

A Guide To Waste Compaction Equipment & Systems

**Digging your way out from
under rising waste handling
costs to find the savings.**



Where To Begin

If you have begun the search for a cost saving system to handle all of your facility's garbage, you have come to the right place. Inside you will find that the information is broken into three sections.

The first section will give you insight into how compaction can lower your waste handling costs and save you money.

The second section describes the compactor models that are available and the purpose of their design.

The third section lists a number of specific components that have a great impact on the operation, durability, and safety of the equipment.

After looking through the information, you should have a general idea of what compaction systems are designed to accomplish and how they can help your facility save money. For more detailed information on a specific model or system, or a particular installation, contact your SP Industries representative for a no obligation facility survey.

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Saving Money With A Waste Handling System

What is compaction all about?

The compaction of garbage is no more than removing the air from the materials and filling voids normally found in open-top containers. For instance, on 36" x 36" x 36" cardboard box takes up one cubic yard of space. If this box is compacted, the air space inside is eliminated and the box becomes a flat sheet of 72" x 72" x 1" thick taking up only .11 cubic yards. A compaction ratio of 9:1 has been achieved. On the other hand, if compaction is attempted on a 4" x 4" board there is no air to remove; therefore, no reduction.

How to measure performance: compaction ratios or container weights?

Historically, compaction ratios has been used as an estimate of compactor performance. For instance, a 4 to 1 ratio shows that if you are presently filling a 30 cubic yard capacity open-top container with garbage the compactor can pack the equivalent of 4 of those containers into 1 - 30 cu. yd. compaction container.

At SP Industries, years of experience have taught us that compaction ratios are a starting point; the true value of compaction is the weight of the garbage that can be packed into a container. The legal weights that can be hauled in a compaction container range from 18,000 to 20,000 lbs.

If you are told that a certain compactor will give you a ratio of 10 to 1 and the garbage in your container presently weighs 5,000 lbs., your compacted garbage would weigh 50,000 lbs. You couldn't haul this weight to the landfill, so the particular style of compactor would be much too large for you situation.

Similarly, if you are told the compaction ratio is 4 to 1 and your garbage only weighs 2,000 lbs., you will only be compacting 8,000 lbs. of garbage into a container. In this case, you may be losing out on the possibility of saving more money by reducing the number of times the container is hauled to the landfill.

The alternative is to use container weights as the goal to reach when compacting. The compactor to use is the one which will put the greatest legal weight of garbage into a compaction container for the particular mix of trash that your facility generates.

The bottom line is to look beyond the sales hype and gimmicks and determine which compactor will put the most legal weight into a container, and save you money.

Dry Industrial Refuse Reduction Ratios

Compactor Force (lbs.)	Single Cylinder 35,000- 50,000	Single Cylinder 50,000- 60,000	SPI Dual Cylinder 75,000- 84,800	SPI Precrusher 84,000- 101,800
Mixed Trash; Paper, Cardboard Etc.	3 or 4 to 1	4 or 5 to 1	6 or 7 to 1	7 or 8 to 1
Flattened Cardboard	2 or 3 to 1	3 or 4 to 1	5 or 6 to 1	5 or 6 to 1
Woods: Skids and Pallets (Note: 2 Pallets Equal 1 Cubic Yard)	1 to 1	1 to 1	1.5 or 2 to 1	4 or 5 to 1
Barrels	1 to 1	1 to 1	1.5 to 1	7 to 1

Dry Industrial Refuse Compaction Container Load Weights (In Lbs.)

Mixed Trash; Paper, Cardboard Wood (10%)	7,000 - 8,000	8,000 - 10,000	13,000 - 15,000	17,000 - 20,000
Wood (Only)	3,500 - 4,500	4,500 - 5,500	5,000 - 7,500	12,000 - 13,000
Mixed Trash; Wood (50%)	5,500 - 6,500	6,500 - 8,500	7,500 - 9,500	16,000 - 18,000

Can compaction save my company money?

The answer is usually yes. Two areas of concern can be looked at for cost savings: the cost to haul the trash to the landfill, and the cost of labor.

Packing more garbage into the container means that the container will be hauled to the landfill fewer times. Your hauler should be charging you per pull; if you have fewer pulls you will have fewer charges.

Also, the landfill charges a fee either based on the volume or the

weight of the trash entering the fill. The hauler in turn passes this charge onto you. If the fee is based on weight, you will not see any landfill savings. However, if the fee is based on volume and with compaction you are putting more garbage into a container per cubic yard than you were in the past, your overall landfill cost will go down.

The second area of concern is labor savings. Your employees will still need to transfer the trash to the disposal site; however, if you are presently spending labor hours to break down large bulky items so you can get more into the container; you will save labor time. The compactor breaks down the material for you.

The bottom line is - if the compactor can't save you money, don't buy it. Ask your supplier to survey your facility. They should be able to make a recommendation for the type of system you need and they should be able to justify that system.

Can a compactor help my company in other ways?

The answer is yes. A compactor can improve your waste material handling in a number of other ways.

Save Space & Stop Wind Blown Trash

In most facilities, space is a premium asset. A compactor system will take up less space than the number of open-top containers it is replacing.

Also, the closed compaction container eliminates the problem of trash blowing out of the container and onto your neighbor's property.

Discourage Vermin, Scavengers & Employee Pilferage

A closed system will help to stop vermin from entering and living in your waste. Without an entry point or with spray systems the insect infestation can be brought under control.

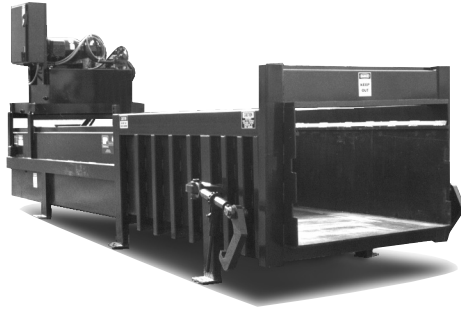
If you dispose of damaged or defective parts, a compaction system can help to discourage scavengers from rifling through your waste. Often goods destined for the landfill are collected, reworked and sold to unsuspecting consumers.

A common vehicle for employee pilferage is the waste bin. Product is thrown into the waste container by employees for recovery later when the facility is closed. A closed compaction system will not allow the employee to retrieve the product. It is destroyed when compacted into the container and/or inaccessible when compacted within other waste.

The Compaction System Looks Better

A compaction system contains all the waste within the container and out of sight of employees and visitors. All-in-all it helps to maintain a cleaner more environmentally sound atmosphere about the facility.

Compactor Models



Stationary Compactors

This type of compactor is available in commercial, industrial, and transfer station designs. The compactor is bolted or welded to a permanent surface and is used to pack waste material into a compaction container or trailer. Once full, the receiver container is hauled to a landfill to be emptied.

Commercial Designs

A commercial model is designed for installations that have waste volumes requiring one compaction container pull per week or less. The waste thrown into the compactor is typically lighter and at a low volume. Retail outlets, grocery stores, business offices, hotels, warehouses, and light industrial plants are typical installations.

Industrial Designs

An industrial model is designed for installations that have waste volumes requiring one compaction container pull per day or more. The waste thrown into the compactor, packaging material, wooden skids and crates, and scrap process material, is typically larger, heavier and at a high volume. Industrial manufacturing plants, institutional facilities, high volume retail outlets and warehouses, and facilities generating purely corrugated material are typical installations.

Transfer Station Designs

A transfer station model is designed to move a large volume of all varieties of waste material collected by the waste hauler or public. Once collected, the waste is brought to a central location and transferred to high volume trailers for transportation to a landfill. The ideal compactor size is determined by a number of factors including volume of waste; typical generation points, residential, commercial, or industrial; the abundance of large bulky items, and the receiving container or trailer.

Specified compactors will range in size from three cubic yard capacity for mini-transfer facilities on up for large regional facilities and MRFs (Material Recovery Facilities). These compactors are high volume industrial models specified and equipped for transfer installations.

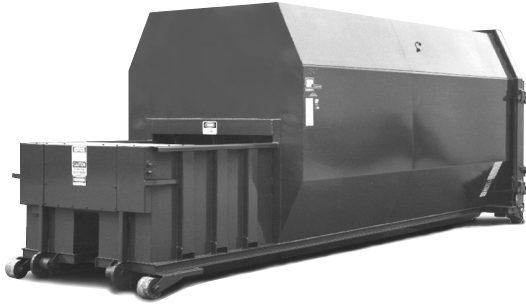
An important note on the size concerns the volume of material that the compactor can conceivably move in the required time period. Although a compactor may have a larger compaction chamber opening such as 13 cubic yards, a smaller compactor such as an 8 yard model may have a faster cycle time or be more efficient in moving the volume of waste required. First, the volume of waste that the compactor can transfer must be determined. Second, the size of the compactor opening that will accommodate the loading method can be specified for efficient loading without over-sizing the equipment.



Vertical Compactors

This type of compactor is also bolted or welded to a permanent surface and is used to pack waste material down into a compaction container located beneath the compactor chamber. A container will range in size from three to eight cubic yards. The compaction mechanism may be a swing panel or straight push ram. Typically more force can be generated with a straight push ram and better compaction can be achieved. Once full, the receiver container is emptied on site into a compaction truck.

This form of compactor is used in low volume locations as a replacement to the typical dumpster containers. Vertical compaction containers can retail high volumes of liquid for applications with very wet waste.

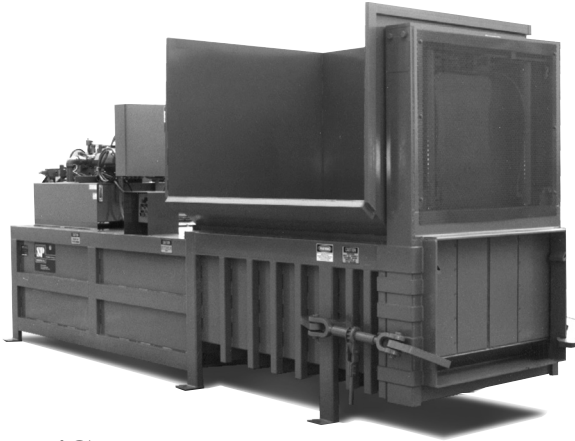


Self-contained Compactor/Containers

A self-contained compactor is designed to handle high liquid volume applications. This model combines a one or two cubic yard capacity compactor with a compaction container into one unit. A compactor is permanently attached to the container and mounted on an understructure. When the container is full the entire unit is loaded onto a roll-off hoist truck for transportation to the landfill.

High volumes of liquid are held inside the unit until it is emptied at the landfill. The volume of liquid that can be held is determined by the height of the sump on the compactor and the quality of the seal on the container door.

One note of importance; roll-off hoist trucks use a variety of designs to load and secure the containers for transportation. The understructure of the self-contained compactor must match the hauler's truck system. Consult the hauler for the correct understructure before ordering the compaction equipment.



Precrusher/Compactors

In many industrial applications, the material which will be disposed will be large and bulky, and difficult to compact in a standard compaction system. A precrusher/compactor incorporates a gate at the front of the compaction chamber to reduce the volume of the waste material before it is compacted in the container. This pre-crushing greatly increases the volume of material that will fit into the container.

An important note is that the precrusher gate mechanism must be an integral part of the equipment. Some manufacturers add the gate onto a stationary compactor as a separate component. However, due to the tremendous forces generated, the integrity of the equipment and the safety of the operator is questionable when the precrusher gate is an add-on feature to a compactor.

When the gate mechanism is an integral part of the compactor, the forces applied during compaction are distributed throughout the compactor to reduce the likelihood of breakage or failure. This will improve the life span of the equipment and assure safer operation.

Component Quality That Makes A Difference

Structural Steel Supports vs. Formed Steel

Structural steel supports used in compactor construction come in a variety of shapes including channel, I-beam, and tube. Of these forms the tube is the strongest and is often used on the sides of the compaction chamber for support in critical areas. In addition, it is a closed shape so it reduces the likelihood that debris will collect on the outside of the unit. Combinations of these supports are used to strengthen the steel plate used throughout the compactor. Larger numbers of supports as well as

stronger shapes are critical in areas such as the compaction chamber floor and ram top which are susceptible to high impact forces when heavy material is dropped into the compactor.

Forming a steel plate into a support shape will increase the strength of the steel; however, the shape is not nearly as strong as a structural shape of the same dimensions. Structural shapes have added strength at the bend points, formed shapes do not. Forming the steel may actually weaken it at the bend point.

In your final analysis of a compactor's integrity, the type, size, and number of supports in critical areas should be evaluated. Compactors which will be used more often and with tougher to compact material should be reinforced to handle this heavy use.

Breaker Bar

Ideally, the structure of the breaker bar must be strong enough to withstand the forces generated by the compactor. If the breaker bar bends past its yield point, the sides of the compactor can be pulled inward and the compactor will become deformed and useless. Material lodged between the ram and the breaker bar should break or force the ram movement to stop before the breaker bar bends.

The breaker bar should be able to withstand at least 2-1/2 times the force generated by the cylinders. Reasoning for this high number is that the force exerted on the breaker bar increases as the angle of the force increases from 0° to 90°.

The force of the ram is forward (0°), but the breaker bar is positioned higher than the top of the ram. If rigid material, such as a hardwood 4 x 4, becomes wedged in between the ram and the breaker bar, the wedged material will push upward against the breaker bar at an angle. This increases the force (up to infinity at 90°), but it will never get to the point because the material will break, the ram will stop, or if the breaker bar is not strong enough the breaker bar will bend or break.

A reputable compactor manufacturer will be able to tell you what the section modulus is of the breaker bar and what forces it can withstand.

Thrust Beam

This component is at the back of the compactor and is the component that the cylinder(s) is(are) mounted to.

This beam must be able to withstand forces greater than 1-1/2 times the force of the cylinder(s). Bending this component beyond the yield point will destroy your compactor.

Compaction Chamber Floor Plate

Steel used in construction of the compaction chamber floor should be high quality and relatively flat. Higher grades of steel are stronger, more consistent in strength throughout, and relatively flatter.

A wavy floor will cause waste material to build up between the ram and floor. Lower grades of steel will wear and weaken more quickly. Both will significantly shorten the life of the floor and the compactor.

An AISI grade steel such as A36 should be used for commercial units. A harder steel such as 1045 should be used for industrial units. AISI 1045 steel is considered work hardening, which means that the steel actually gets harder the longer it is used.

Conversely, the steel used on the bottom of the ram, which rides on top of the chamber floor, should not be as hard as the chamber floor steel. Both plates will last longer if the two steel plates working against each other are of different hardnesses.

Ram Guide System

A ram guide system maintains the ram from fishtailing side-to-side, and bucking up-and-down during movement.

Ideally, the ram should ride on the compaction chamber floor. This uses the entire surface of the floor to support the ram and resist waste material build-up between the ram and the compaction chamber floor.

Engineering shows us that the ram riding on the floor will not cause any significant loss of forward force from the friction between the ram bottom and the compaction chamber floor. Once the ram is moving, the coefficient of friction is the same whether the supporting area is one square inch or one-thousand square inches keeping weights and materials consistent.

Forward force lost between a ram which rides on the floor and one that is suspended above the floor is negligible.

The actual guide system consists of a number of adjustable wear blocks at the back of the ram and ram hold-down bars above the ram on each of the compaction chamber walls. Wear blocks are made of a special hardened plastic such as Nylatron which will slowly wear before the steel wall or support it is in contact with wears.

The principle is to give the guides a good surface to work on so that the ram movement remains stable. Any movement side-to-side or up-and-down will cause the compactor ram and compaction chamber to wear more quickly; shortening the life of the compactor.

Hydraulic Cylinder(s)

Hydraulic cylinders create the force generated against the material in the compaction chamber and attached container. Hydraulic oil is pumped into the case which in turn forces the rod to extend, then pumped out causing the rod to retract.

A hydraulic cylinder is measured by its bore (the inside diameter of the casing), rod (the outside diameter of the movable rod), and stroke (the length the rod is able to move). The force that the cylinder can exert is determined first by the size of the bore; a larger bore cylinder is capable of exerting greater forces. The diameter of the rod determines whether or not the rod can withstand the force it is generating. A larger rod means a stronger cylinder.

Some compactors are equipped with one cylinder (single cylinder models); others with two (dual cylinder models). Generally, two cylinders of the same size will have twice the force of one, and they can be spaced to spread the force generated against the ram face more evenly than one cylinder pushing in the middle. Larger compactors with wider ram faces tend to have less side-to-side ram movement when they employ two cylinders.

In addition, longer cylinders must be supported to assure against sagging or bending from the force they generate, and their own weight and the weight of the oil inside when they are fully extended.

Crossed Cylinders

Many compactor models use two hydraulic cylinders which are crossed. The cylinders are mounted on one side of the compactor and the opposite side of the ram.

This design helps to shorten the overall length of the compactor and is useful in certain applications. However, one notable shortfall is that crossed cylinders do not generate as much force as straight push cylinders of the same size. A crossed cylinder pushes at an angle to the ram movement which reduces the forward force of the ram. Cylinders with greater final angles to the ram face will have less final forward thrust on the ram.

Hydraulic Oil

Hydraulic oil is the lifeblood of the compactor. Clean high-grade oil should be used in the power unit at all times. Lower grade oils can break down faster and cause components to wear out more quickly. A pour point of -40° F is a must for cold climates. Oil heaters and coolers are available for extreme conditions.

Hydraulic Oil Pump

The pump moves the oil into the cylinder(s). The rating for the pump is in GPM (gallons per minute). The larger the number, the faster the pump can move the oil and the faster the ram will move forward and back.

Two considerations should be made when the pump is specified. First, the internal operation of the pump is designated as vane or gear. In order to keep noise levels during operation at a minimum, the vane pump design operates at a lower noise or decibel level.

The pump will have an effect on how loud the machine will operate and at what speed the ram will move. A vane pump will operate at a lower decibel level than a gear pump and will help to keep the equipment operating within OSHA restrictions.

A constant displacement pump will maintain operating speed even under load conditions; as opposed to hi-low pump which slows the cycle time when under pressure. If cycle times are being assessed, consideration should be made concerning the speed of the compaction cycle when it is actually compacting the waste material.

Electrical Components

All components should be UL listed for compatibility and safety. Once the control panel is complete the entire panel can be UL approved if necessary. In this case a UL inspector will check the panel and mark it as approved.

The components should be designed for heavy duty industrial use and readily available for repair or replacement if necessary.

An electrical panel can be designed to be controlled with relay logic or PC logic. Relay logic uses individual switches, timers and relays to direct the control of the operation of the compactor. If a control fails, it can be readily replaced with a like control.

PC logic uses an electronic control board to control the operation of the compactor. If this board fails, a new control board must be purchased from the manufacturer for replacement.

SP Industries Equipment & Services

- Stationary Compactors
 - Commercial Models - 1/3 to 6 Cubic Yard Capacities
 - Industrial Models - 2 to 13 Cubic Yard Capacities
 - Transfer Station Models - 3 to 13 Cubic Yard Capacities
- Precrusher/Compactors
- Self-contained Compactor/Containers
- Compaction Containers
- Hydraulic Cart & Container Dumpers
- Engineering Services
- Nation Wide Network of Dealers and Distributors
- Nation Wide Installation and Service
- Best Built Equipment in the Industry
- Industry Leading Warranty Program



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