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## Solving cooling problems

*Clogged radiators place a heavy strain on agricultural machines & significantly increase fuel consumption. With the Cleanfix reversible fan, machines work longer, more productively, & more efficiently*

*IFI can confirm how this Cleanfix agricultural report has equal benefits for the forestry and biomass industries.*



*The Cleanfix reversible fan offers the perfect cooling solution*

**E**ach agricultural season comes with its own challenges.

To ensure that agricultural machines are 100% operational at all times, farmers must make the right investments. The strain on agricultural machinery during dirty and dusty work such as plowing, mowing, and harvesting is enormous. Grass, dust, and dirt clog the radiator.

To continue meeting the engine cooling requirements, the fan needs more drive power, which leads to higher fuel consumption. What's more, the risk of overheating the engine increases. Tractors with front power take-off applications are particularly

vulnerable to cooling problems. The farmer must regularly interrupt work and manually clean the radiator to prevent a machine breakdown.

The Cleanfix reversible fan offers the perfect solution. The Cleanfix blade profile provides high cooling capacity with low flow resistance and thus efficient cooling. The fan switches from cooling to cleaning at regular intervals. To clean the radiator, the blades rotate on their own axes to face the opposite direction. When the blades have rotated fully, the fan changes the direction of the air flow and blows the contamination from the radiator.

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### Increased productivity



The advantages of the Cleanfix reversible fan are clear.

The reversing function boosts the productivity of any machine. For one thing, the maintenance intervals are extended thanks to fully automatic cleaning. Moreover, the machine experiences less downtime due to repairs. If the cooling capacity is too low, the operator runs the risk of overheating the engine, transmission, and hydraulic system, which can result in complete machine failure.

This is particularly serious if multiple machines are interdependent. For example, the failure of a single harvester can hold up the entire fleet and thus severely impair productivity during peak season.

### Improved cooling capacity as needed

The main requirement of a fan is to prevent overheating problems.

The right fan, however, also boosts engine efficiency. By adjusting the blade angle, the Cleanfix fan adapts the cooling to the engine's needs. Depending on the work conditions, the fan engages the power reserves or saves fuel.

If the need for cooling is low, for instance, a flat blade angle in economy mode can reduce power consumption by up to 60%.



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### Save money with the right investment



Modern agricultural machines require a high level of cooling.

To cover this need, compact water coolers, intercoolers, and air-conditioning coolers are installed one behind the other. Operators who want to save in the long run must optimize cooling and invest in the right technology.

In concrete terms, the reversible fan saves money by reducing fuel and maintenance costs. Clean radiators are more efficient and save fuel. In a traditional 250 hp tractor, the fan needs 8 kW more drive power per hour with dirty radiators than with clean radiators.

- The annualized increased power consumption for 900 operating hours comes to 2,340 liters of fuel. During work in which the radiator is dirty 40% of the time, fuel costs amount to \$1,113 per year. Furthermore, every minute of downtime generates costs for wages, the machine, and loss of production. Depending on the amount of work, this adds up to \$60 per hour. If 15 minutes a day for 90 days a year are spent cleaning the radiator during maintenance, additional maintenance costs of \$1,340 accumulate.
- The savings are based on annual operating hours. A small farm with relatively low utilization saves up to \$1,310. At the upper end of the spectrum is an agricultural contractor with high machine utilization that saves \$5,350. At medium machine utilization, the new purchase pays for itself after 18 months.
- By retrofitting a machine with a Cleanfix reversible fan, a farmer is prepared for any eventuality and saves real money to boot. Whoever makes the right investment saves in the long term.



### Calculated additional fuel consumption per hour due to a dirty radiator:

$$1kW \Rightarrow \frac{0.28 \frac{kg}{kW \cdot h}}{0.85 \frac{kg}{l}} = 0.329 \frac{l}{h}$$

$$8kW \Rightarrow 0.329 \frac{l}{h} \cdot 8 = 2.6 \frac{l}{h}$$

Note: Specific fuel consumption per 1 kW = 0.28 kg/(kW·h); specific density  $\rho$  of diesel = 0.85 kg/l

### Calculated additional costs due to dirty radiators at an average of 900 operating hours per year:

$$900h/year \cdot 2.6 \frac{l}{h} = 2340l/year$$

$$2340l/year \cdot \frac{\text{€}1}{l} \cdot 40\% = \text{€}936/year$$

Note: Cost per l diesel = €1.00; it is assumed that the radiator is dirty approx. 40% of the operating time

