ANHYDRIDES
JOINT INDUSTRY
TASKFORCE

Voluntary Commitment: Preliminary Progress Report 2018

Date: *6-7-2018*

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Introduction

Hexahydrophthalic anhydride (HHPA) and methylhexahydrophthalic anhydride (MHHPA) (hereinafter collectively referred to as anhydrides) have been identified as substances of very high concern (SVHC) for their respiratory sensitising properties, as this property is considered by authorities as constituting an equivalent level of concern to carcinogenic, mutagenic and toxic to reproduction (CMR) substances.

The Anhydrides Joint Industry Taskforce (AJIT) is a joint initiative of manufacturers, formulators, and downstream users of the anhydrides used as epoxy hardeners (member companies listed in annex I). The purpose of AJIT is:

1. To evaluate socio-economic impacts of an authorisation.
2. To gather information on current exposure levels and risks associated with anhydrides and promote best practice regarding protective measures.
3. To inform authorities of possible risk management options for the use of anhydrides

The potential socio-economic impact was described in the AJIT Public Consultation Report, which can be found on anhydrides.eu.

Over the course of the first semester of 2016, AJIT member companies performed exposure measurements and AJIT collected retrospective medical data from the members and non-members. This information was aggregated and presented in the AJIT Exposure and Medical Inventory. The inventory showed that since the 1990s, when the potential adverse health effects of anhydrides became apparent in scientific literature, industry improved risk management measures and operating conditions to protect the health and safety of workers.

However, as an additional precautionary measure AJIT member companies agreed to join a voluntary commitment whereby they agree to:

- Incorporate the AJIT Medical Diagnostic Guideline into annual medical surveillance
- Develop and implement an exposure minimisation plan per plant
- Implement an AJIT worker training program
- Improve the HHPA and MHHPA exposure measurement methodology

In October 2017, AJIT published a first report recapitulating the progress made in the implementation of the Voluntary Commitment. The document herein reports on our progress since then.

Implementation of the Voluntary Commitment

Signatories and responses

21 companies have signed the voluntary commitment. 4 of the signatories have operations involving anhydrides exclusively outside of the European Union[1]. In 2017, 16 of the signatories

[1] These members are either producing anhydrides for import into the European Union or are a member to obtain access to best practices, guidelines, an understanding of EU chemicals legislation, and other benefits that AJIT brings.

had provided one or more implementation reports[2], covering 23 sites within the EU. In 2018, 15 of the signatories have provided implementation reports, covering 24 sites as well.

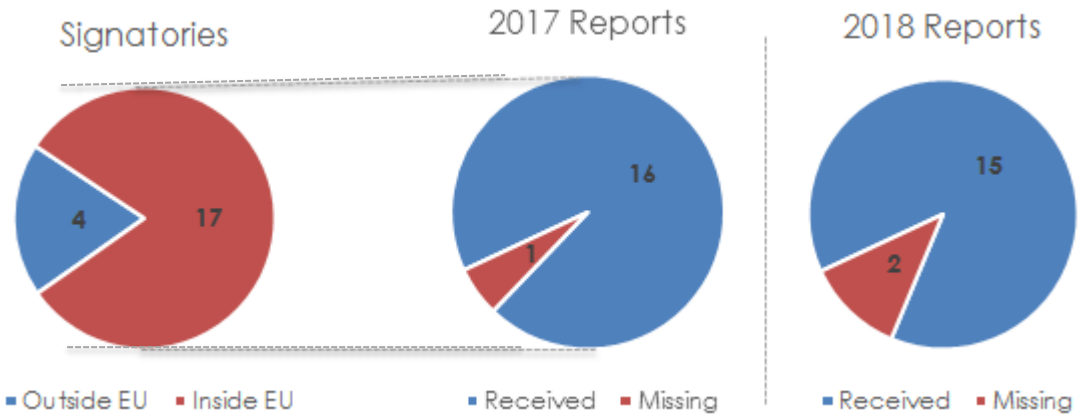

Figure 1. Current Status of Implementation of the AJIT Voluntary Commitment among the Signatories.

AJIT Medical Diagnostic Guidance Implementation

In 2018, 17 sites have declared to have implemented the AJIT Medical Diagnostic Guidance, and 2 sites plan on doing so in the short term. 3 sites have reported the use of other guidelines, either according to the national law or to corporate policy. One site made it optional on workers' request.

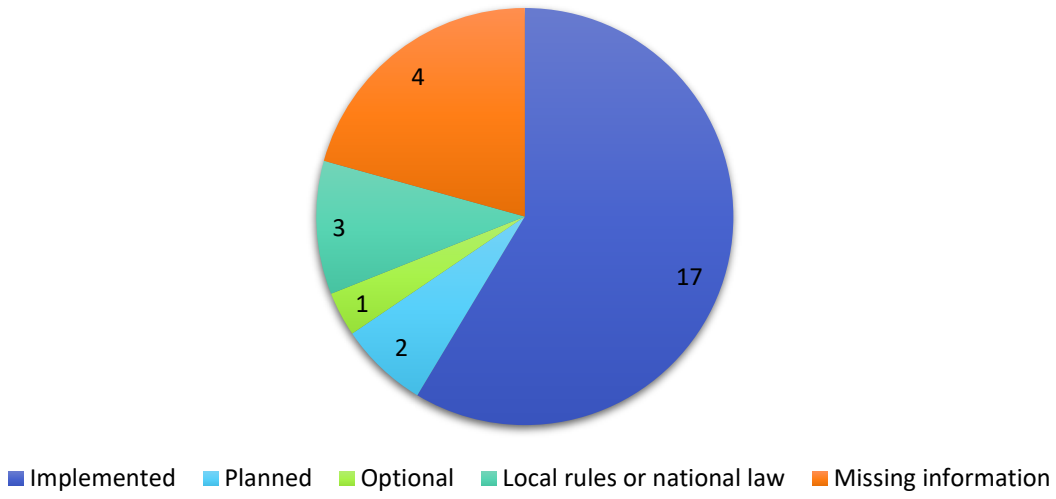

Figure 2. Reported Status of the Medical Diagnostic Guideline Implementation

[2] Multiple implementation reports are submitted by various companies that have more than one site using anhydrides.

AJIT Workers Training Program Implementation

The AJIT Worker Training Program was developed in 2017 and implemented since. Out of the 24 responding sites, 21 have implemented the training program or plan on doing so in the short term. Two sites decided to implement a training program as specified by the national law.

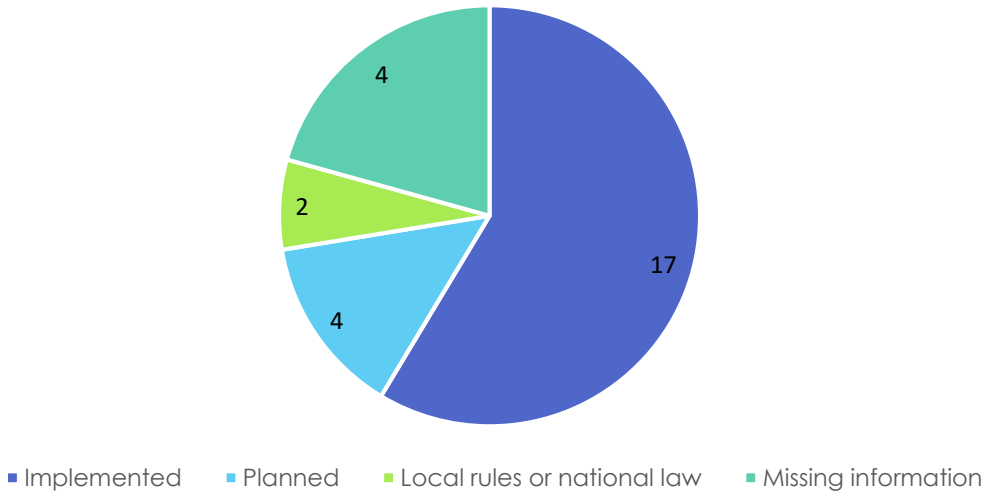

Figure 3. Reported Status Workers Training Program Implementation

Exposure Minimization Measures Implemented

Since the beginning of the Voluntary Commitment implementation, **close to 90% of all signatory sites have reported to have implemented engineering, organisational and/or personal exposure minimization measures**. If 48% of all signatory sites declare that they will implement further measures in the future, 30% of them deem further measures unnecessary due to controlled exposure and/or measured exposure levels under the 5 µg/m^3 threshold.

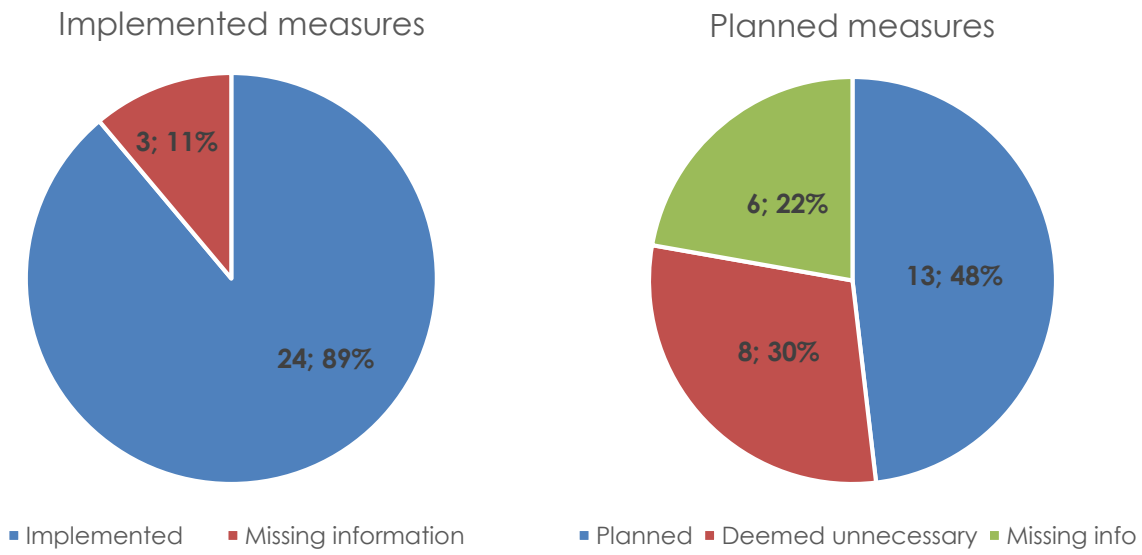

Figure 4. Exposure Minimization Measure Implementation Rates.

Of all signatory sites, 15 reported to have already implemented exposure minimization measures. All of them have implemented engineering measures, 14 have implemented organisational measures, and 11 have implemented personal measures.

Of all signatory sites, **60% declared to have implemented engineering measures** already, including:

- Upgrading general ventilation
- Upgrading local exhaust ventilation
- Pressurizing process halls
- Isolating processes
- Lowering process temperature
- Closing purge buckets
- Reducing the use of or substituting the chemical of interest

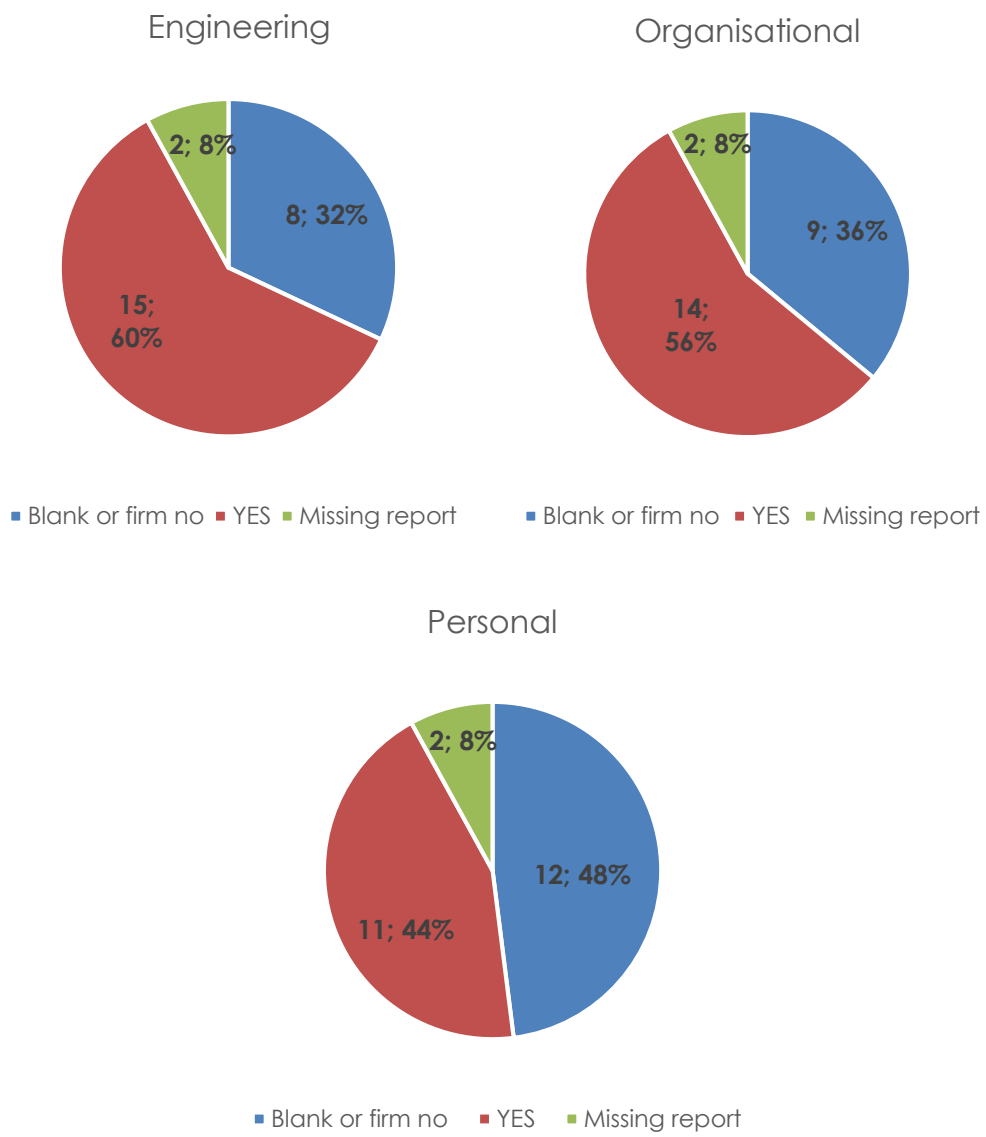

Figure 5. Reported Type of Measures Implemented.

Of all signatory sites, **56% declared to have already implemented organizational measures**, including:

- Defining hazard zones
- Isolating hazard zones (walls, curtains, doors)
- Restricting entry to process halls
- Building vestibules for operator entry and PPE storage
- Training employees
- Reducing time spent in the process halls

Finally, of all signatory sites, **44% declared to have already implemented personal measures** such as:

- Upgrading PPE and instructions
- Implementing training and handbooks
- Increasing medical checks

Exposure Minimization Measures Planned

Of the responding sites, 13 have declared to plan on implementing new or further exposure reduction measures in the future, while 8 consider that no additional measure is necessary. Of all sites who responded positively, 8 sites plan on implementing engineering measures as well as organizational measures, and 4 of them will complement the latter with personal measures.

These measures will comprise **engineering improvements on 36% of the sites**, including:

- Upgrading general ventilation
- Upgrading local exhaust ventilation
- Replacing ventilation cabinets
- Replacing the air supply system
- Isolating processes
- On one instance, closing a VPI plant

These measures will be complemented with **organizational modifications on 36% of the sites**, among which:

- Redesigning the working halls (building vestibules, installing faster sectional doors, etc.)
- Monitoring worker exposure times
- Renewing worker training annually

Finally, **4 sites will implement further personal measures** such as:

- Wearing double safety shoes
- Upgrading masks and respiratory filters

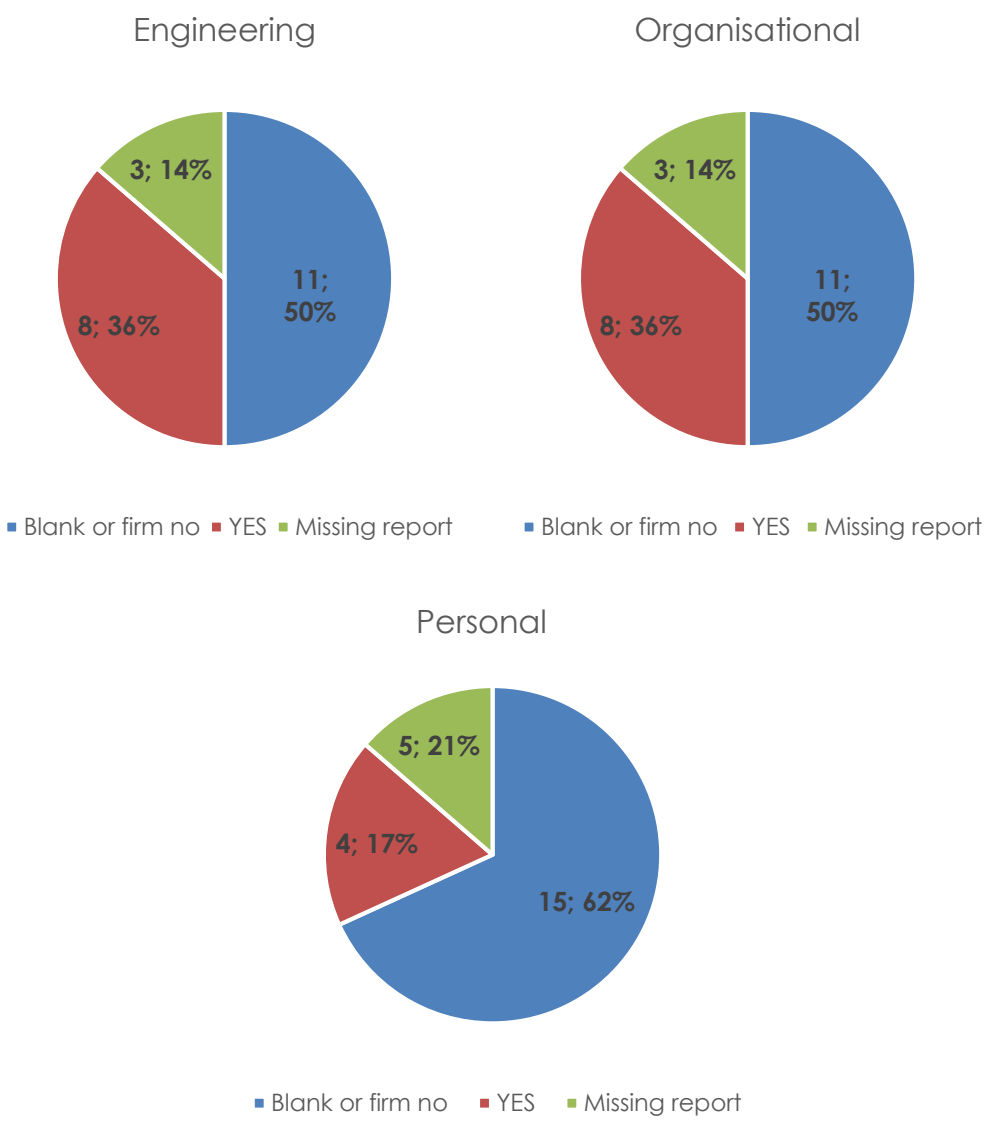

Figure 6. Reported Type of Measures Planed.

Exposure Measurement Methodology

AJIT has commissioned a study by Institut universitaire romand de Santé au Travail (IST) to generate data to validate the AJIT Harmonised Exposure Measurement Methodology. We should receive their final report on June 30th. By allowing homogeneous exposure assessment across plants, these data will help AJIT undertake a fundamental step in its Voluntary Commitment mission.

Conclusion

The voluntary commitment is in the process of being implemented by the members of AJIT and will result in the provision of the best possible medical surveillance and exposure minimization amongst the signatories.

In a second step, registrants have committed to use the full power provided to them by the legislator in article 39 in REACH to ensure that the remainder of industry is driven to adopt the same standards as signatories of the voluntary commitment.

The AJIT firmly believes that this alternative risk management measure is the most effective method for controlling the risk that is associated with anhydrides.

Annex I List of AJIT Members

Polynt
Hitachi Chemical
Working On Wonders
Dixie Chemical
The Element of Open Innovation
New Japan Chemical Co., Ltd.
HEXION
ELANTAS
Electrical Insulation
HUNTSMAN
ABB
Schneider Electric
EPOXONIC®
innovative epoxies
SIEMENS
Veneta Isolatori
ANDRITZ Hydro
DIAB
VEM
ELIN Motoren
A Trasys Company
ADITYA BIRLA CHEMICALS
ISEP®
MGC
MOSER-GLASER
better connections
DRIESCHER • WEGBERG
BRUSH

Participatory sponsors:

SolidCure
T&D europe
The European Association of the Electricity Transmission and Distribution Equipment and Services Industry
CEMEP
European Committee of Manufacturers of Electrical Machines and Power Electronics

Annex II Process Descriptions

Below you will find a description of the processes used in industry

Automatic Pressure Gelation

The process of Automatic Pressure Gelation involves the injection under high pressure of an epoxy/hardener mixture into a mould. Most often this is a 2 part mould clamped under high

pressure. This mould is then heated to accelerate polymerisation. See Figure 3 for a schematic diagram of such a clamping machine that is fed with a mobile mixer system.

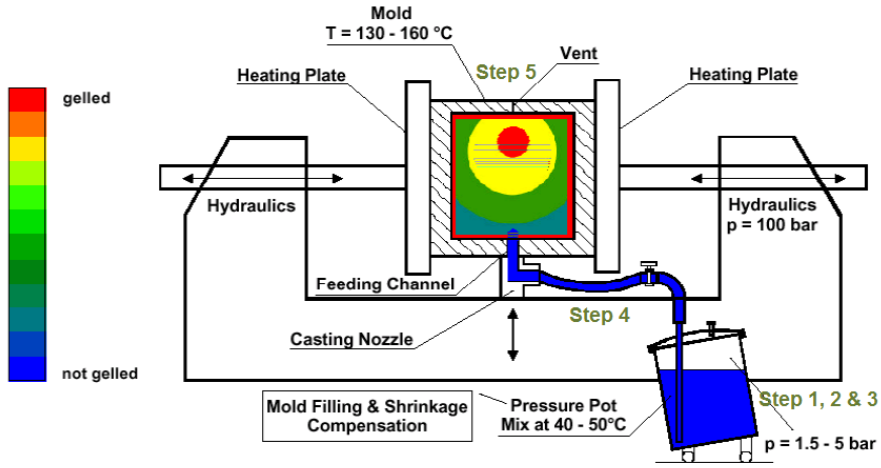

Figure 3 Automatic Pressure Gelation using a mobile mixer system. Source: AJIT

The clamping units can be fed with either a mobile mixer system or a closed feeing system. The mobile mixer system involves the filling of a mobile mixer at a dedicated facility as show in Figure 4; and transport of the closed mobile mixer to the clamping unit where it is connected as shown in Figure 3.

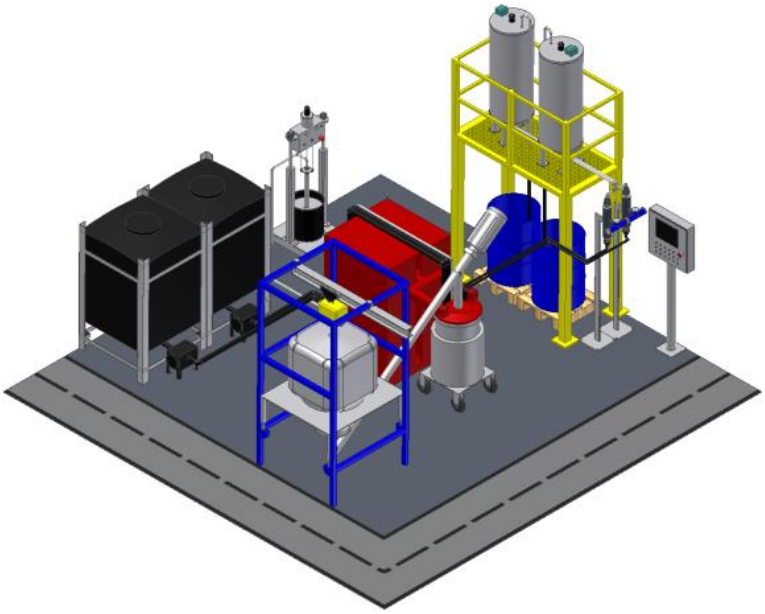

Figure 4 Mobile Mixer Preparation Station. Source: AJIT Members

Alternatively, clamping units can be fed and mixed in a continuous system as show in Figure 5 and Figure 6, whereby epoxy and anhydride arrive separately, are fed separately to the clamping machine and only at the last moment mixed in a static mixer before being injected into the clamping unit.

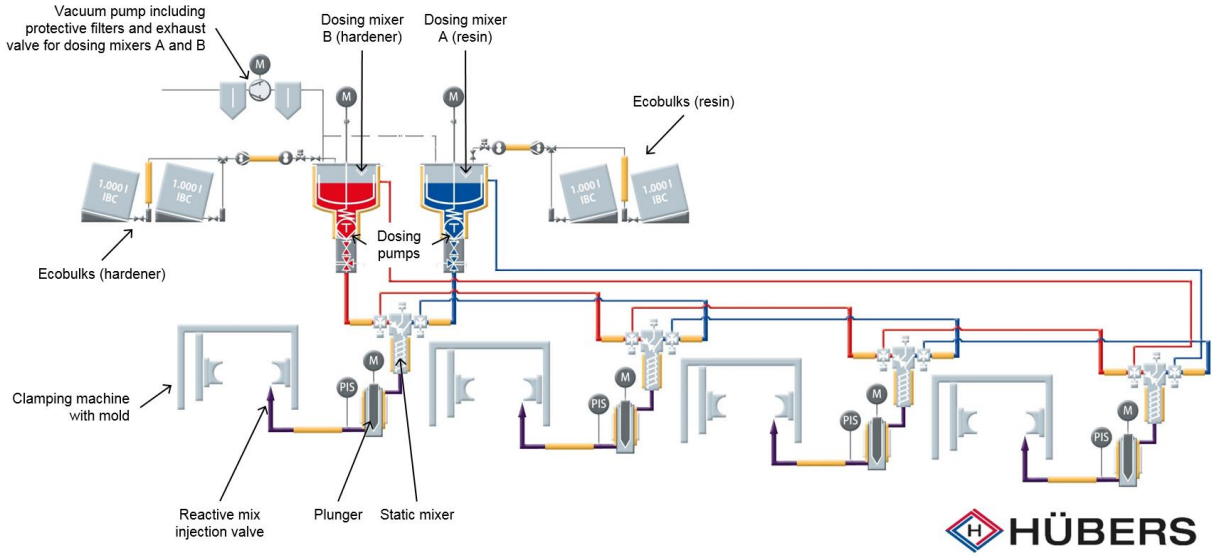

Figure 5 Process Scheme of an APG System with 4 Clamping Machines. Source: Hübers

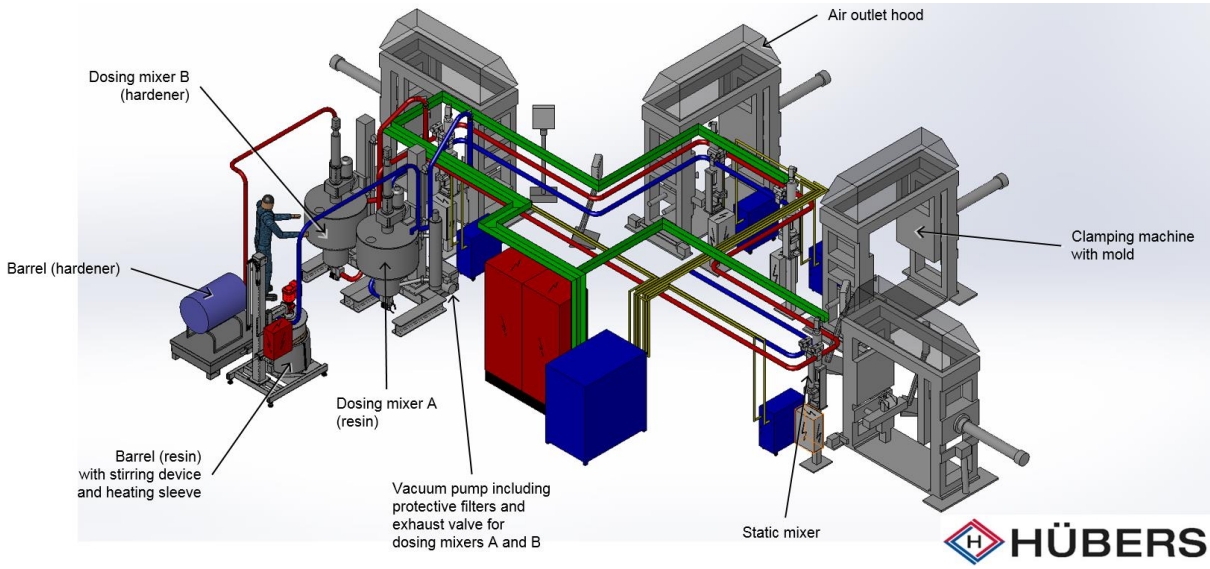

Figure 6 CAD rendering of an APG system with 4 Clamping Machines. Source: Hübers

Vacuum Casting

A Vacuum Casting process employs a continuous mixing system under vacuum as described in Figure 7 and Figure 8. The epoxy-anhydride mixture is fed into a mould under vacuum. The vacuum chamber is repressurised and the mould is moved to an oven into which the parts are cured.

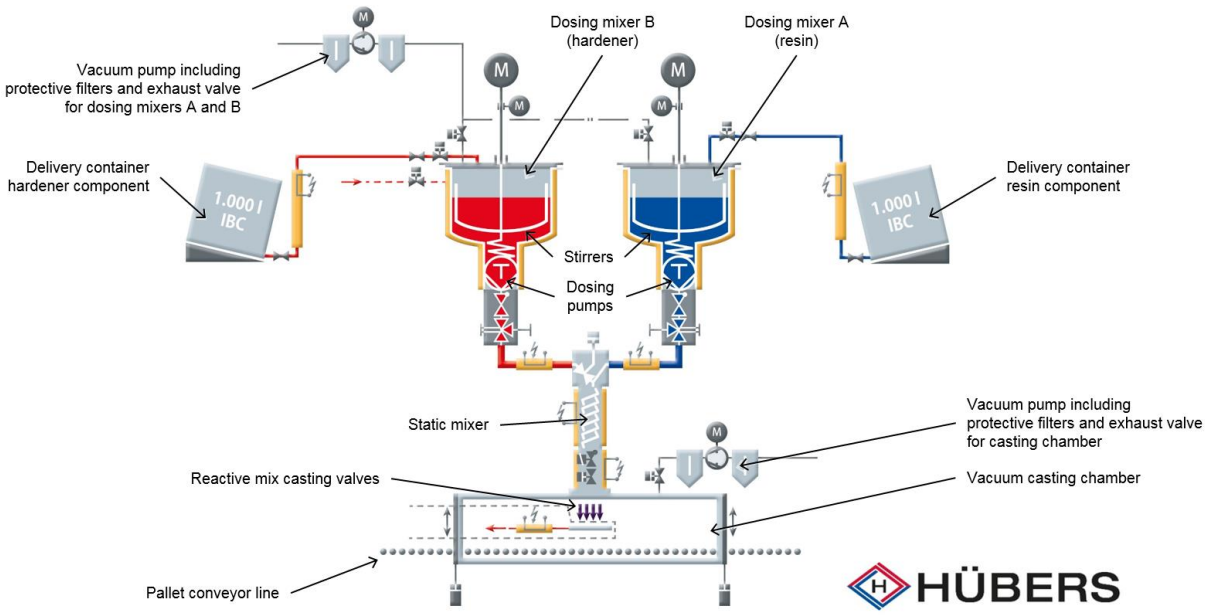

Figure 7 Vacuum Casting Process. Source: Hübers

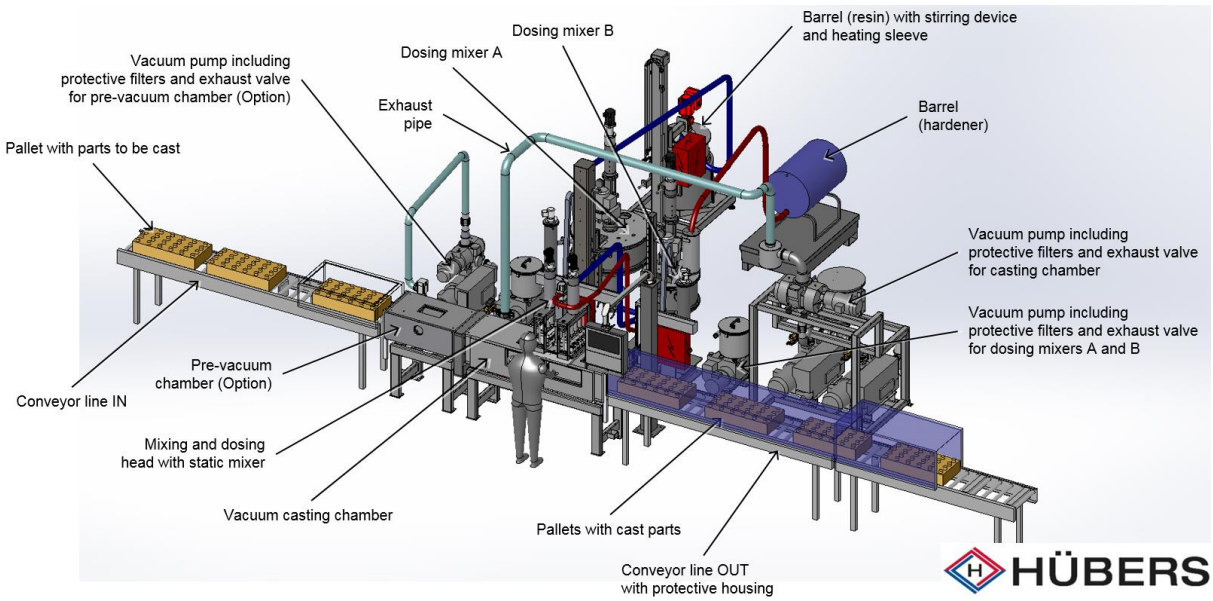

Figure 8 CAD Rendering of a Vacuum Casting Process. Source Hübers

Vacuum Pressure Impregnation

During Vacuum Pressure Impregnation an object is placed in an impregnation chamber (Figure 9). The impregnation chamber is placed under vacuum and the resin/hardener mixture and impregnation chamber are preheated (Figure 10). This removes any moisture from the object. Subsequently, the object in the pressure chamber is flooded with the resin/hardener mixture, followed by the application of high pressure (Figure 11). Finally the resin/hardener mixture is evacuated to the storage tank and the impregnated object is moved to an oven for curing (Figure 12). During the movement of the impregnated object from the impregnation chamber to the curing oven the impregnated object is not in a closed environment, therefor the VPI process is categorized as a "semi-open" process.

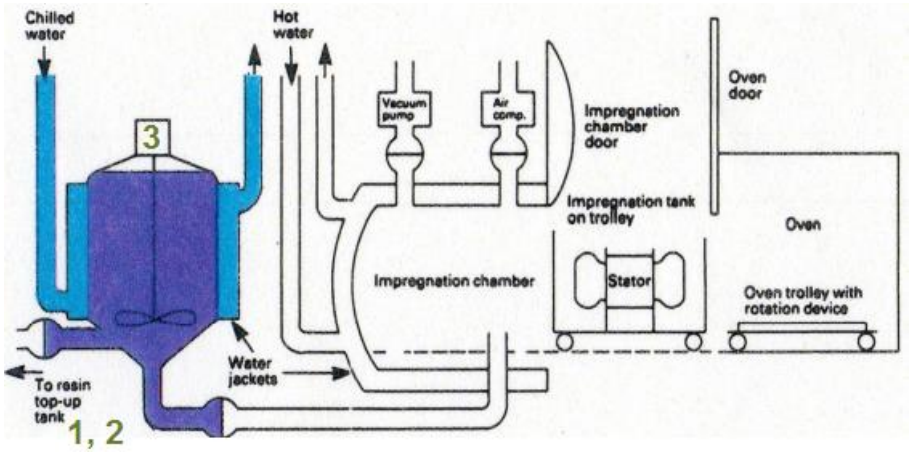

Figure 9 Vacuum Pressure Impregnation Step 1. Source: AJIT

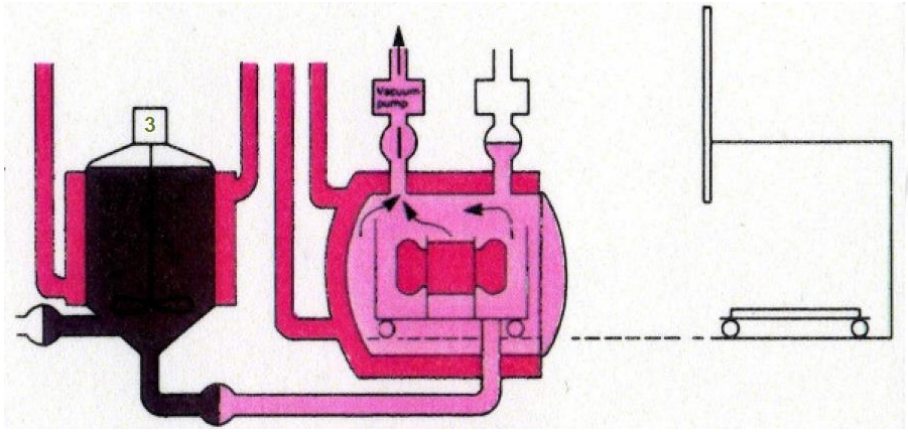

Figure 10 Vacuum Pressure Impregnation Step 2. Source: AJIT

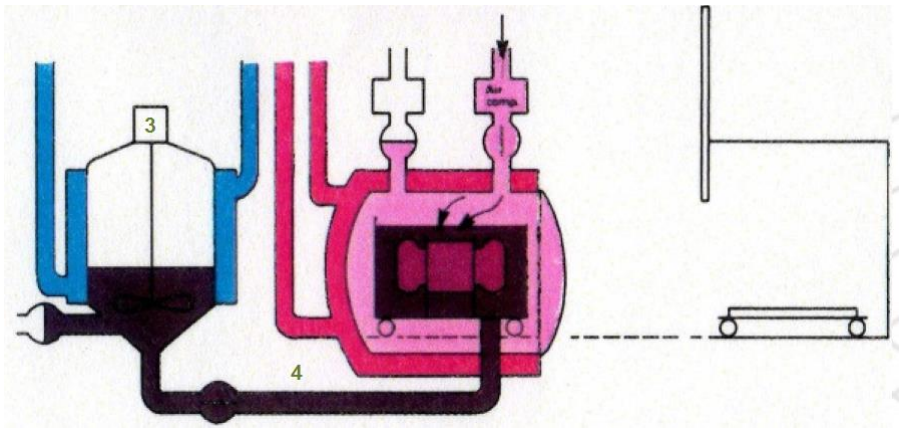

Figure 11 Vacuum Pressure Impregnation Step 3. Source: AJIT

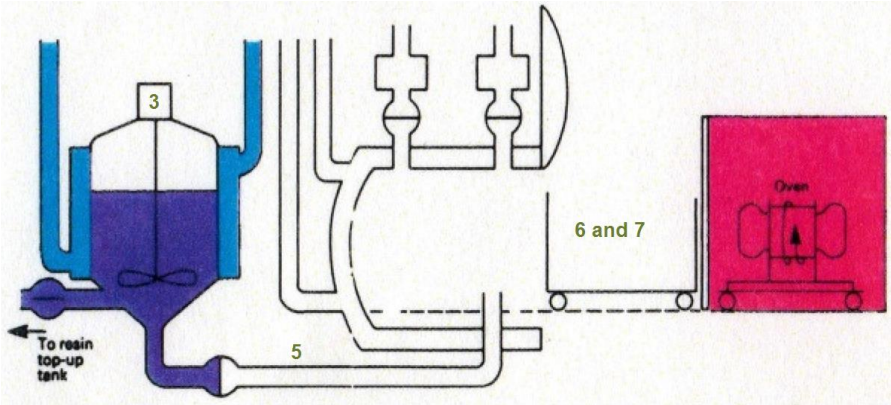

Figure 12 Vacuum Pressure Impregnation Step 4. Source: AJIT