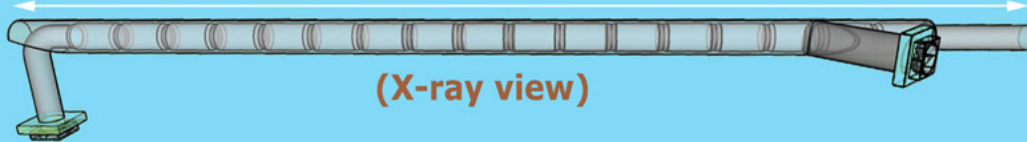


Soda Can - Pvc pipe Air Heat Exchanger

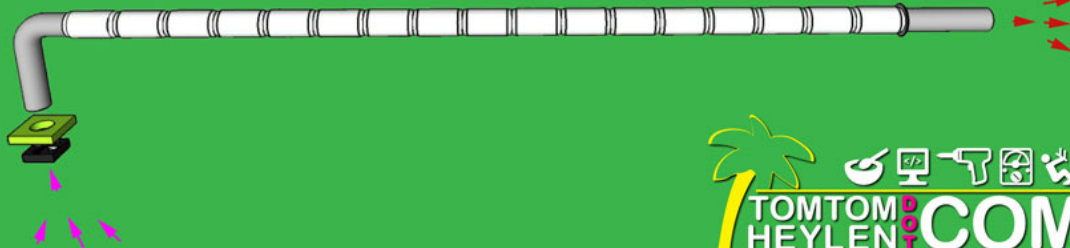
+/- 2m (6.5 ft)



Outer pvc pipe



Inner aluminum can pipe



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Note:

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Low cost yet very effective air heat exchanger



You will learn how to make a **low cost, easy to build and very effective air heat exchanger** by using soda cans, pvc pipes and some computer fans.

The purpose of the heat exchanger is to ventilate a room or house with fresh air while not losing too much heat.

In winter times we want to have a comfortable indoor climate while not wasting too much energy on heating and ventilating.

The heat exchanger heats up the cold fresh air with the hot air that is being replaced before entering the room.

The heat exchanger can be used in hot climates as well to ventilate air conditioned rooms or houses.

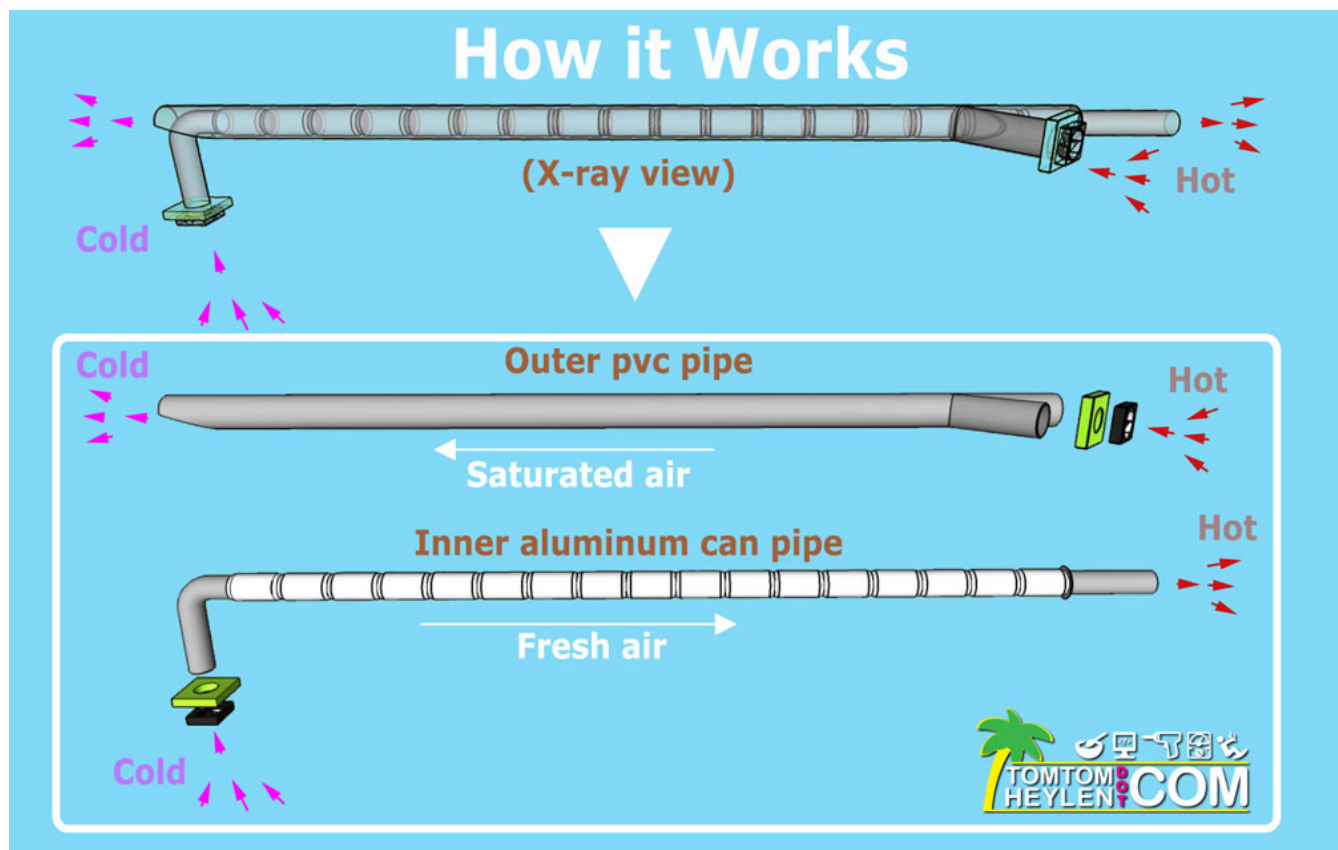
How it works

The air heat exchanger consists mainly of an **aluminum pipe** made from soda cans that sits **inside** a wider **pvc pipe**.

The cold fresh air is being pushed through the aluminum pipe to entering the room.

The hot saturated air is being pushed through the pvc pipe in the other direction to leave the room.

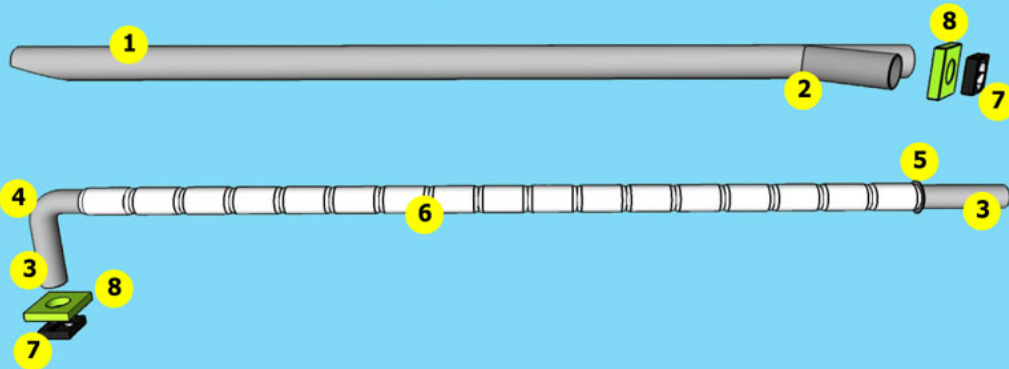
Since **aluminum** is a very **conductive material**, the **heat/cold** will be **transferred** upon each other while keeping the fresh **air separated** from the saturated air resulting in **fresh air entering the room without losing too much heat**.



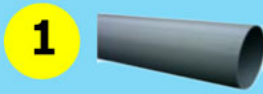
Material list

	Where to find
1 Pvc pipe L = 2m (6.5 ft) dia. = 7 cm (2.7 in)	Hardware store
2 Pvc Y-piece Dia. = 7 cm (2.7 in)	Hardware store
3 Pvc pipe L = 1 m (3.2 ft) Dia. = 5 cm (1.96 in)	Hardware store
4 Pvc 90 degree elbow Dia. = 5 cm (1.96 in)	Hardware store
5 Pvc Pipe reducer 7 cm (2.7 in) to 5 cm (1.96 in)	Hardware store
6 Soda or beer cans	Trash
7 Pc cooling fan (2x) 7 x 7 cm (2.7 x 2.7 in)	Old desktop pc or computer store
8 Polystryne board (2x) 10 x 10 cm (3.9x3.9 in)	Hardware store
9 Alu or multi purpose glue or epoxy	Hardware store
10 Glue gun	Hardware store
11 Foam sheet ep. +/- 5 mm (0.9 in)	Hardware store
12 Adaptor 220v or 110v ac to 12v dc (min 0.3 A)	Old router, shaving machine, pc power supply,...
13 Electrical wire	Hardware store
14 Switch	Hardware store

Material list



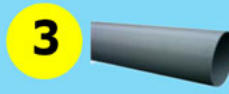
Pvc pipe L = 2 m (6.5 ft)
Dia. = 7 cm (2.7 in)



Pvc Y-piece
Dia. = 7 cm (2.7 in)



Pvc pipe L = 1 m (3.2 ft)
Dia. = 5 cm (1.96 in)



Pvc 90 degree elbow
Dia. = 5 cm (1.96 in)



Pvc Pipe reducer 7 cm
(2.7 in) to 5 cm (1.96 in)



Soda or beer cans



Pc cooling fan (2x)
7 x 7 cm (2.7 x 2.7 in)



Polystryne board (2x)
10 x 10 cm (3.9x3.9 in)



Alu or multi purpose
glue or epoxy



Glue gun



Foam sheet
ep. +/- 5 mm (0.9 in)



Adaptor 220v or 110v ac
to 12v dc (min 0.5 A)



Electrical wire



Switch



Putting it all together

We use a can opener to open up the top of the soda cans. About 12 or so cans is what we need. Together the length of the cans should be a bit less then the length of the outer pvc pipe.



Use a drill with a 10 mm steel drill bit and bore 5 holes in the bottom of each can.



Calculating the total surface of the bore holes in the bottom of each can

The total surface of the holes should be equal to the space between the two pipes.

To calculate this I use an example with a drill bit of 10 mm.

The big pvc pipe has a diameter of Ø 70 mm (radius 35 mm). The soda cans have a diameter of Ø 66 mm (radius 33 mm).

$$\text{Area pvc pipe} = \pi r^2 = 3.1415 \cdot (35 \cdot 35) = 3848 \text{ mm}^2.$$

$$\text{Area aluminum pipe} = \pi r^2 = 3.1415 \cdot (33 \cdot 33) = 3421 \text{ mm}^2.$$

Now we subtract the aluminum pipe from the pvc pipe.

$$3848 - 3421 = 427 \text{ mm}^2.$$

The holes we bore in the bottom of the cans should have a total of 427 mm².

We calculate the surface of 1 hole with a drill bit of 10 mm (radius 5 mm).

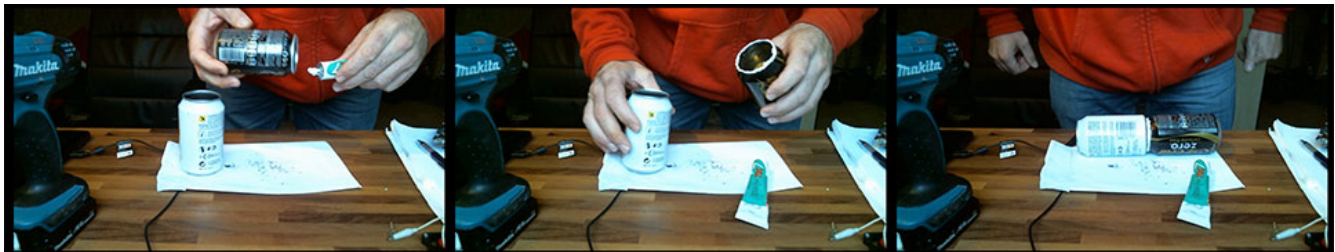
$$\pi r^2 = 3.1415 \cdot (5 \cdot 5) = 78 \text{ mm}^2.$$

Now we divide the 427 mm² by 78 mm².

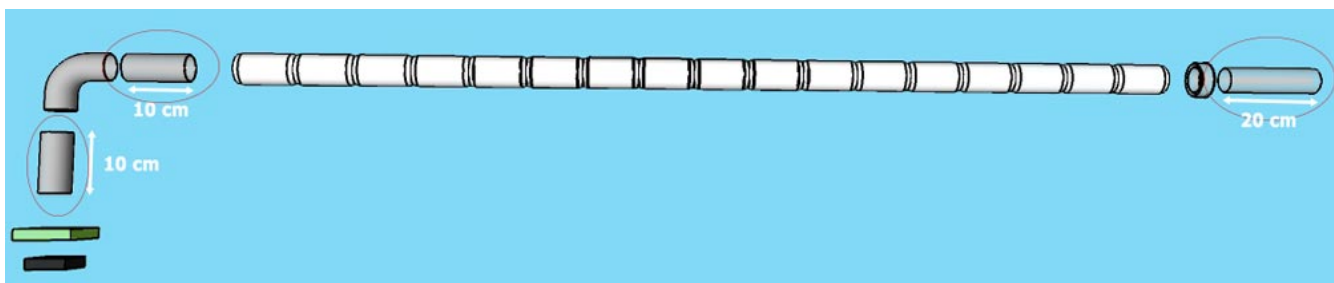
$$427 / 78 = 5.4 \text{ rounded to } 5$$

So we need to bore 5 holes with a drill bit of Ø 10 mm.

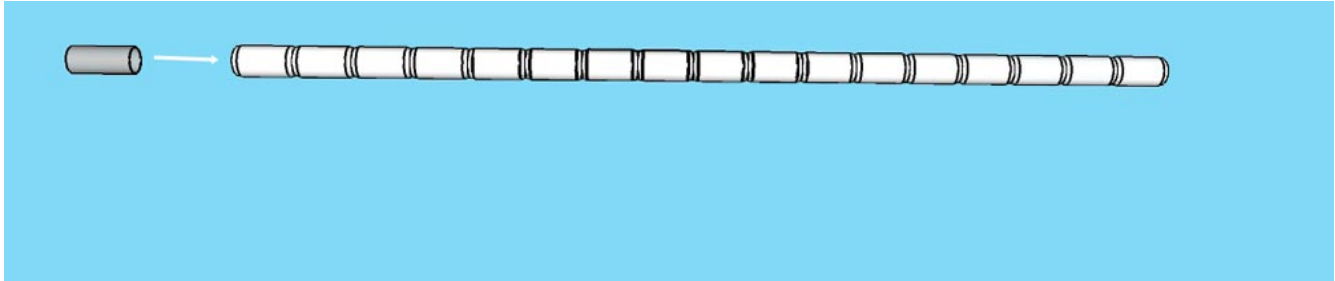
Now glue together the bottom to the top of each can with the aluminum glue. I used 2 strips of wood to lay the cans on to make sure the pipe is 100 % straight.



With a grinder or metal saw cut 1 piece of 20 cm and 2 pieces of 10 cm from the Ø 5 cm (1.96 in) Pvc pipe.



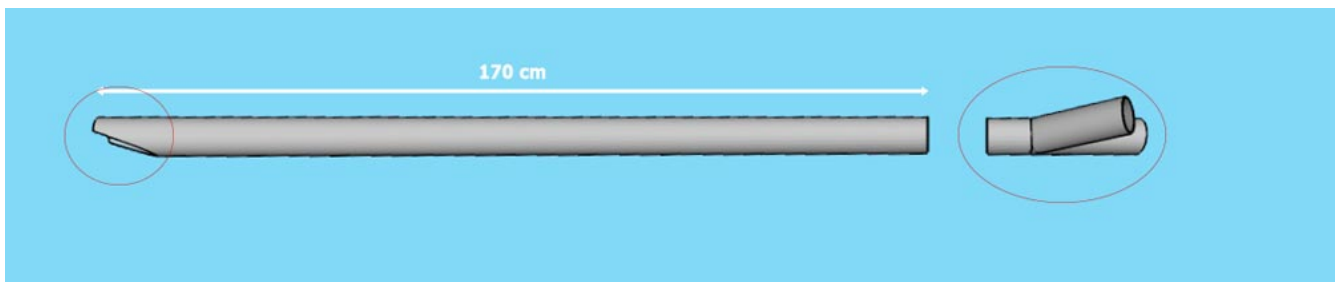
Put one end of the 10 cm pvc pipe in the opening of the top can from your aluminum pipe and glue together to make sure there are no fits.



Let everything harden out and respect the hardening time as subscribed on the glue you are using.

Use a grinder or metal saw to cut the $\text{Ø} 7 \text{ cm}$ pvc pipe at a length of 170 cm. At one end of the pipe, cut away diagonally a piece about 10 cm long. This is to prevent rain or snow getting in to the pipe.

Glue the pvc y-piece on the other end of the $\text{Ø} 7 \text{ cm}$ pvc pipe.



Cut a bunch of stripes of +/- 1 cm width and +/- 15 cm long out the foam sheet.

When your aluminum pipe is hardened out, glue on each can 2 stripes diagonally over the can on both sides. Make intervals of 45° on each can to make sure the air can travel trough the pipe.

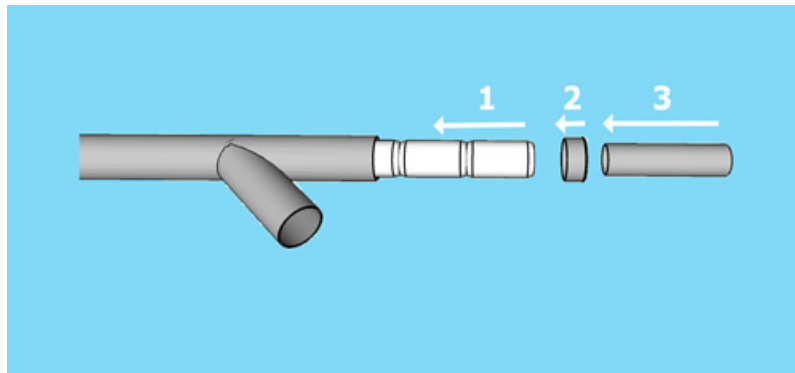


Now it's time to slide the pipes in each other.

Gently slide the aluminum pipe with the pvc end in the larger pvc pipe starting at the y-piece.

Now glue the pvc pipe reducer to the end of the aluminum pipe and slide it in the y-piece.

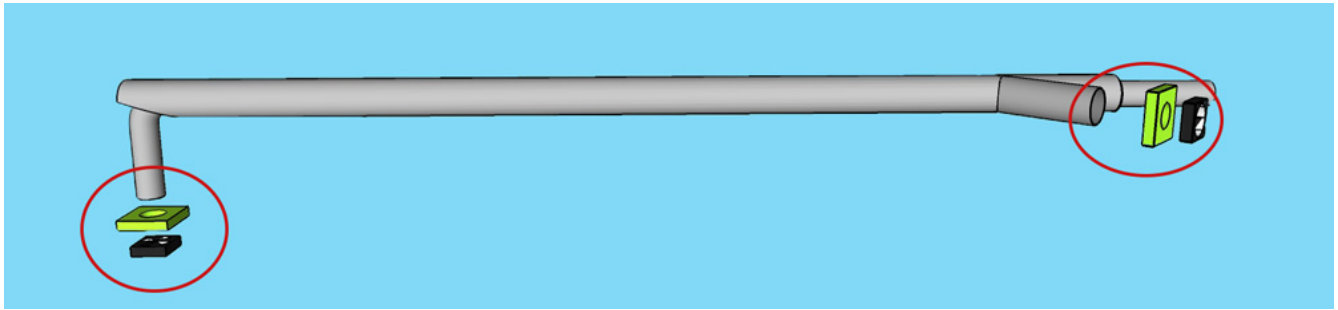
Glue the 20 cm small pipe to the reducer and the pvc elbow and the 10 cm pipe to the other end on the aluminum pipe.



Your heat exchanger is nearly ready now.

In center of the polystyrene boards, cut out a circle with a diameter of 5 cm.

Glue the fans to the center of the boards with you glue gun and glue one board to the opening in the y-piece and the other to the opening of the Ø 5cm pipe near the elbow.



The last step is connecting the 12v dc adaptor to the fans.

Warning!

Working with electricity can be dangerous.

If you're not familiar with electrical circuits, get an electrician to do the last step.

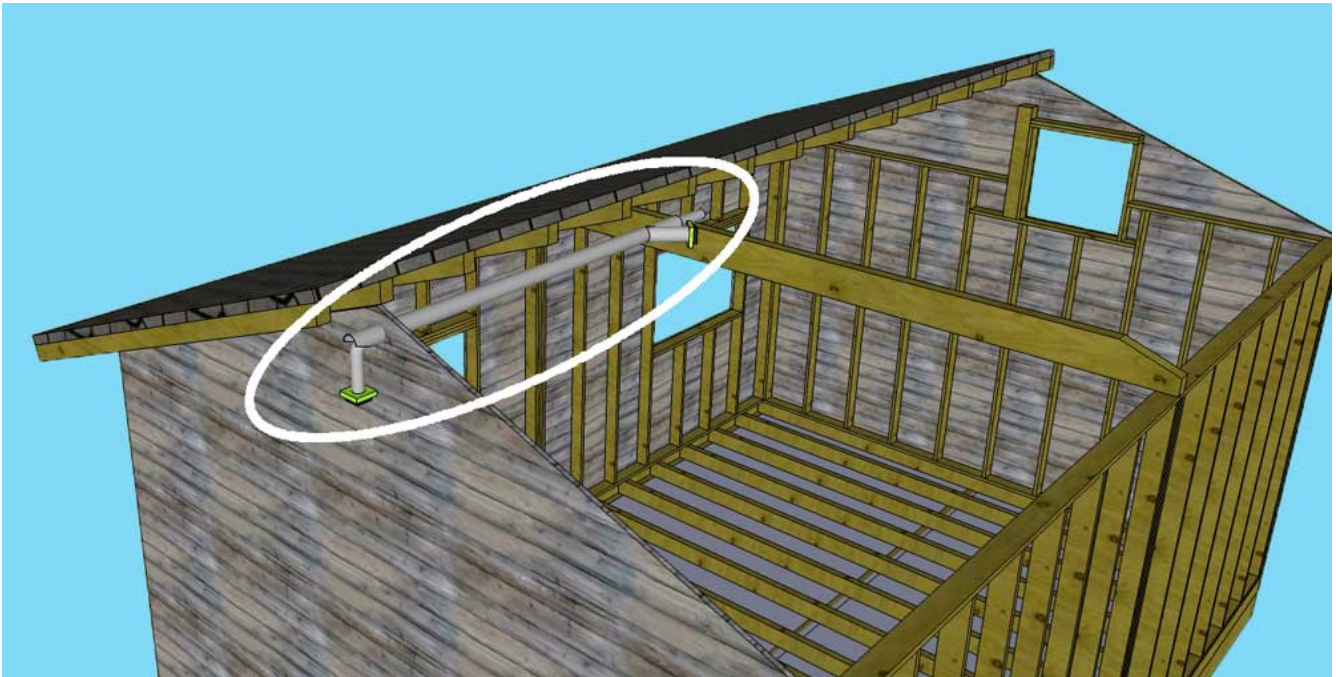
Connect the adapter with the electrical wire and the switch in parallel to the fans. Make sure to get the positive and the ground right.

Your air heat exchanger is ready!

Installing

The best place to install your heat exchanger is under the roof since that is the warmest place in the house.

In case you using it to keep your house cool, install it down the bottom of the house.



Extra info

For larger houses or rooms, the heat exchanger can be made longer with stronger fans.

More info, videos, and updates can be found on my website.

tomtomheylen.com/categories/DIY/Air_heat_exchanger.php

Do you have suggestions or comments on this project, please feel free to contact me trough the website.