system is required for a particular application, Cee Dee have numerous examples of such installations and will be more than able to offer their expertise.

Cee Dee Products:







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