

Radiators

Not all radiators are the same...



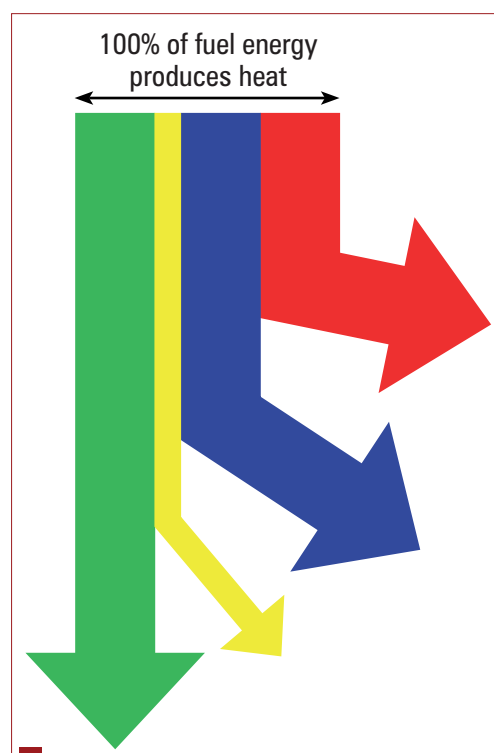
Having no basic knowledge about radiators one can make serious mistake while buying a new one.

Filling up a fuel tank of our car we do not realize that most of energy received from this fuel will be uselessly lost. Thermal balance of the engine shows that only 30% of created energy is used for real work (for moving a car), another 30% is going out with exhaust fumes, 10% is used to overcome engine and transmission inner resistance, and the rest must be emitted to atmosphere by cooling system.

Efficiency in every moment

If this heat instead of being emitted to atmosphere through cooling system, remained inside the engine it would cause a dangerous temperature increase following overheating the engine head, pistons, rings etc. The possible engine damages are:

- engine head deformation causing damaging of engine head gasket;
- blocked piston rings in pistons rows (caused by rests of overheated oil) and lower engine compression. All these effects destroy engine seriously;
- Melted engine pistons cracking the engine completely.



Thermal balance of internal combustion engine.

- ca 30% of fuel energy produces heat, which is collected by cooling system and emitted to atmosphere;
- ca 30% of produced heat is going out with exhaust fumes;
- ca 10% of energy is used to overcome engine and transmission inner resistance;
- ca 30% of created energy is used for real work (for moving a car).

To avoid this scenario, it must be assured that cooling system will emit excessive heat to the atmosphere even in extreme situations like:

- driving with trailer up the hill during hot summer;
- driving in traffic jam in hot temperature for a long time.

The whole cooling system should play its role even in such difficult conditions. It means that radiator must have a necessary heat emitting efficiency. This efficiency depends on heat emitting surface (tube's surface), fin's surface and on radiator's capacity as well. It is also necessary that a proper air stream could flow through radiator fins.

What plays a deciding role?

Additionally, cooling system engineers try to design proper radiator at possibly lowest production cost. Owing to cheap parts, the complete car can be offered at competitive price.

The engineers can choose one from several radiator types. Production price cannot play a deciding role as there are many other factors to be taken in consideration. It is worth to analyze advantages and disadvantages of various radiator types. This choice looks as follows:

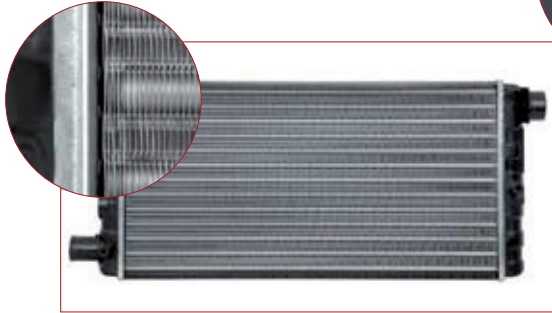
1. Mechanical assembly radiators with round tubes.

Disadvantages:

- small heat emitting surface of round tubes;
- small rigidity causing big risk of leaking connected with engine vibration;
- a necessity of using high quality gaskets as these gaskets play major role to avoid leakage. Some manufacturers do not follow this requirement having no experience or wanting to cut production costs.

Advantages:

- low production costs (round tubes are cheaper than oval tubes), low cost of necessary production machines, production can be lead in smaller halls.



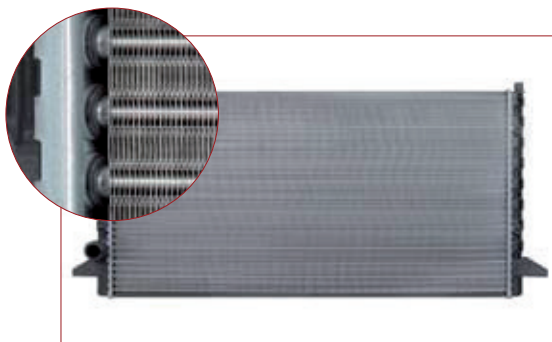
2. mechanical assembly radiators with oval tubes

Disadvantages:

- small rigidity as well;
- high requirements with regard to the quality of gaskets as well;
- patent restrictions causing the fact that only few manufacturers can legally use this technology.

Advantages:

- huge heat emitting surface of oval shape tubes;
- lower production costs than in case of brazed core radiators.



3. brazed core radiators

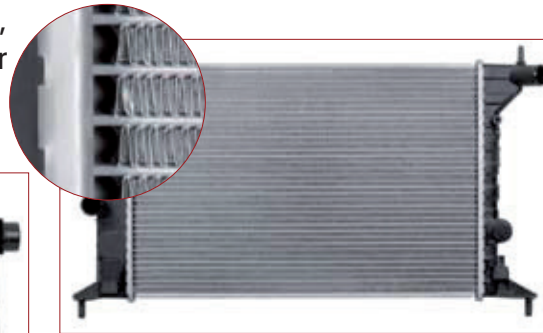
Disadvantages:

- high production cost caused by using expensive equipment and big production halls. This production needs also experienced and skilled people.

Advantages:

- big rigidity and durability what is especially important for diesel engines;
- huge heat emitting surface as tubes are fixed (brazed) together with fins

and aluminium side panels. Plastic tanks are fixed to panels using durable O-ring type gaskets.



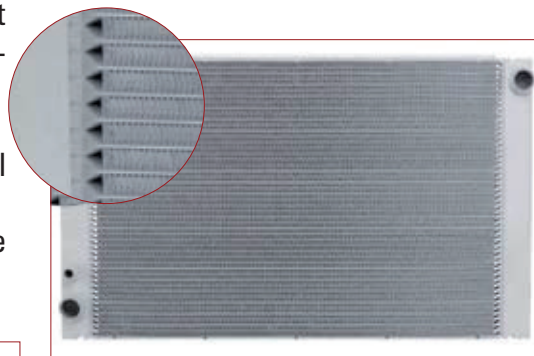
4. brazed radiators fully made of aluminium (core and tanks)

Disadvantages:

- extremely high price caused by expensive components, modern assembly lines and expensive „know-how“.

Advantages:

- highest heat emission ability;
- Highest rigidity and durability.



Full aluminum high tech radiators mentioned in point 4 are used in high class cars equipped with strongest engines (for example Audi A8 6.0 V12 48v 450 HP). Similar radiators are often used in rally cars or in special cars used in drifting.



Radiators for sport cars are produced in small series or on special orders for specified engine power.

Copper brass brazed radiators produced manually and being so common some years ago are not used any longer, because of constant growing copper prices.

Similarities and differences

Basic knowledge of various radiator technologies and their advisable applications helps a lot and allows to avoid serious mistakes when searching for a replacement radiator.

We should always start from checking the technology of the original radiator (OE part used by car factory on assembly line). Suppose that we find out that our radiator was mechanical assembly with round tubes then in this case the price should not be too high, but it is still necessary to check following conditions:

- core thickness should not be smaller than in OE radiator;
- number and diameter of tubes should not be smaller than in OE radiator;
- fins density should not also be lower.

Having checked that all these conditions are fulfilled, we recommend buying such a radiator.

Dangerous consequences

If we discover that our car was originally equipped with radiator type 2 or 3, we should remember that the cooling engineers for sure had some reasons to use more expensive radiator in our car. That is why using the cheapest radiator of type 1 in such a car (for instance driving in traffic jams, in high outside temperatures or towing a trailer) can have really serious consequences like:

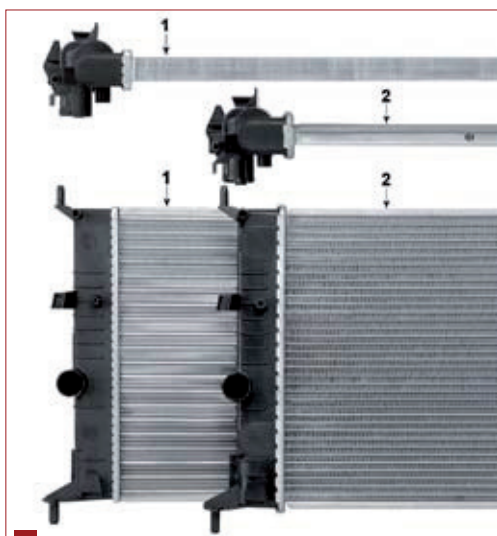
- engine fan damage caused by nonstop usage;
- overheating the engine – seeing growing engine temperature displayed on dashboard it is advisable to switch off the engine and let it to cool down;
- Serious engine damage what leads as a consequence to its overhaul.

General rules

It means that the general rule when buying a new radiator should be to choose always such radiator, which is produced using not worse technology than our old OE radiator. If this condition is already fulfilled it is necessary to compare core size, number of tubes and density of fins with an old radiator. Only in case when the replacement radiator is brazed and the old OE one was mechanical assembly it is acceptable that core thickness is little smaller.

Reputable manufacturers who produce brazed radiators always check carefully the new product before launching it in the market. The heat emission performance and leakage tests are the most important features to be checked. The best factories stop production of mechanical radiators and decide to focus only on modern brazed core production.

The decision of this kind is also made when a factory intends to widen their radiator production range. And if their production line is suitable for small series, such companies can easily compete against biggest OE manufacturers producing radiators in big series.



Mechanical assembly radiator (1) can be replaced without any risk by brazed core radiator (2).

The market invasion of extremely cheap radiators from unknown Chinese manufacturers is easy to observe.

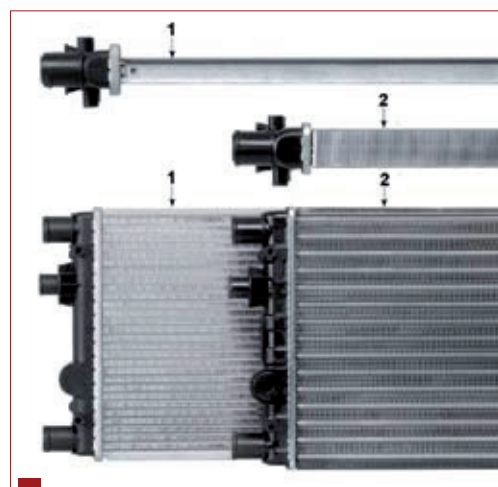
All of these cheap radiators are produced in mechanical technology using round tubes. Such radiators are offered also for models, which were equipped by car factory with brazed core radiators.

We explained already how dangerous and expensive it can be, but the question why so many workshops and car owners still buy them remains. There are two possibilities:

- Customer has not even got a basic knowledge and believes in seller's radiator description. So we may say he is simply cheated by not honest seller;
- Customer knows that radiator manufacturer plays unfair game, but he has a plan to sell a car soon and he does not care about problems of the next owner.

Cutting the costs

Many Chinese radiators have also another dangerous feature - also in case when they are applied for cars with smaller and not powerful engines.

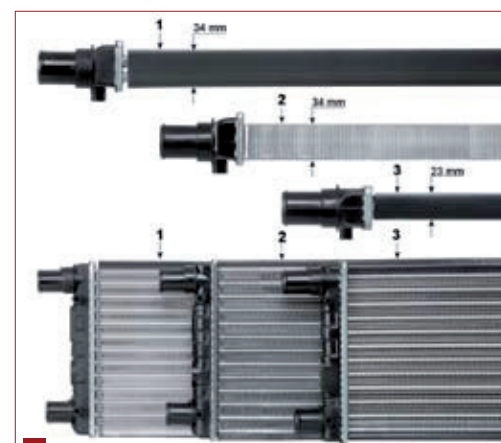


In this case the brazed core radiator (1) was replaced by mechanical assembly radiator with round tubes (2). But the manufacturer of replacement part decided to use two rows of tubes to increase the heat emitting surface. Still, life of such radiator is much shorter than that one with brazed core.

The strong inside China competition makes many manufacturers to cut costs to be able to offer lower prices. Here are very common results of this price war:

- lower core thickness;
- smaller number of tubes;
- smaller density of fins.

The above construction changes mean big savings for factories and all of them can be seen by our own eyes. But it is clear, that also the inside changes are being made to cut costs.



This picture shows:

- 1 - mechanical radiator used as OE part on car assembly line,
- 2 - good quality aftermarket part,
- 3 - super cheap aftermarket part with lower number of tubes, lower density of fins and additionally lower core thickness.

Thinner pipes or cheaper (worse) gaskets explain why so called cheap radiator's life lasts in many cases only months instead of years.

Expensive savings

To finalize we should be extremely careful seeing low price radiators. This kind of savings might mean the necessity of buying several radiators instead of one. And this will not be the worst result of such saving. Overheating and finally braking the engine can cause even more serious problems and costs for car owner.