PAC Tips & Tricks

Overview

When considering air conditioning options, central air and window air conditioning systems have some key advantages over Portable Air Conditioners (PACs), including

- No water to drain
- Efficient cooling capacity
- The noisy parts are outside

However, central air can be expensive and difficult to install if wall ducts and supporting infrastructures are not already in place. Window air conditioners are not always allowed due to HOA or landlord restrictions.

In these cases PACs provide a good alternative. PACs are easy to install, they can be used anywhere and moved to different rooms if needed.

The purpose of this SlideDeck is to help you;

- Determine if a PAC is right for you
- Choose a PAC that fits your environment
- Pick features & upgrades to improve efficiency
- Unpack, install, operate and maintain your PAC
- Resolve common problems, improve comfort level

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PAC Tips & Tricks

Product Range

There is a wide variety of PACs available on the market today, ranging in price anywhere from $270 to $35,000 per unit. As expected, the price is driven primarily by cooling capacity, which is defined by the amount of cold air produced per hour (BTUs).

On the low end, the Costway 23049-CYPE (priced around $280) generates 8,000 BTUs for cooling a small room.

On the high end, the Kwikool Kpo 12-43 (priced around $33K) produces 135,000 BTUs for cooling a 4,800 square foot industrial area.

Our primary focus will be on small to medium sized units that produce 8,000 to 14,000 BTUs for use in single rooms ranging in size from 300 to 700 square feet.

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Product Selection - Cooling Capacity Overview

Matching PAC cooling capacity to room size is one of the most important things to consider when choosing a PAC. Without a proper match, the PAC will perform less efficiently and may not provide the desired results.

- A PAC with too much power will cool the room before removing the moisture, thereby making the room feel clammy, humid & uncomfortable.
- A PAC with too little power will fail to keep the room temperature at a comfortable level.

In addition to room size, the following contributing factors should be considered when calculating cooling capacity:

- Ceiling height
- Number of occupants
- Large windows exposed to direct sunlight
- Room location (e.g. first floor, second floor)
- PAC air management (e.g. single or double hose)
- Heat generating appliances (e.g. dishwasher, stove)

Air Conditioning cooling capacity is specified in BTUs and calculated in accordance with ASHRAE* standards. Since PACs are not as efficient as window or central air conditioners, the U.S. Department of Energy (DOE) came up with a different means of calculating cooling capacity for PACs which more accurately reflects performance. For example, the DOE rating for a 1 hose PAC would be multiplied by about 1.6 to compute the equivalent ASHRAE rating.

Most PAC manufacturers specify cooling capacity in terms of ASHRAE, some show ratings in both DOE and ASHRAE. If the rating type is not shown, the default is typically ASHRAE.

In order to simplify the process, we talk in terms of ASHRAE and compensate with multipliers to compute total cooling capacity. So for example, if you wanted to replace a 10,000 BTU window air conditioner with a 1 hose PAC (and there were no contributing factors) we would recommend buying a PAC rated at 16,000 BTUs.

*ASHRAE - American Society of Heating, Refrigerating & Air-Conditioning Engineers.

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Product Selection - Cooling Capacity Requirement

The following provides instructions and an example for computing the cooling capacity requirement for your room:

In this example, we compute the PAC cooling capacity recommendation for a 200 square foot room with a standard 8' high ceiling, located on the third floor of an apartment building, with 1 large window exposed to the sun and with 3 people typically residing in the room when air conditioning is needed. In this case, the buyer wants to buy a 1 hose PAC.

The total cooling requirement is calculated at 12,400 BTUs, which is rounded up to 13,000 BTUs for the purpose of selecting a standard PAC size.

Line	Description	Example	
		Entry	Calculations
1	Determine room volume (length x width x ceiling height)	1,600	20' x 10' x 8' = 1,600 cu ft
2	Calculate basic BTU requirement (multiple Line 1 by 2.5)	4,000	1,600 x 2.5 = 4,000 BTUs
3	Add BTUs for 1 hose PAC (multiply Line 2 by 1.6)	6,400	4,000 x 1.6 = 6,400 BTUs
4	Add BTUs for 2 hose PAC (multiply Line 2 by 1.2)		
5	Add BTUs for large windows exposed to sun (500 BTUs/window)	500	1 x 500 = 500 BTUs
6	Add BTUs for each person normally in room (500 BTUs/person)	1,500	3 x 500 = 1500 BTUs
7	Add 4,000 BTUs if the room has heat generating appliances (e.g. kitchen a with stove and dishwasher)		
8	Add 4,000 BTUs if the room is not on the first floor.	4,000	
9	Compute total BTU requirements	12,400	add lines 3 thru 8
10	Round up to the next highest 1K for the buy recommendation	13,000	

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Product Selection - Features

The following provides a summary of key features available in most PACs:

Air Purifier

- Captures airborne particles, including; dust, hair, pollen mold, dust mites, odor, smoke, bacteria and viruses.

Ionizer

- Generates negative ions that attach to airborne particles and cause them to fall to the ground
- Increases oxygen flow in brain; improves metal energy & alertness

Dehumidifier

- All PACs remove moisture from the air as part of the AC process
- Some PACs provide an extra dehumidify feature to remove moisture from the air without cooling, or use with cooling to improve cooling capacity and comfort level

Multiple Fan Speeds

- For best results, use low speed on humid days, high speed on dry/hot days

Remote Controller

- Handheld unit used to control PAC operations, including; power on/off, temperature setting, fan speed, mode, time setting, timer
- Some have built-in sensors to give the PAC feedback on air temperature in other parts of the room

Smart Phone Control

- Android phones have an IR blaster, enables remote control by phone

Smart Device Control

- PACs with a remote controller can be controlled with smart devices by using a Wi-Fi >> IR Converter unit (WIC):
  - Use PAC's brand name or remote controller to teach WIC how to communicate with PAC
  - Connect WIC to home Wi-Fi, point WIC at PAC
  - Download compatible app to smart device
  - Send commands to PAC: smart device >> WIC >> PAC
- Smart devices include; smart phone, computer, Alexa, Google Home

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Product Selection - Air Hose

Probably the most important feature to consider is the number of hoses used for connecting the PAC to outside air. All PACs use either one or two hoses to gain access to outside air thru a dedicated opening (e.g. windows, walls, doors).

The single hose PAC uses the hose to expel hot air to the outside. The outgoing air is replaced by air seeping in from open areas in the house (e.g. other rooms, cracks in windows, ceiling vents).

The single hose system loses efficiency by spending time and energy trying to draw replacement air from other parts of the house and cooling nearby air that has already been cooled. Performance can be improved by using external fans to draw cool air away from the PAC and move external air towards the PAC.

The loss in efficiency becomes more and more noticeable as the outside temperature increases. This is especially noticeable when temperatures exceed 90° F.

The duel hose PAC uses one hose to expel inside air and the second hose to draw-in outside air.

The duel hose system is typically more efficient than the single hose system because it can easily draw in new outside air to replace the air that has been sent outside.

The duel hose system is highly recommended for houses that are tightly sealed and when outside temperatures frequently exceed 90° F.

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Installation

Find a convenient place near an AC outlet and window for installing your PAC. If possible, use the window that receives the least amount of direct sunlight.

PACs require substantial power to operate, typically anywhere from 10 to 20 amps. Check your user manual to determine the PAC's power requirement. Be sure that the breaker associated with your intended AC outlet is rated to handle the current draw from the PAC and other equipment connected to the same breaker. If not, you will need to have an electrician come out and exchange the breaker with a suitable replacement.

If possible, plug the PAC's AC cord directly into a dedicated AC outlet without using an extension cord or AC strip. If this is not possible, check your PAC user's manual, manufacturer or electrician for advice. You may be able to use a high current, heavy duty extension cord to make the connection.

Set your PAC on a level surface so the internal mechanisms and drainage system can operate properly.

Avoid placing the PAC near heat producing items (e.g. televisions, lamps, appliances). The extra heat can confuse internal sensors and cause the PAC to run longer than necessary, thereby wasting energy and driving room temperature below desired level.

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Connection to Outside Air

Use the PAC's components and instructions to connect your PAC's air hose or hoses to outside air. If 2 hoses are used, maximize the distance between the hose output locations in order to minimize the amount of hot air (released by the output hose) drawn into the input hose.

Also, try and minimize the length and bends in the hose or hoses as much as possible. This will help the PAC to operate more efficiently, improve cooling power and reduce operating cost.

The exhaust output hose can get very warm and increase room temperature, thereby increasing the PAC's workload and decrease efficiency. You can minimize this heat transfer and significantly improve PAC cooling capacity by encasing the output hose with an insolating sleeve.

The Cool-Aide Sleeving is made especially for insolating PAC air hose. This sleeving is safe to use (no fiberglass nor polystyrene), has a washable surface, uses recycled material and can increase PAC operating efficiency by 32%.

The sleeving can be installed with a few simple steps:

- Insert the hose into the sleeve
- Extend the hose for expected maximum reach
- Cut the sleeve to leave about 2" of hose sticking out of each side
- Use tie wraps on each end to secure the sleeving. The tie wraps (provided with the sleeving) can be easily detached and reused if changes are needed.

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Water Drainage

You should plan to address water drainage, even if you live in a dry climate and even if your PAC is designed to expel condensation out of the air output hose. In both cases, some water will accumulate in the PAC's internal tanks and this needs to be drained, from time to time, to allow for continuous operation.

If your PAC comes with a removable, built-in bucket for collecting water, then its just a matter of dumping the bucket when it's full.

If your PAC's drain nozzle is located a few inches above the base, the drain issue is easy to deal with. In this case, the water can be drained into a deep pan or bucket positioned below the nozzle.

If your PAC's drain nozzle is located close to the floor, then capturing and disposing of water becomes much more challenging. In this case, here's some options to consider;

drain nozzle

- Place a small pan under the PAC's drain nozzle (this might work for collecting small amounts of water)
- Position the PAC's drain nozzle over a floor drain
- Run a small hose between the PAC's drain nozzle and a floor drain or outside area. The drain hose and drain location must be kept lower than the drain nozzle in order for this to work.
- Set the PAC on a platform so a deep sided pan can be placed under the drain nozzle. Refer to SlideDeck 1A for DIY plans to build a PAC Platform.

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PAC Tips & Tricks

Leaks

Most PACs operate for years without leaking water. However, there are exceptions and if your PAC becomes an exception the outcome could be serious, especially if the problem goes undetected and there is expensive carpeting involved.

Water leaks can be caused by a number of problems, including;

- Drain plug is out or not securely inserted
- Condensation collecting on PAC internal components
- PAC tank overflows without triggering shut down circuits
- Hole in PAC tank due to shipping damage or manufacturing defects

This potential problem can be avoided by simply placing a Drip Tray under the PAC to collect leaking water. If the PAC is mounted on a platform, a hole can be drilled into the Drip Tray and Platform Plate to allow automatic drainage into a larger container. It will make it easier to center the holes and avoid water leaking onto the Platform Plate by making the hole in the Drip Tray smaller than the one in the Platform Plate, as shown in the photos.

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Operation

Set the PAC's fan speed low on humid days and high on dry days.

- The low speed will move air through the PAC at a slower rate, thereby increasing the amount of moisture removed from the air and improving efficiency and cooling capacity.

- The high fan speed on dry days will improve your air circulation and comfort level without compromising efficiency.

Use ceiling fans or portable fans on dry or humid days to improve circulation. Fans provide a quick and easy way to improve PAC efficiency and comfort level without spending a lot of money.

Be sure to clean the PAC air filter and vents on a regular basis and follow all instructions in the user manual to ensure your PAC remains clean and in good working order.

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