



# CONDIMAT

World Class  
Conditioning of  
Nylon with the  
Vacuum-  
Saturated- Steam  
Process Patented  
by Welker.



# CONDITIONING WITH AN ADVANCED TECHNOLOGY.

## CONDITIONING OF NYLON INJECTION MOLDED PARTS

The processing of Nylon- Polyamide (PA) needs dry raw materials to ensure that the manufactured parts are in perfect conditions. However, when exposed to humid environment or water, these parts absorb humidity relatively fast. Therefore, to ensure that physical properties like impact strength are gained and improved, these parts need to be exposed to a humid environment. This process is called conditioning.

## CONDITIONING PROCESSES

In the literature, there are four described processes to achieve absorption of humidity:

- Storage in warm water bath,
- Storage by exposure to warm and humid climate,
- Exposure to saturated steam stream up to 105°C, and
- Utilization of an industrial vacuum – pressure conditioning machine (autoclave) and exposure to saturated steam.

### A. STORAGE IN WATER BATH

Storing the moulded parts in a water bath for some time has been the easiest way of moisturising. This procedure, however, does not provide a solid basis for a quality-managed production as the variation can be significant and the duration of absorption can also vary substantially.

In modern production, this procedure may only be used in an emergency or for small batches with reduced quality relevance.

### B. CLIMATIC CHAMBER

The exposure to a regulated climate has been the mostly used way of moisturising nylon so far. The parts are kept in relatively high temperatures between 80 and 95°C to ensure a higher saturation. The weak points of this process are the length of the exposure, significant moisture variations in the batches, high energy cost and reduced reproducibility.

The penetration of moisture into the parts is not achieved consistently. The migration from the outer to the inner layers of polymers has an increased timeframe, and consequently higher moisture concentration outside.

The larger the thickness of the parts, or the higher the quantity of glass fibre in the material, the more difficult will be the migration of moisture.

### C. STEAM STREAM at 105°C

Submitting the parts to a steam stream of high temperature inside a rotating perforated drum was introduced around the year 2000.

This process was not successful as it is not applicable for bigger parts. There is also a risk of deformation and crystallisation due to the high temperature used and moisture penetration performance was inferior.

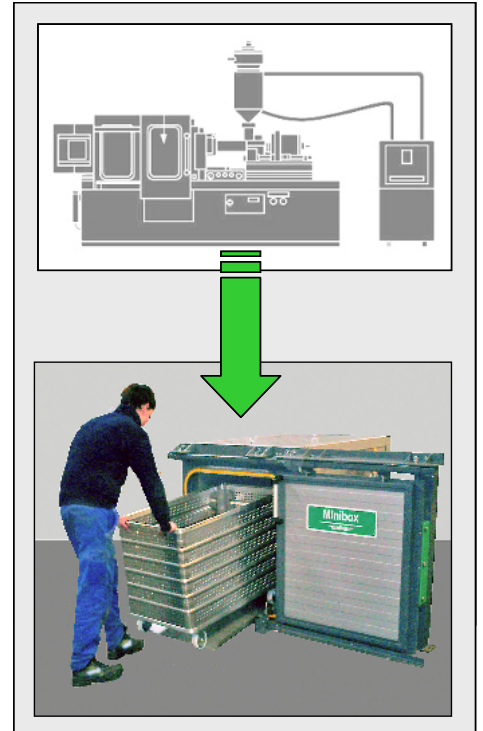
### E. PROCESS WITH VACUUM- SATURATED- STEAM OF WELKER

The Vacuum- Saturated Steam process patented by Welker (European Patent NO. EP 2496635 B1) for the conditioning of nylon injection moulded parts allows processes from 50 up to 105°C in vacuum ambient starting at 95% Vacuum (or- 950 mbar).

With the modification of the inner pressure of the autoclave using high efficiency vacuum pumps, the introduced hot water is transformed into saturated steam thus having 100% saturation.

The action of vacuum provides a fast and deeper penetration of the water molecules in a very short period of time. The absolute saturation enhances much shorter exposure times at a rate of at least -50% when compared to climate chambers.

The reduced exposure time goes along with a reduced need of energy and most of the cases with a reduced space need as well. The process can be repeated and intensified as well as entirely documented for ISO purposes. Processes are entirely repeatable- same adjustment provides same results.







COMPREHENSIVE SOLUTIONS ARE AVAILABLE.



CONDIMAT TUNNEL P 24 H

### CUSTOMISED MANUFACTURING

WELKER conditioning systems are planned and produced individually. Based on the long experience in the conditioning and automation technology, there are proven solutions available for any size of autoclave and way of transportation.

Due to the shorter exposure times, it could make sense to consider an automation of the material handling. There are solutions with one or 2 doors, platform, chains, rollers and belts. Customer specifications in customised colours and accessories can be met easily.

Supply, assembly, start up and service are made in course of our regular activities. We have agents in all major markets world wide and approx. 2.000 units installed.



2 x CONDIMAT P 2 H





# VACUUM- SATURATED STEAM. PROVEN INNOVATION.

## VACUUM – SATURATED STEAM

The main characteristic of the process are sequences of vacuum and saturated steam in a controlled process. The utilisation of vacuum at high degree is the core element to achieve a constant, deep penetration of the saturated steam in the inner sections of the nylon parts.

The individual elements such as hot air, vacuum, saturated steam, holding periods and repetitions can be programmed entirely as required. The possibilities of the system make sure that top results can be achieved and repeated in a regular production environment.

## CONTROL SYSTEMS

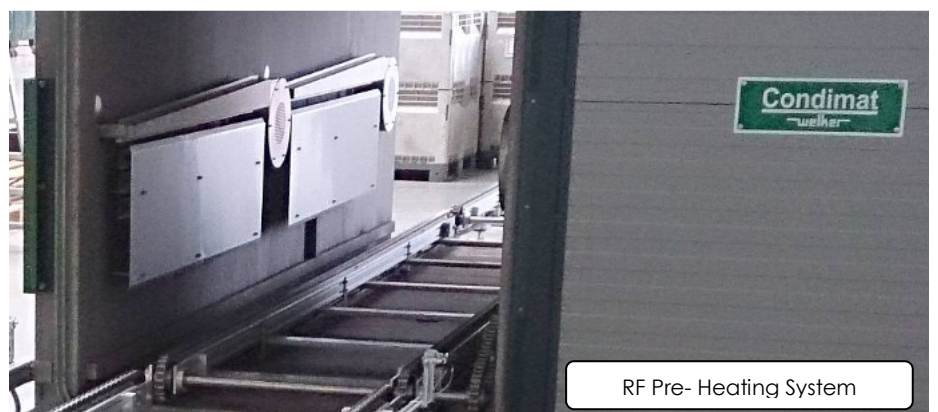
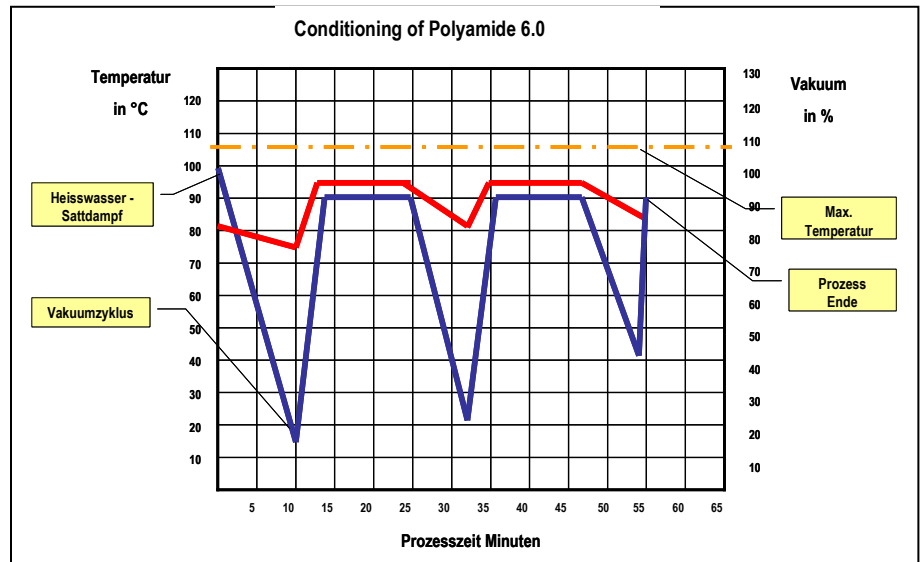
WELKER systems can be equipped with controls with individual degrees of information and control possibilities. In some cases, there is no need of a more sophisticated data management and control technology. Smaller machines are usually equipped with a standard control system, whereas large units need a more sophisticated as well. In any case, the available systems are designed to meet all needed requirements.

DIGIMAT is the standard equipment for small and simpler machines. It provides needed control functions, but without data connection and process visualisation.

DOSITRON meets all requirements for control, data management and interface, data logging, information and visualisation. It is especially well prepared for ISO based process documentation. The touch panel provides immediate visual information to the operator via a process graphic and – status.

## PRE- HEATING AND DRYING

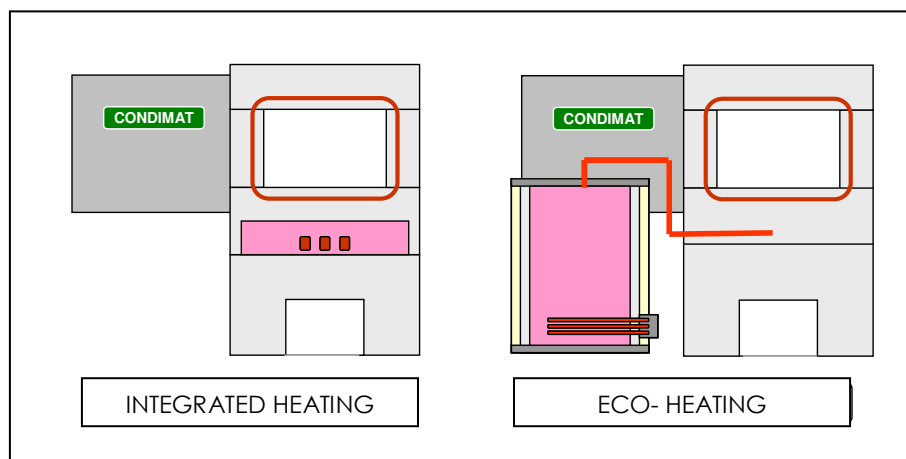
The systems can be equipped with a vacuum proof radial fan system to distribute equally hot air inside the autoclave. This hot air is used as pre- heating, which is in some cases needed to eliminate scaling and deposits of Caprolactam on the parts surfaces. Furthermore, with this function a standard start point of the process can be adjusted.







PREPARED FOR ANY TASK.



#### HEATING ALTERNATIVES

WELKER conditioning systems usually use electric heaters if no other source (warm water or steam) is available locally.

The heating can be located inside the autoclave in cases where the investment is to be kept low or where there are lay-out constraints.

The optional ECO and ECO- CASCADE is a more sophisticated and economical alternative of heating with lower energy consumption and higher vacuum values.





# CONDITIONING WITH AUTOMATION.

## TUNNEL SYSTEMS

TUNNEL systems with two doors allow the automation of the carrier transport and of the process in the material flow, reducing the need of workforce for supervision and handling.

In large production sites the use of TUNNEL conditioners allow to separate conditioned and non- conditioned carriers, avoiding contamination.

The systems can be equipped with transport conveyors with belts, chains, rollers or platforms.

## LOADING PLATFORMS

Solutions with one or more platforms for one or two doors are possible, depending on lay- out and local procedures.



CONDIMAT TUNNEL P 12 H



CONDIMAT TUNNEL P 4 H

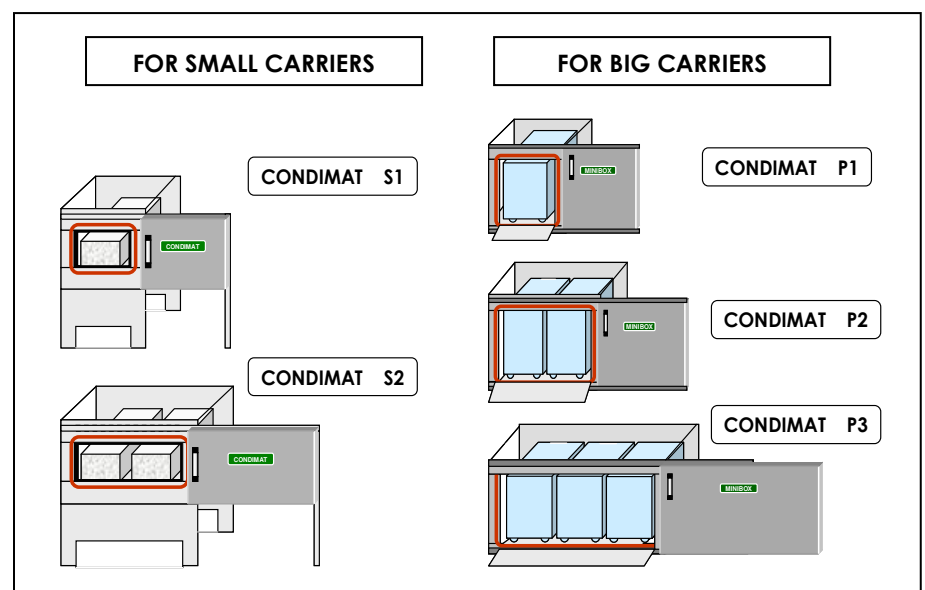
## MACHINE FORMATS

WELKER conditioning systems are available in quite different designs and formats, from lab units up to largest production sizes, with or without automation, as per customer needs.

## STANDARD FORMATS

The „S“ type models and „P“ have a certain standardisation in their formats with a reduced quantity of accessories, focusing more on lower investment cost and smaller batches.

In any case, however, we recommend a prior conditioning test in one of our trial machines to determine the needs. It could well be that a small but sophisticated machine is needed to meet your quality requirements, so that a “standard” has to be upgraded.





MADE IN GERMANY. SINCE 1856.



## OUR LOCATION

We are a family owned company located in Neustadt an der Weinstrasse, approx. 110 km south west of Frankfurt. Our region was always heavily influenced by textiles, which is our technical origin..

Here we manufacture our machines and export them world wide. Every machine is completely assembled and tested before leaving the company.



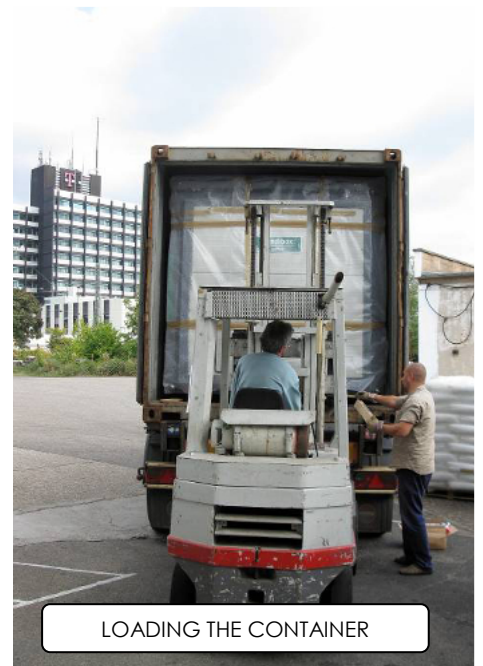
TEST MACHINE



DOOR ASSEMBLY



FUNCTIONAL TESTING

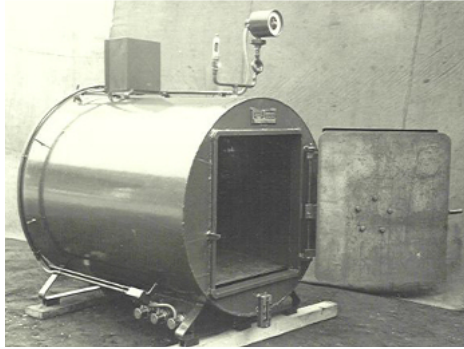


LOADING THE CONTAINER





## OUR PROFILE.



### 1856: FIRST IN BUSINESS

WELKER was founded in 1856 by Philip Welker, and is therefore, one of the most traditional suppliers for the Textile Industry. In the early 40's, WELKER started with the manufacturing of felt washing machines, paper processing machine lines with roller fulling and hammer die cutting machines.

In 1941 and the first generation of vacuum steaming equipment was developed and successfully introduced to the market. WELKER systems are installed world wide and are applied in all areas of heat-setting, conditioning and drying.

Since 2010 we have started our activities in the plastic sector, producing machines for the conditioning of nylon injection moulded parts, starting in Europe with further expansion to other markets.



### WELKER IN THE WORLD

With approx. 2.000 machines installed all over the world and agents in almost all markets we provide project sales, installation and services to customers. Our network in the plastic industry is also being expanded steadily.



### INNOVATION AWARD 2013

The state of Rhineland- Palatinate has awarded our new conditioning system with an innovation award in 2013.



### NOMINEE 2014

Our company was nominated for the „Großen Preis des Mittelstandes“ through the jury of the der Oskar- Patzelt- Foundation in 2014 & 2015.

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