

# Soil/Landfill compactor

**Note:** It is recommended that you read the Supporting Information page before you read this factsheet.

## Preparation and completing work *(Preparation)*

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- Soil and landfill compactors, as the names suggest, compact either earth or waste-type materials. They differ from conventional compaction equipment, such as ride-on rollers, because they are fitted with a front-mounted blade which the machine uses to both spread and level materials during the compaction process.
- The aim of this factsheet is to make operator aware of the issues that have occurred with these types of compactor but, due to the hazardous nature of the environment in which they work, the factsheet focusses on landfill operations.
- Pre-use checks that conform to manufacturers' requirements need to be carried out. Failure to do so has caused near-misses and injuries where a compactor's performance has deteriorated or a component has failed. For example, if the operator notices a fault or defect such as a leak in one of the transmission drives, they must report it immediately and not use the compactor until authorised to do so.
- Even if they consider the fault to be minor, they should still seek expert advice as they may not have the experience or appropriate knowledge to recognise a significant but invisible fault, or a minor fault that could get worse during the working day.
- The reversing of vehicles and machinery is still a significant factor in accidents, injuries and fatalities in the workplace and these have occurred within the landfill sector.
- Compactors are fitted with a reversing warning system and one of the essential checks is for the operator to ensure that the alarm is functioning correctly and that it is sufficiently audible to or loud enough for those who may be behind the compactor.
- As compactors work in harsh conditions and are subject to extreme amounts of dust, visibility is naturally a key area for safe operations. Regular cleaning of the cab glass should be undertaken before work starts. On compactors, some of the cab glass is at difficult to reach areas and before attempting to clean any glass, the task needs to be planned so that any potential fall from height can be avoided or minimised, such as using proper guardrail-equipped access steps.
- This also applies to carrying out the pre-use checks, as some items may require operators to climb onto parts of the machine which, when covered with a layer of dust, can be very slippery and again they could fall.
- The build-up of dusts and waste materials can further affect the compactor by partially or totally blocking cooling intakes for transmission and engine radiators. Although measures are taken by manufacturers to minimise such events, such as the reversing of cooling air through a radiator, blockages can still occur so the compactor's radiator grills must be regularly cleaned.

## Working safely and with others *(Working safely)*

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- Before any material is to be compacted, the area should be checked to ensure that there are no voids, or soft, weak areas, that can cause the compactor to get stuck or, in some cases, become unstable.
- Compactors are sometimes used to extract stuck vehicles, or are retrieved by other plant such as a dozer if they get stuck themselves. Injuries and deaths have occurred when the recovery procedure was not properly planned and coordinated.
- Before any stuck vehicle or machine is recovered, a specific risk assessment and safe system of work must be devised so that all risks are taken into account, control methods applied and relevant points communicated to all those involved in the recovery operation.
- All personnel must be clear of the path of a dozer or compactor being reversed up to a stuck machine, particularly when a towing chain or wire rope is going to be attached. Before the towing chain or rope is attached to both

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machines, the compactor's (or dozer's) transmission must be in the neutral position and the parking brake fully applied or engaged.

- While a stuck tipping vehicle is being extracted, there must be good communication between all those involved in the recovery process, including the vehicle driver.
- When the stuck vehicle is being pulled, and before any strain is taken by the dozer or compactor, the operator must ensure that all personnel are well clear of the potential chain or rope strike area in the case of a failure.
- Compactors are fitted with a roll over protective structure (ROPS) – either the cab itself or an overhead-type frame. If the compactor does roll over onto its side, the ROPS frame can minimise, but not eliminate, injuries to an operator providing the seatbelt is being worn.
- Good practice and manufacturers' recommendations normally specify that the engine of the majority of plant is switched off when the operator exits the cab or seating area. This eliminates the possibility of an operating or transmission lever from being accidentally moved, which would cause unintentional movement of the compactor if the engine was left running.
- As the majority of soil/landfill compactors have a hydraulically operated transmission, if transmission components are incorrectly adjusted, a running engine can further cause the compactor to creep forward, even if its transmission lever or pedal is in the neutral position.

## Working efficiently

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- Compactors are high production machines and production costs and efficiency are an important consideration for landfill operations. Fuel costs form a big part of the overheads so operators can minimise the fuel used by their machine by working the compactor efficiently and not at maximum engine speed.
- In nearly all cases, manufacturers indicate in both the operator's manual and on the machine's rev counter the optimum engine speed or range that should be maintained to ensure efficient running of the engine, transmission and hydraulic systems.
- The engine on the compactor should be switched off when the operator leaves the cab, not just for safety reasons but also because fuel consumption is further reduced as it is not wasted on non-productive work.
- Efficiency and fuel use is further determined by compacting to the required specification without undertaking additional passes. The level and extent of compaction also determines the effectiveness of the landfill operation.
- In general, the maximum number of passes that should be taken by the compactor is normally six, with the highest rate of compaction achieved when compacting thin layers. Increasing the number of passes usually has little effect on the compaction density and just increases fuel use.
- In terms of efficient working, a distance of 20 metres is considered to be the maximum length of a compaction pass.

## Reversing and visibility *(Travelling)*

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- As reversing of vehicles and machinery is still a significant factor in workplace incidents, guidance recommends that reversing is, as a first course of action, eliminated. Where this is not reasonably practicable, such as in the case of compactor operations where reversing is an essential part of the operation, then other measures must be taken with the next step to restrict operations to within a segregated, controlled area where delivery and tipping vehicles are kept clear of a compactor's working zone.
- Visiting delivery drivers are probably most at risk within the tipping area of a site as they may underestimate or be oblivious to the dangers of reversing compactors and the limited visibility from the operator's station.
- The design of a compactor and the working environment limits effective vision from the operator's seat although additional vision aids such as mirrors and CCTV systems can provide some assistance in providing all round vision. However, each vision aid has its limitations; for example, although CCTV systems are commonly used, they can be ineffective in strong sunlight and when covered in dust.
- Certain CCTV systems indicate the range of, or distance from, an object but this can be distorted if the correct vision mode is not selected, as some systems require settings to be changed to a reversing mode when reversing is going to take place. Irrespective, operators must use all aids available at all times and not rely on one single system.

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- After pushing a batch of material and before reversing, the compactor operator must ensure by various methods that the required reversing path is clear of both pedestrians and other vehicles or plant.

## Compacting techniques *(Working tasks)*

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- The main function of a landfill compactor, as stated, is to provide maximum compaction with the minimum number of passes. The ground pressure of the machine coupled with the type of wheel has the biggest impact on the amount of compaction made by the machine.
- Although track-type dozers can be used for compaction operations, the track design is meant to minimise ground pressure, whereas a compactor's steel wheels are designed to apply a greater ground pressure for the same machine weight.
- Factors that can affect the compaction rate include when the steel wheels become clogged with material as this means they cannot penetrate effectively and apply the same down force, as the clogging spreads the load of each wheel.
- In order to ensure total compaction of a given area, the operator needs to take into account the gap between the steel wheels and vary the position of the machine on each pass so that total compaction is achieved.
- Working on a slope is considered to be a more efficient way of working with the best angle for working a compactor being a 45 degree angle to the slope.
- If the compactor works nearer to 90 degrees or along the slope, its weight may be biased towards the downside of the slope, with a higher compaction rate on the downhill side of the machine and a reduced compaction rate on uphill side. This will produce inconsistent compaction.
- The angle or steepness of a slope can also affect the rate of compaction. The steeper the slope means compaction is reduced. The recommended maximum incline for efficient working is a 1 in 3 gradient.
- Compactors, like many plant and equipment that are continually used by same operator over long stretches of the day, whole body vibration needs to be considered.
- Most manufacturers design the cab to minimise vibration whilst working, with a suspended operator's seat being another method of minimising vibration and harsh movements to the operator. They need to ensure that the seat is correctly adjusted for their weight, especially following a change of operator from one shift to another.

## Sample questions

The following questions are based on the text within this factsheet and indicate how the questions and answers are structured. Based on the factsheet, there is only one correct answer. The correct answer to each question is indicated at the end of this factsheet.

**Q1. Which factor has the biggest impact on the amount of compaction made by the machine?**



The weight of the compactor



The area (length x width) of the compactor's blade



Ground pressure exerted by the compactor



Height of the compactor's wheels

**Q2. Failure to effectively or regularly clean the radiator cooling intake grills could cause what problem?**



Fuel starvation



Excessive wear of engine components



Increased use of fuel



An overheating engine

## Study checklist

This checklist aims to act as a study aid to ensure that the reader has identified and understood the relevant parts of this factsheet.

Do you know?

1. What the effect maybe of a failed or deteriorated component.
2. Why even small or minor faults must be checked by an expert before the compactor is used.
3. Why the reversing warning alarm should be sufficiently audible or loud enough before work starts.
4. Why proper access equipment such as mobile steps should be used when cleaning the cab glass.
5. How the build-up of debris can affect the performance of the compactor.
6. What must be in place before the recovery of stuck machines or vehicles takes place.
7. What the dangers are and what procedures need to be followed when extracting a stuck machine or vehicle.
8. Why the engine must be switched off before leaving the operators seat.
9. What is considered the maximum distance of compaction for efficient working.
10. Why following the specified number of passes is important for efficient landfill operations.
11. How reversing accidents can be minimized.
12. What the limitations are of driver visibility aids.
13. Why an operator should not rely on visibility aids.
14. What factors affect the compaction rate.
15. What needs to be taken into account by the operator to achieve total compaction over an area.
16. What is the considered best angle for compacting on a slope.
17. Why the steepness of a slope can affect compaction.
18. How whole body vibration can be reduced.

**Answers to sample questions: Q1: C and Q2: D**