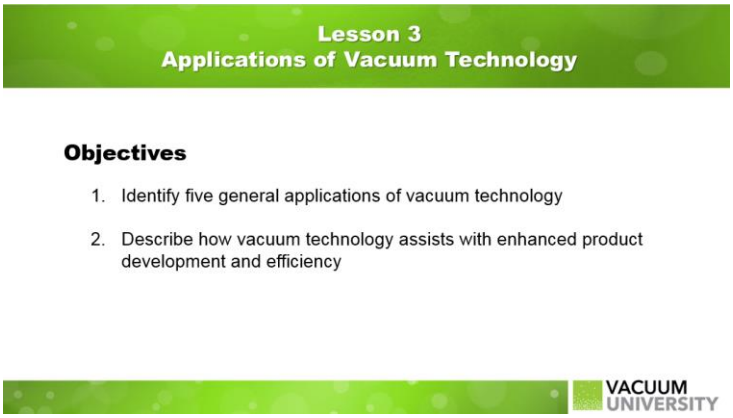
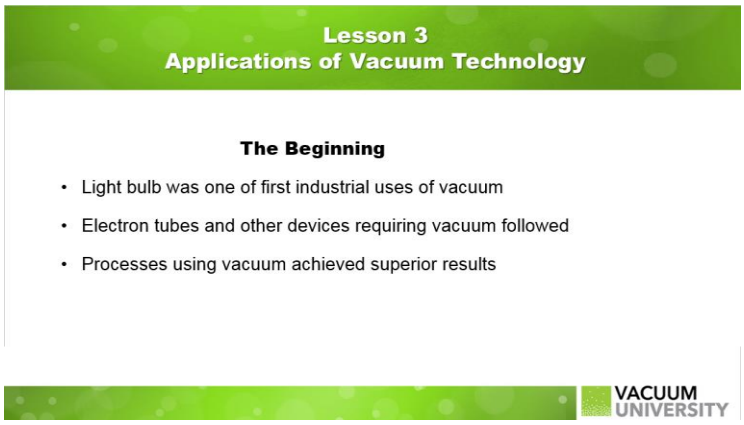
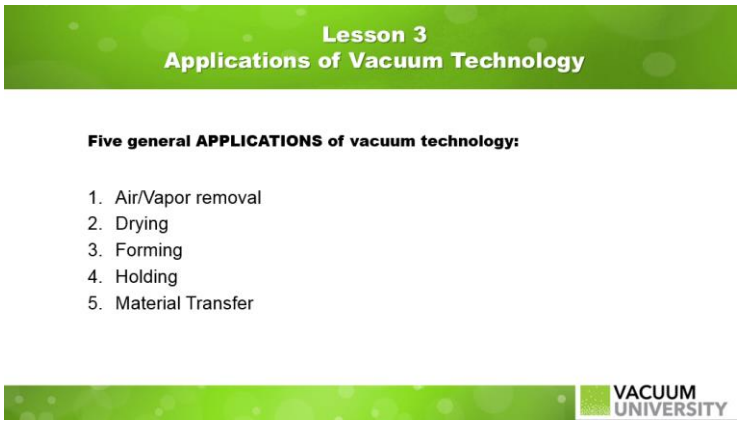
Vacuum University101

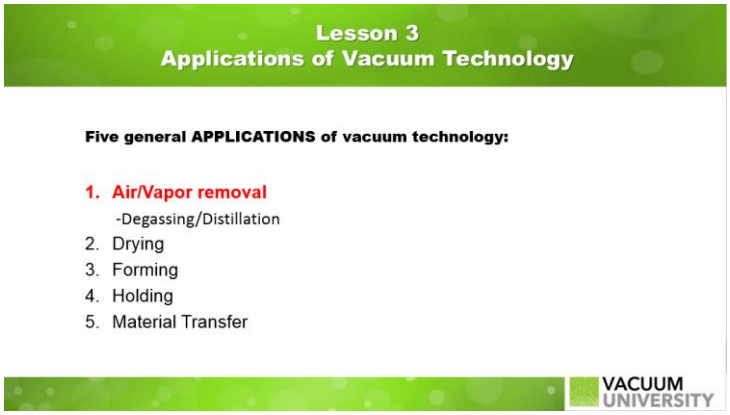
LESSON 3: Applications of Vacuum Technology

Image	Voice Narration
	Welcome to Lesson 3. In this lesson, we will be reviewing some of the applications of vacuum technology. In order to view a more detailed list of the applications and industries using vacuum, refer to the ADDITIONAL MATERIALS section of this site to view the Applications and Industries Matrix.
	The objectives for this lesson are to: 1) identify five general applications of vacuum technology used today 2) describe how the applications use vacuum technology to assist with enhanced product development and efficiency
	One of the first major industrial uses of vacuum technology occurred about 1900 in the manufacturing of electric light bulbs. Other devices requiring a vacuum for their operation followed, such as the various types of electron tubes. It was discovered that certain processes carried out in a vacuum achieved either superior results or were unattainable under normal atmospheric conditions.



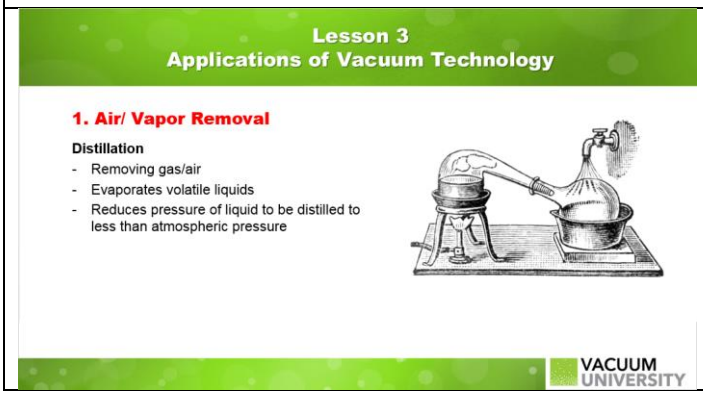
Let's examine five general uses of vacuum technology today:

1. Air/Vapor removal
2. Drying
3. Forming
4. Holding
5. Material transfer

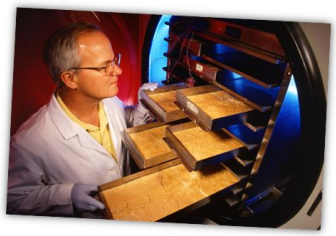


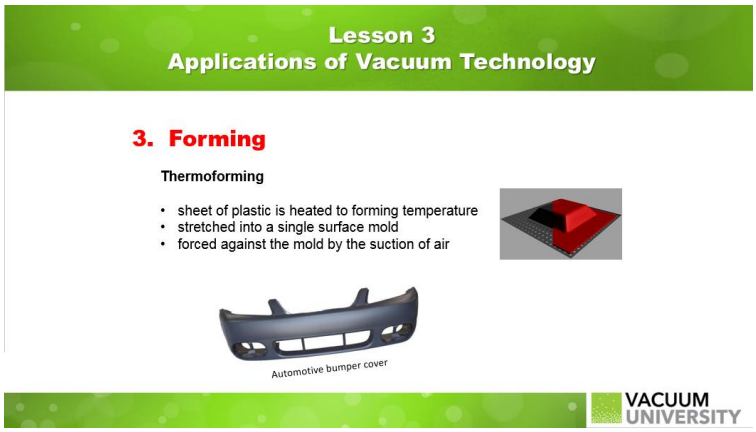
Air / Vapor removal is one of the most common uses of vacuum pumps and essentially defines vacuum technology. Vacuum chambers remove air or vapor; this is most frequently done through processes called degassing and distillation.

Degassing means removing dissolved gases from liquids, especially water or other solutions. For example, chemists often remove gases from solvents when the compounds they are working on are air- or oxygen-sensitive, or when bubble formation at solid-liquid interfaces becomes a problem. A common example is wine degassing, used to remove carbon dioxide.

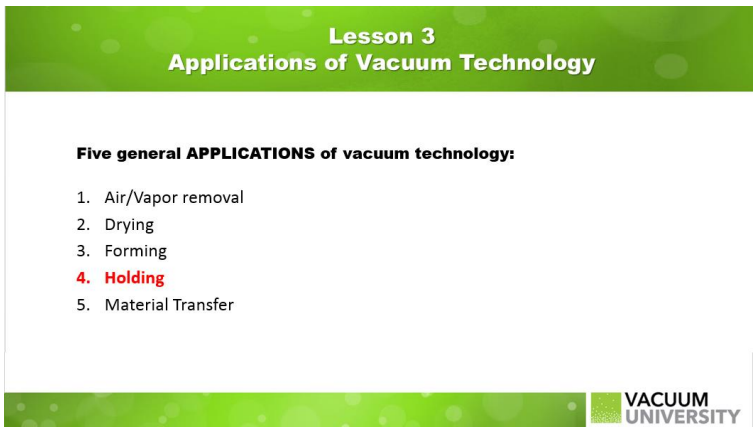


Distillation is another process that involves air or gas removal. Distillation evaporates the most volatile liquids (those with the lowest boiling points) by reducing the pressure close to the vapor pressure of the liquid mixture to be distilled causing the liquid to boil and evaporate.

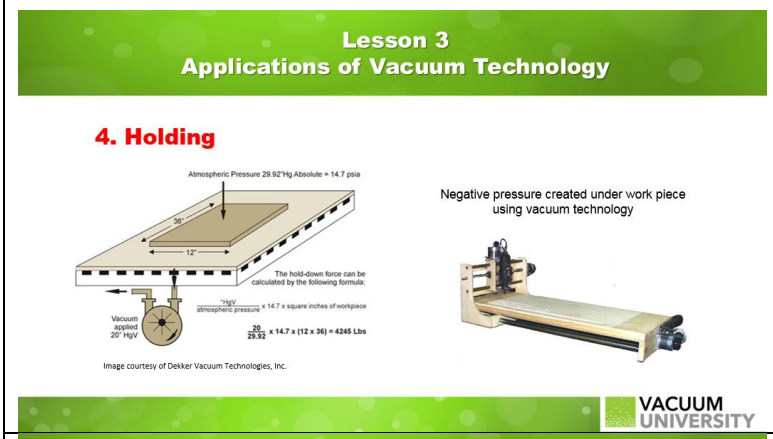
Lesson 3 **Applications of Vacuum Technology** **Distillation in Petroleum Refining Process** Atmospheric Distillation Column Vacuum Distillation Column VACUUM UNIVERSITY	The refining of crude oil begins with distilling the incoming crude oil in an atmospheric distillation column operating at pressures slightly above atmospheric pressure at a temperature as high as 700 degrees Fahrenheit. Vacuum distillation is used to extract the remaining high boiling compounds without having to heat the crude above 700 degrees Fahrenheit, as so called thermal cracking will form petroleum coke which will plug the tubes in the distillation column. By reducing the pressure those compounds will evaporate at a lower temperature.
Lesson 3 **Applications of Vacuum Technology** **Five general APPLICATIONS of vacuum technology:** 1. Air/Vapor removal 2. **Drying** 3. Forming 4. Holding 5. Material Transfer VACUUM UNIVERSITY	**Drying** is another logical application of vacuum technology. Vacuum drying conserves more energy, is faster, and does less damage to the material than heat or air drying.
Lesson 3 **Applications of Vacuum Technology** **2. Drying** • Conserves energy • Faster • Less damage • Less heat needed  VACUUM UNIVERSITY	When materials are dried in a reduced pressure environment, less heat is needed. Vacuum dryers can vary in size from small units to massive rooms or vessels, which can be used to dry large-scale products like timber.
Lesson 3 **Applications of Vacuum Technology** **Five general APPLICATIONS of vacuum technology:** 1. Air/Vapor removal 2. Drying 3. **Forming** 4. Holding 5. Material Transfer VACUUM UNIVERSITY	**Forming** is another general application of vacuum and occurs in many industries.



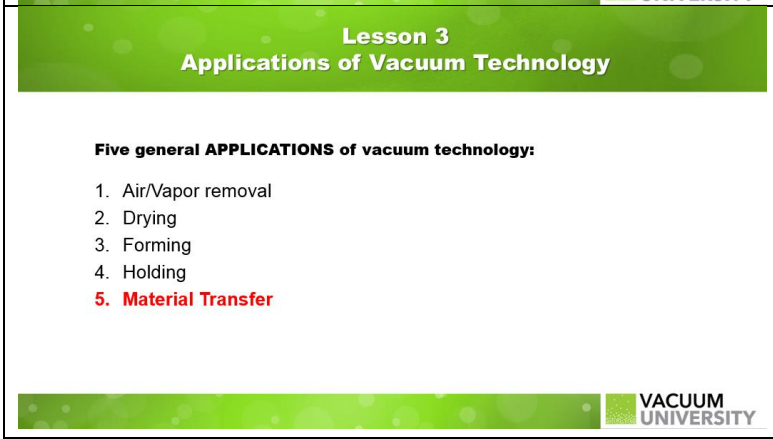
It is a simplified version of thermoforming in which a sheet of plastic is heated to forming temperature, stretched into a single surface mold, and is forced against the mold by the suction of air (vacuum) to form its shape. Automotive bumper covers, for example, are manufactured in this way.



Holding, sometimes referred to as chucking, uses the suction power of the vacuum pump to hold wood or metal on a router table for better support. Holding provides a strong, even force, and eliminates problems caused by clamping, such as marring or deformation of the piece, obstructed access, and the inability to hold unusually shaped pieces.



- When the work piece is placed on the table and a vacuum is applied, a negative pressure is created underneath the work piece.
- In the picture provided we show a schematic layout of a router table with a work piece the size of 12 x 36“



Imagine trying to move small objects such as pills or needles, or fragile foods like macaroni, through a manufacturing process. That’s where the role of material transfer comes in.

Lesson 3 **Applications of Vacuum Technology** **5. Material Transfer** • Helps move difficult to move materials • Automate the transfer process • Does less damage to products VACUUM UNIVERSITY	**Material Transfer** describes the ability of vacuum to easily transfer difficult to move material or automate the transfer process without damage to the product. Pick and place (where a product is moved from point A to point B) is another common material transfer application.
Lesson 3 **Applications of Vacuum Technology** **Review** **Five general APPLICATIONS of vacuum technology:** 1. Air/Vapor removal 2. Drying 3. Forming 4. Holding 5. Material Transfer VACUUM UNIVERSITY	Now let's review the five general applications of vacuum technology used today. Again, these are not the only applications for vacuum technology. Listed in no particular order, vacuum is used in air/vapor removal, drying, forming, holding, and material transfer. These vacuum processes help with product development and efficiency for manufacturing.
Lesson 3 **Applications of Vacuum Technology** **You have completed Lesson 3!** **Vacuum University** brought to you by Dekker Vacuum Technologies, Inc. Copyright © 2015 by Vacuum University, Inc. THIS WEBSITE AND MATERIALS CONTAINED WITHIN ARE CONFIDENTIAL AND PROPRIETARY TO VACUUM UNIVERSITY, LLC. AND MAY NOT BE REPRODUCED, PUBLISHED, OR DISCLOSED TO OTHERS WITHOUT COMPANY AUTHORIZATION No part of this work may be reproduced in whole or in part in any manner without the permission of the copyright owner. No part of the materials available through the VACUUMUNIVERSITY.NET site may be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without prior written consent of VACUUM UNIVERSITY, LLC is prohibited. All materials contained on this site are protected by United States copyright law and may not be reproduced, distributed, transmitted, displayed, published, or broadcast with the prior written permission of VACUUM UNIVERSITY, LLC. VACUUM UNIVERSITY	This concludes Lesson 3, vacuum technology applications. We have learned several general applications of vacuum technology and how this technology functions in various industries. Next you will learn in lesson 4 about the different industries applying the use of vacuum technologies today.
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