**Building Science Education Solution Center -** **The Business Case for Heat Pump Water Heaters**

**Proficiency Level 3:** Apply

# Learning Objective 3.1:

* Prioritize and apply specification best practices to achieve customer satisfaction

# Lecture Notes 3.1:

***Specification and Installation Best Practices***  
As with any water heater installation, customer satisfaction is necessary. All installers know that call backs are unwelcome interruptions and expensive. Achieving high levels of customer satisfaction with HPWHs is dependent on a few key details that contractors must consider:

* Tank sizing that maximizes availability of hot water and efficiency,
* Tank location to avoid comfort complaints due to the cool air discharge from the tank,
* Use of isolation pads and neoprene washers when securing the tank to reduce noise levels,
* If the household has a recirculation pump, installing on demand controls, and
* Physical dimensions, exhaust air discharge locations, and piping connections.

***Tank Sizing***  
Let’s now discuss applying tank sizing for sufficient availability of hot water and maximizing efficiency. Choosing the right tank for a specific installation includes considerations for the hot water needs of the household and the physical constraints of the tank location. If the location allows for a larger tank, it’s best practice to size up one tank size. The plumbing code dictates the minimum size of a tank is based on the number of bedrooms and bathrooms. The code is based on providing sufficient hot water, and not maximizing the efficiency of heat pump water heaters. Sizing recommendations for HPWHs include:

* 50-gallon tank for up to 2 adults, or 1 adult and 1 child
* 65-gallon tank for 3 adults, or 2 adults and 2 children
* 80-gallon tank for 4 or more adults, or 2 adults and 3 or more children

Upsizing the HPWH provides more capacity, it also increases the overall efficiency of the HPWH. More importantly, sizing the tank correctly avoids the inconvenience of your customers running out of hot water.

If the install location cannot accommodate the best size tank, consider using a thermostatic mixing valve. These devices allow the tank to store water at a higher temperature while keeping the delivered hot water safe. For every 10 degrees rise in temperature, the tank will increase its effective storage capacity by 10 gallons. The overall efficiency of the tank will only drop slightly.

***Tank Location: Minimizing Noise***  
It’s also important to identify the location of the tank and apply methods to minimize noise transmission. Noise created from a HPWH is a new sound to homeowners and can be bothersome, so this will need to be accounted for when choosing a location to install the water heater. The noise generated is a low, soft humming sound, similar to the noise generated by a dishwasher or a refrigerator. The majority of HPWHs generate sound less than 52 dBA. When looking up model specifications, remember the decibel scale is logarithmic and an increase of 10 decibels represents a doubling of sound. The sound is caused by the moving fan and compressor components of the heat pump on the appliance. This source of sound is expected, and not an indicator of an issue or error – whereas any additional, distinctive sounds not caused by the heat pump system can be an indicator of an issue. Because of the sound generated from the heat pump and the cold, dry air exhausted from the fans, it is generally recommended that the unit is installed in a remote part of the house that is adequately conditioned with sufficient space. Avoid locations near a thermostat, as the exhaust may impact HVAC operation. Usually, these requirements make HPWHs best suited for basement or garage installations.

When using earthquake strapping that requires cinching the tank to a wall, isolation pads between the tank and wall helps to minimize sound transfer through the wall. Using neoprene washers on the bolts that secure the strapping to the wall will also help.

***Tank Location: Managing Cool Air Exhaust***  
HPWHs discharge cool air. It is important not to block this exhaust air by keeping the exhaust air at least 12 inches away from walls or other solid objects in order not to restrict the airflow. Having this cool air directed to places where the occupants will be spending large amounts of time should be avoided as it may cause comfort complaints during the heating season.

***Recirculation Pumps***  
Uncontrolled recirculation pumps should not be used with any HPWH. Uncontrolled recirculation pumps waste substantial amounts of energy regardless of the water heating system used. In addition to the energy wasted, the hot water returning to the tank will undermine the predictive controls of the tank and may cause the tank to fail to heat enough hot water for delivery. It is not recommended to run continuous recirculation, but to run with an on-demand controller.

***Selecting the Right Model for the Job***  
As with any product there is no universal best HPWH model for every installation scenario. We have covered selecting the best size of HPWH, and other differences between HPWH models include:

* The physical dimensions of the tank – will it fit in the existing space and will fit through the entrance to the space?
* Some models discharge the exhaust air from the tank out of the top and others are side discharged while others are rear discharge. Depending on the site, where the discharge air is located may make the installation more or less difficult.
* As with the location of the discharge air, models differ where the piping connections are made. Some models are side plumbed, some are top plumbed while other models can be side or top plumbed.
* 120-volt models have their own features that may influence the model chosen for a particular job. These include the capacity of the compressor, the existence of a small electric resistance heater and if the unit does or does not require a dedicated circuit.

**Problem Set 3.1:**

1. Name two reasons for potential reasons for customers being dissatisfied with the level of hot water delivery:
2. How would you inform a client that their HPWH will make a noise they are not accustomed to without alarming them and have them decide not to purchase the unit?
3. What are possible methods to avoid the possibility of receiving cold air complaints from customers?
4. What is the only type of recirculation control to use with HPWH?

# Learning Objective 3.2:

* Incorporate HPWHs into sustainable business models

# Lecture Notes 3.2:

***Sales Approaches***The upfront cost of HPWHs will be more than a standard tank. These higher upfront costs can be offset by incentives, tax credits and lower operating costs. It is important that the bid includes these details. Most importantly, it is important that your entire team -- from the receptionist to the service technician -- can speak to the benefits of heat pump water heaters.

In recognizing the diverse needs of potential customers, including those in the low to moderate income bracket, it's essential to adapt our pitch to emphasize affordability, ease of installation, and the long-term savings offered by HPWHs. To effectively communicate these benefits, consider incorporating the following points into your sales approach (when applicable):

1. **Highlight Overall Cost Efficiency:** Emphasize that despite the higher upfront cost, HPWHs are highly efficient and can reduce monthly energy bills when installed in specific scenarios. This can make them a financially viable option in the long run due to their efficiency.
2. **Low Operational Costs:** Stress the low operating costs of HPWHs, a critical factor for customers prioritizing affordability in their heating solutions. When switching from a standard electric tank to a HPWH, the savings will be significant. When switching from oil or propane, the savings will also be significant. When switching from natural gas to a HPWH, the change in operating costs will depend on the relative costs of gas and electricity.
3. **Simplified Installation Process:** Assure customers that in many cases, especially when replacing existing electric water heaters, the installation process for HPWHs can be straightforward and quick, similar to traditional units. Highlight that while some scenarios, particularly those involving upgrades from non-electric systems, might require additional steps, many installations do not involve extensive modifications, thus minimizing household disruption.
4. **Incentives and Financial Assistance:** Inform about government rebates, tax credits, and utility incentives that can offset the initial investment, making the technology accessible, especially for low to moderate income customers.
5. **Quick Turnaround Time:** Commit to fast installation times, which ensure that the transition to a new HPWH is as seamless and hassle-free as possible, catering to those who cannot afford long waiting periods.

***Smart Technology***   
Giving consumers options is critical to growing your business. Today's consumers expect options – from the coffee they order to the trim package on their truck or car they buy. In addition, many of today's consumers expect higher tech solutions and are tech savvy themselves. The ability to remotely control their water heater and see their day-to-day energy consumption via the HPWH app is appealing to many of today’s consumers. Additionally, consumers can easily use an app to schedule the operating hours of the HPWH during hours of lower electric rates.

According to Service Titan, the number one way to grow your plumbing business is to “Embrace Smart Technology”:

* Consumers utilize technology to control everything on their smartphones — from regulating their home’s indoor air temperature to creating a grocery list.
* Today’s homebuyers, many of whom grew up with smartphones, are not only extremely tech savvy, but also environmentally conscious.
* Consumers actively seek service providers who use high-tech solutions, such as water leak detection to prevent unexpected water damage. Giving consumers options on their water heater option won’t always result in a HPWH sale, but as that old sales adage goes: “If you don’t offer it, for sure they won't buy it.”

***Strategic Partnerships***  
Building on these direct-to-consumer strategies, it is equally important to establish strategic partnerships that extend our reach beyond individual customers to larger, systemic projects. By collaborating with industries such as solar photo voltaic (PV) installers, electricians, electric vehicle companies, and green builders, you can help position HPWH offerings within the broader context of sustainable home solutions. These partners often have established customer bases that are already invested in green technology and are looking for comprehensive solutions that include water heating.

Collaborating with these partners not only expands market access but also aligns with the growing trend of home electrification and sustainability, which can significantly enhance the perceived value of a HPWH offering. These partnerships can allow you to leverage their marketing and customer education efforts, making the integration of HPWHs into their projects more seamless and attractive. Chances are that your organization already has formal or informal business agreements with other trades. Expanding that network to companies that specialize in energy efficiency upgrades -- such as solar PV, electric panels, insulation, and windows -- allows those companies to offer even greater savings to their customers. Electricians, solar and HVAC companies are key players in the broader trend toward home electrification, and partnering with them can be mutually beneficial.

Teaming up with solar PV installers, in particular, can offer a significant opportunity. Solar PV is often viewed as more attractive and marketable than water heating. Combining solar PV with HPWHs is an excellent way to lower operating costs. By aligning with solar companies, HPWHs can market to a segment that may not typically engage with plumbing services directly but is actively seeking comprehensive energy upgrades. This partnership is also advantageous for solar companies, as it allows them to propose more extensive PV systems calibrated to new energy needs, including those of the HPWH. Additionally, integrating HPWH installation with solar panel installation minimizes perceived barriers related to electrical upgrades since these are typically part of the solar setup. Encouraging solar PV companies to include HPWHs in their offerings not only expands their product line but also enhances their appeal to customers looking for complete home electrification solutions. This strategy effectively utilizes the ongoing electrical work, making the addition of an HPWH seem like a natural extension rather than a separate project.

In addition, companies that specialize in whole house upgrades and/or electrification (including but not limited to Home Performance Contractors) currently exist or are emerging in many markets. These companies often do not have plumbers on staff and are willing to partner on an exclusive basis.

Of course, it is important to stress the long-term energy and money savings, as well as any incentives, rebates and/or tax credits they may be eligible to receive.

***Cost Options & Financing***  
Selling higher cost water heaters may require a shift in how your company presents the bid to your customer. The first shift might be to offer more than one choice. As we have noted, today's customers want options and by simply offering options you can enhance your company's image. The practice of offering three options – such as bronze, silver, & gold -- could include a standard 50-gallon electric tank as the bronze option, a 50-gallon HPWH as the silver option, and a 65-gallon HPWH as the gold option.

Other sales tactics may include financing. For many households, financing is the preferred option for larger purchases or to help close the remaining gap after incentives, rebates &/or tax credits. While there are interest rates charged by financing companies, there is a good chance that it is lower than the rate charged by their credit card company. In many cases, the monthly payment will be offset by energy savings. In addition, many utilities offer low or no interest loans to customers making energy efficient upgrades.

Other options include bundling with other upgrades, such on demand recirculation pumps and leak detection systems.

***Pricing Considerations***  
As with any water heater, it’s important that your company earns the expected profit margin on the install. While certain HPWH installations will be similar to a standard water heater tank installation – with the exception of the price of the tank and condensate management – it’s important to include parts and labor that are not usually a part of standard tank installation.

If an upgraded electrical panel and a new circuit are required, then of course an electrician will be involved. While this will add significant costs to the bid, this does provide an opportunity for the homeowner to perceive value in the upgrade.

In terms of parts, you will want to be sure to consider including any of the following:

* Mixing valves
* Condensate management / pumps
* New recirculation controls

Calculating labor hours will be based on the specifics of any given installation. Open garages and basements will entail the fewest additional hours, with the potential extra time required to install the condensate management system.

Larger tanks such as the 80-gallon models may include sending two technicians to the site to help with transport and lifting. This is especially true with basement installations with a less-than-code-approved staircase.

If you are aiding in the processing of rebates and incentives, be sure to include the extra administrative hours.

If you are conducting more advanced installations that require ducting or venting to overcome volumetric constraints, be sure to include those parts as well as the extra labor hours. A short list of those parts include:

* Duct work
* Vents
* Duct adaptors, if required
* Duct terminations such as grilles and wall vent hoods

For more information on installs that may require ducting and or venting, we recommend the Northwest Energy Efficiency Alliance (NEEA) online course available at:  
<https://hotwatersolutionsnw.org/partners/on-demand-trainings>

***Over-the-Phone Bidding***A phone call is usually a contractor’s first contact with a customer. When it comes to replacing a failed water heater, the customer’s first question is likely to be: *How fast can you do it?*

While on-site bidding will always be more accurate and personal, phone bidding is sometimes a necessity. Standard installs, such as those in spaces that do not require ducting or venting, can be done easily if the customer has a cell phone and is willing to take pictures. In fact, there are mobile apps and platforms that allow an estimator to see what the customer is seeing in real time. This gives the estimator the ability to better direct the customer to specific locations of interest.

Key pictures or video to include:

* Volumetric space availability
* Name plate picture
* Looking for a recirculation pump
* Looking for drains and existing condensate pumps
* Picture of the existing water heater tank (e.g. is it gas or electric? will it require a drain pan?)

With the name plate you can look up the existing physical size of the tank.

For sizing purposes, a quick household survey will guide you in choosing the right size. Questions to ask:

* Household size (# of occupants)
* Extra loads (ex. walk in tubs)

***Customer Education and Messaging***  
Informing homeowners as to the benefits of HPWHs is a required part of selling HPWHs. As an option, your company may want to develop a simple 1-page flyer or brochure, as well as a script that can be used to by your team members to convey the customer benefits of HPWHs quickly and effectively. Pre-educating customers through online resources is one way to inform potential customers of the benefits of HPWHs, what is involved in the best fit selection of a HPWH, and what to expect during the installation process. The following websites provide valuable and publicly available customer education resources:

* Northwest Energy Efficiency Alliance (NEEA)   
  <https://hotwatersolutionsnw.org/>
* ENERGY STAR [www.energystar.gov/partner\_resources/residential\_new/educational\_resources/sup\_program\_guidance/heat\_pump\_water\_heater\_guide](http://www.energystar.gov/partner_resources/residential_new/educational_resources/sup_program_guidance/heat_pump_water_heater_guide)
* Richard Heath and Associates   
  <https://www.rhainc.com/index.php/2023/09/05/hpwh-best-practices-field-guide/>
* Advanced Water Heating Initiative  
  <https://www.advancedwaterheatinginitiative.org/>

Additionally, here are links to some consumer-oriented videos you can share:

* [Appliance Family Meeting (Hot Water Solutions)](https://www.youtube.com/watch?v=aHhRZ4vpN7U&ab_channel=HotWaterSolutions)
* [How To Install a Heat Pump Water Heater: Consumer Version (Hot Water Solutions)](https://vimeo.com/277360429)

***Customer Communication Strategies***

Let’s briefly cover some of these types of customer communication strategies that can be helpful when conveying the benefits of HPWHs, addressing common objections, and setting realistic expectations:

* **Clear Explanation of Benefits** - When discussing HPWHs with customers, it's crucial to simplify the benefits. Emphasize that HPWHs are 3 times more efficient than traditional water heaters, which can sometimes translate to significant energy savings. Highlight how this efficiency may lead to lower energy bills over time, making the initial investment worthwhile. Additionally, inform customers about available tax credits and rebates that can reduce the upfront cost, making the switch to HPWHs more financially accessible. Cost and emissions savings calculations and calculators can be found in *Introduction to Heat Pump Water Heaters – Level 3.*
* **Addressing Objections** - Be prepared to handle common objections such as the higher upfront cost and unfamiliar technology of HPWHs. Counter these concerns by explaining the long-term savings of HPWHs. Stress the environmental benefits, such as reduced carbon emissions, which are increasingly important to many consumers. Use real-world examples and testimonials to build credibility and show how other customers have benefited from making the switch.
* **Highlight Key Selling Points** - Focus on the key selling points of HPWHs. Point out the significant reduction in monthly energy bills that customers may expect. Discuss the convenience features, such as the ability to monitor and control the water heater remotely through an app. This not only provides ease of use but also allows customers to optimize their energy consumption. Emphasize the environmental benefits, including reduced carbon emissions, which contribute to a greener home.
* **Use of Visual Aids** - Leverage visual aids to help customers understand the benefits and features of HPWHs. Show them brochures and visual materials that clearly illustrate these points. Demonstrate the HPWH app, highlighting its user-friendly interface and functionality. Visual aids can make complex information more accessible and engaging, helping customers make informed decisions.
* **Personalized Recommendations** - Make personalized recommendations based on the customer's specific needs, household size, and energy usage patterns. Ask questions to understand their situation better and suggest the most suitable HPWH model and size for their home. Tailoring your advice to their unique circumstances will help build trust and show that you have their best interests in mind.
* **Setting Expectations** - It's important to set clear expectations regarding the installation, maintenance, and operational differences of HPWHs compared to standard water heaters. Explain that the installation may require additional space and electrical modifications, and that proper condensate management is essential. Inform customers about the routine maintenance required, such as filter cleaning and periodic checks to ensure optimal performance. Highlight the differences in operation, such as the cool air discharge and potential noise levels, and how these can be managed to ensure comfort. Setting these expectations upfront helps avoid misunderstandings and ensures a smoother customer experience.

***Staff training on HPWHs***  
In addition to educating your customers, educating your entire staff is also very important. Imagine a customer calling in about the possibility of a HPWH installation due to their local utility promoting and incentivizing them, only to find that the receptionist is unaware of the product and ends up sending them elsewhere. The training resources listed on the previous slide are a great place to start.

Topics of particular importance are:

* The ability to explain in simple terms how a heat pump operates efficiently, such as:
  + HPWHs are 2-4 times as efficient than standard gas and electric water
  + They save money over time because of this efficiency
  + Available tax credits and other incentives lower the cost
* The importance of filter maintenance
* The modes of operation – while the terminology changes depending on the model, all HPWHs have 4 modes:
  + Heat pump only
  + Hybrid mode - tank relies on compressor with some help from the heating element
  + High demand mode - tank relies more heavily on the element
  + Vacation mode - allows the user to set the number of days they expect to be away, which will turn down the temperature during that period and then turn the temperature back up before they arrive home
* How to download the app
* Environmental benefits (e.g. reduced carbon emissions)

For more information on installs that may require ducting and or venting, we recommend the Northwest Energy Efficiency Alliance (NEEA) online course available at:  
<https://hotwatersolutionsnw.org/partners/on-demand-trainings>

***Navigating Common Misconceptions***  
One prominent myth about HPWHs is that they do not work in cold climates. As with all myths, there is an element of truth to this myth. Heat pump water heaters typically operate only as standard electric tanks when the incoming air is below 37F. In the warmer parts of the country, this will not be a problem regardless of where the tank is located. In colder parts of the country, the existing tank will need to be located in a conditioned or semi- conditioned space such as an unfinished basement. In this case the tank will not experience temperatures below the 37F cutout temperature. In milder climates, garages may dip below the cut off temperature for a few days a year, so the overall negative impact is minimal.

Another myth revolves around the fact that since HWPHs extract heat energy from the surrounding area, this means they will negatively affect the home’s heating bill in a significant way. Several studies have researched this, and when the tank is in a basement or garage, it has been proven there is no effect on the heating energy usage. When the tank is located in a fully conditioned space, there is a small, less than 5% increase during the heating season, no effect during the shoulder months, and even a small benefit during cooling season.

***Incorporating “After Sales Service”***  
All water heaters require some maintenance to ensure they achieve rated life spans and maintain peak efficiency. One method of doing this is to sell annual maintenance contracts that cover the HPWH and include an inspection of other plumbing fixtures. These contracts offer peace of mind, greater customer satisfaction, and provide your company a steady revenue stream. Many companies that use maintenance contracts also include 5-point inspections that include inspections of other plumbing fixtures such as toilets, drains and condensate pumps. These inspections can lead to additional sales.

One advantage of HPWHs is their on-board diagnostics. In the event of a problem, the HPWH will display an error code. Knowing the error code in advance of a service call will help prepare the service technician for the visit, or in some cases eliminate the need for a visit, by informing the homeowner they can complete the required action by undertaking the required “fix” themselves, such as cleaning the air filter.

***Next Steps to Offering HPWHs***  
Choosing to offer and install HPWHs is similar to choosing to install any new product. By focusing on standard installs at the outset, incorporating HPWHs into your offering will be made easier. Standard installs are those installs that do not require venting or ducting. HPWHs appeal to a wide variety of customers, from the technologically savvy to the environmentally minded to those wanting lower monthly operating costs. In many cases, offering HPWHs will help your company to increase its customer base.

The important steps to a successful incorporation of HPWH offerings include:

* Organize for technical training from the manufacturer or other trusted sources
* Know your pricing
* Educate your entire staff on HPWHs
* Make connections with other trades to support their installs
* Identify how to select the best tank for the job
* Understand and be willing to aid customers in receiving any incentives or tax benefits
  + Below is useful link explaining federal tax credits:   
    [ENERGY STAR - Federal Tax Credits for Energy Efficiency](https://www.energystar.gov/about/federal-tax-credits)
  + While not exhaustive, here is a link for various local rebates:   
    [ENERGY STAR - Rebate Finder](https://www.energystar.gov/rebate-finder?scrollTo=0&sort_by=utility&sort_direction=asc&page_number=0&lastpage=0&zip_code_filter=98672&find_rebates=Find+Rebates&product_types=Select+a+Product+Category)
* Pre-educate your customers as to what to expect from their HPWH
* Consider offering annual maintenance agreements

Remember: If you don't bid it, nobody will buy it!

**Problem Set 3.2:**

1. When offering a bid for a HPWH to a customer with an existing standard electric tank, what factors would you use to overcome the objection to a higher price water heater?
2. What other trades could you promote your company to in order to get leads of potential clients that are likely to purchase HPWHs?
3. When ducting or venting is required to overcome the lack of the required volume, what are some extra costs to include in the cost estimate?
4. What information about a potential HPWH install can you gather from pictures of the existing water heater?
5. What are good questions to ask the homeowner in order to help with sizing the tank to maximize efficiency?
6. Create a list of items you would include on a one-page flyer describing what a HPWH and its benefits.