PIVOTBASICS

WHAT YOU NEED TO KNOW ABOUT CENTER PIVOT IRRIGATION

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CENTER PIVOT IRRIGATION

Center pivot machines have been used in irrigation for decades. Center pivots, one of several types of mechanized irrigation machines, can lead to increased yields compared to other irrigation practices such as flood irrigation. But how exactly does a center pivot work?

As the name suggests, center pivots irrigate in a circular pattern around a central pivot point. Pivots are capable of applying water, fertilizer, chemicals, and herbicides. This versatility can improve the efficiency of irrigation practices by using a single piece of machinery to perform several functions.

Most center pivot machines are electrically powered, using either a generator or a public power source. Pivots use both 120 and 480 volts of alternating current (VAC) to operate. 120 VAC is used as the control circuit, powering the safety circuit, the forward and reverse movement of the pivot, and, more precisely, the movement of the Last Regular Drive Unit (LRDU). The 480 VAC is the power circuit and supplies the needed energy for the drive units to move.

CONTINUE ▼

FIVE PRIMARY COMPONENTS

Five main components make up a center pivot. Each part is responsible for the movement, control, or structure of the machine. Each component is described in detail.

1 PIVOT POINT

2 CONTROL PANEL

3 SPANS

4 DRIVE UNITS

5 ELECTRICAL CONTROL BOXES

1. PIVOT POINT

The pivot point anchors the machine to a permanent location in the field. It also houses a system of subcomponents that contribute to the overall functionality of the pivot.

1. PIVOT LEGS

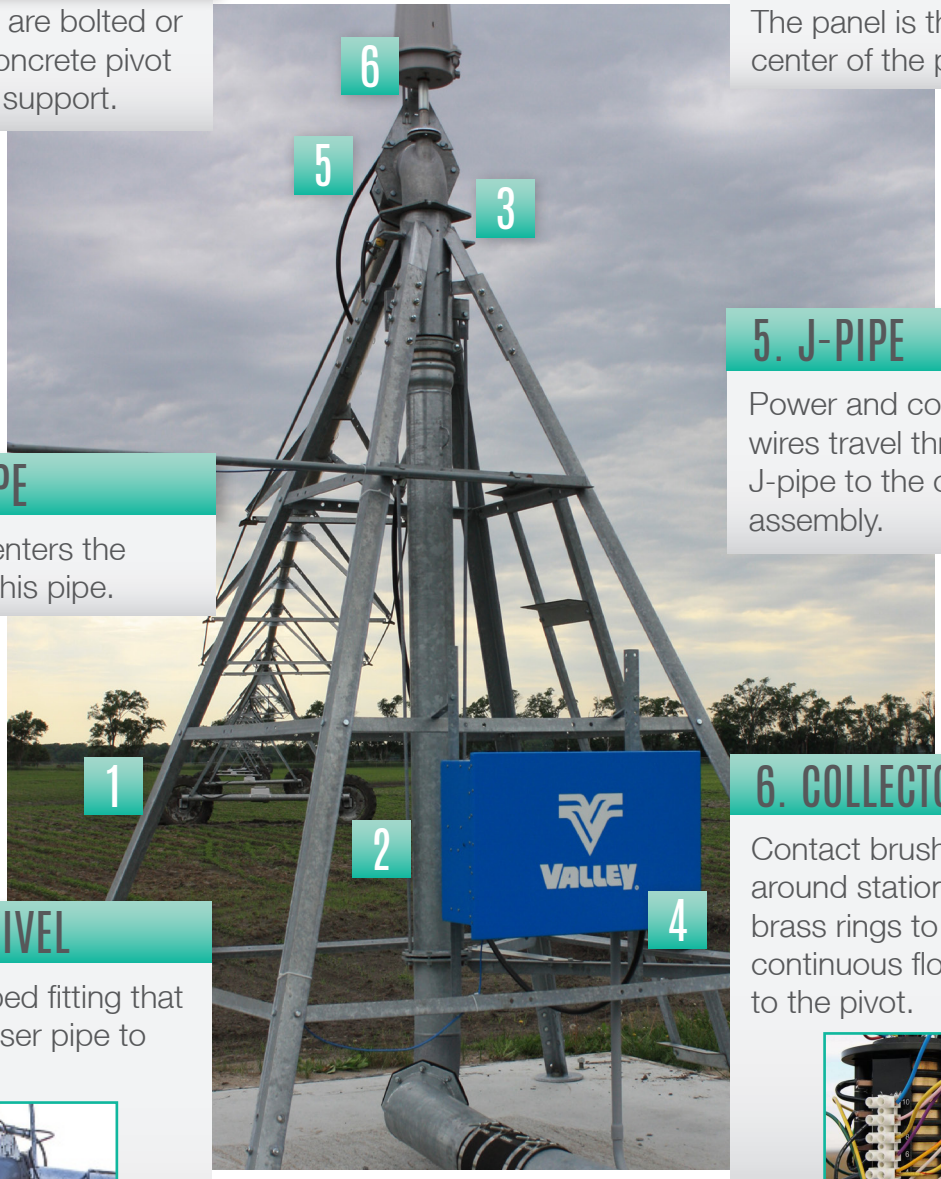
Four pivot legs are bolted or chained to a concrete pivot pad, providing support.

2. RISER PIPE

Water supply enters the pivot through this pipe.

3. PIVOT SWIVEL

An elbow-shaped fitting that connects the riser pipe to the first span.



4. CONTROL PANEL

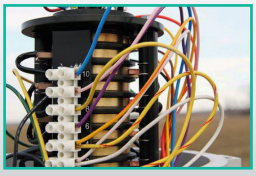
The panel is the command center of the pivot.

5. J-PIPE

Power and control circuit wires travel through the J-pipe to the collector ring assembly.

6. COLLECTOR RING

Contact brushes rotate around stationary brass rings to provide a continuous flow of electricity to the pivot.



2. CONTROL PANEL

A control panel is a piece of hardware attached to the pivot point that gives commands to the center pivot. Control panels are considered the ‘brain’ of the machine. They control starting, stopping, changing directions, running wet versus dry, and much more. A variety of control panels are available, and you can choose panels with very basic capabilities or digital panels that can be programmed to work with advanced irrigation technologies.

3. SPANS

MAIN WATER LINE

The long pipes between drive units are called spans. Spans consist of the main water pipeline, sprinklers, and a supporting structure of trussing that holds the weight between towers. Different span lengths can be combined to create a center pivot that fits almost any field!

TRUSSING

Span pipes are supported by trussing and the drive units. Trussing is engineered to keep the pipes stable and to create an arch, allowing for easy drainage of the pipes. The number of trusses will vary depending on the length of the span.

RISER PIPE

The riser pipe is connected to the first span through the pivot swivel. The swivel rotates around the riser as the machine travels around the field. Water travels through the riser out to the spans and is distributed by the machine's sprinklers.

4. DRIVE UNITS

A drive unit or drive tower is the part of the machine that touches the ground and contains the necessary components for the machine to move. It consists of a basebeam, drive train, wheels, and various structural supports. The drive units and the supporting structure provide clearance above the crop for the spans and control the movement of the machine.

The Last Regular Drive Unit, or LRDU, is the last tower on a regular pivot or the last tower before a corner arm or pivot add-on that extends your irrigated acres.

When the control panel tells the machine to move, 480 VAC are sent to the drive motor through the tower box, causing the drive unit to move.

5. ELECTRICAL CONTROL BOXES

Each drive unit has a tower box that uses various components to control pivot movement and alignment. Power to the drive units occurs in three steps.

1

Power from a generator or public power supply runs thought the collector ring at the pivot point.

2

Span cables carry 120 and 480 VAC to each tower box. 120 VAC maintains the safety circuit and 480 VAC supplies power to the drive units.

3

Tower boxes send 480 VAC to the drive motors when signaled to move by the 120 VAC control circuit.

HOW IT ALL WORKS TOGETHER

PERCENT TIMER

The control panel contains a percent timer. The percent timer is a 60-second timer that controls the movement of the last tower, or LRDU. This timer directly effects how much water is applied to the soil and how long a full revolution around the field takes.

The percent timer does not control how fast a machine moves, but it does control how long the machine runs during one minute. For example: If the percent timer is set to 100%, the last tower will run for the full 60 seconds. If the timer is set to 50%, the last tower will run for 30 seconds out of each minute.

100% = 60 sec

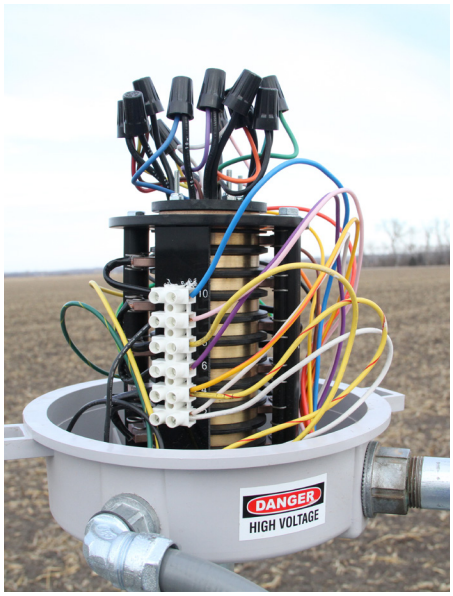
50% = 30 sec

75% = 45 sec

25% = 15 sec

COLLECTOR RING

The collector ring is a unique component that is located at the pivot point and consists of a series of stationary brass rings and rotating contact brushes. Electrical wires from the control panel are fed into the collector ring and connected to stationary brass rings. The contact brushes are aligned so they continue to touch the rings as they rotate around them, providing a continuous stream of electricity to the pivot. This component allows the pivot to make revolutions in any direction without having to worry about the electrical wires wrapping or twisting around the pivot point.



SPAN CABLE & SAFETY CIRCUIT

POWER
480 VAC

Pivots use conductor span cable to carry electricity from the pivot panel, through the collector ring, through each tower box and ultimately to the Last Regular Drive Unit. The cable contains wires for both power (480 VAC) and control (120 VAC) circuits. Wires within the cable are color-coded to designate the function of each wire.

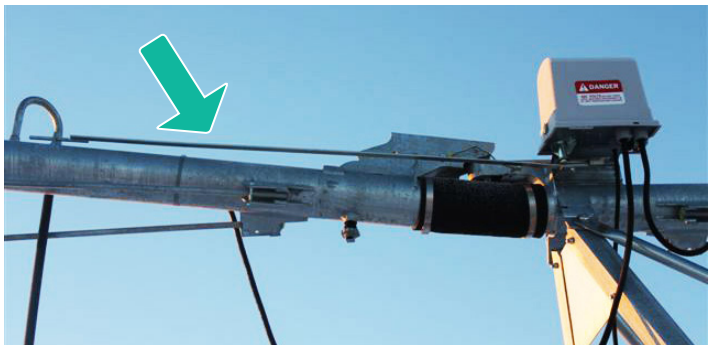
CONTROL
120 VAC

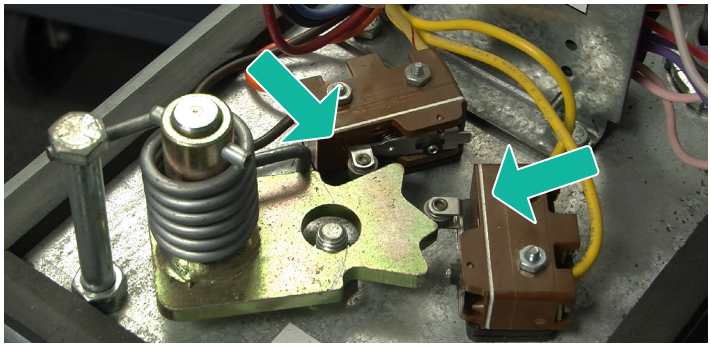
The safety circuit is the most important circuit on the pivot. It ensures that the pivot runs safely and will shut down the machine if it's not operating correctly. This series circuit runs from the control panel, out through each tower box to the end of the machine and back again. If anything along the way goes wrong, the machine will shut down, reducing the chance of crashes and/or structural damage to the machine.

CONTROL ROD

Each inner tower has a control rod fastened between the tower box and a small tab on the next outer span. As the span moves, the control rod activates a microswitch which energizes the contactor, sending 480 VAC to the drive motor.

When the control rod moves far enough, the run switch is activated and the tower begins to move. The tower will continue to move until it is back in alignment, which deactivates the microswitch.





MICROSWITCHES

There are two microswitches in each tower box that are moved by the control rod.

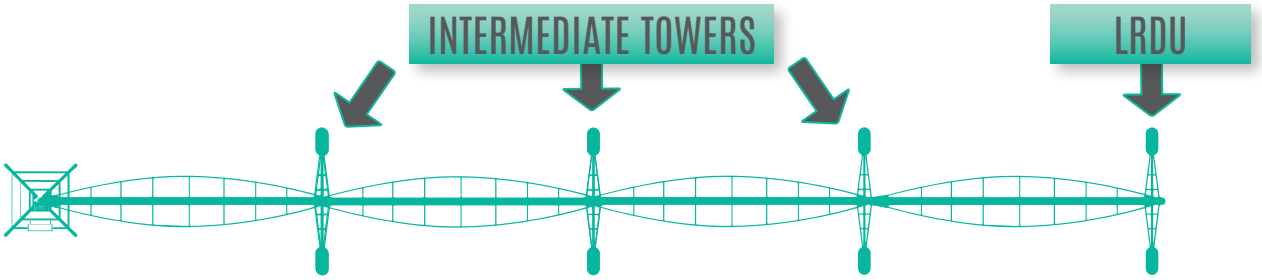
RUN MICROSWITCH - Starts and stops the drive unit
SAFETY MICROSWITCH - Shuts off the machine if misalignment occurs

MOVEMENT IS A CHAIN REACTION

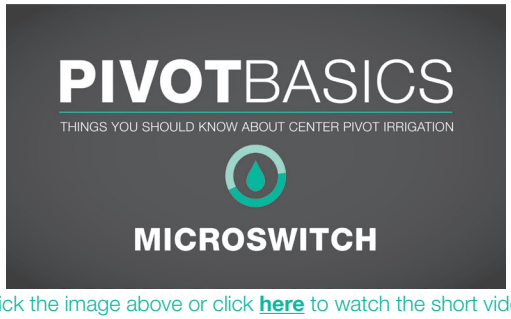
The pivot's control panel operates the main functions of the machine. Depending on which control panel the pivot has, the controls will be different, but the way the pivot operates is the same. When a command is entered into the control panel, an electrical signal is sent down the pivot until it reaches the Last Regular Drive Unit. 480 VAC then travels through a motor lead cable from the tower box to the engine. The LRDU moves, either forward or reverse, as the control panel indicated.

When a pivot moves, it is led by the Last Regular Drive Unit. The LRDU moves until the switch arm, connecting the last span to the second-to-last tower, is pulled to an angle that activates the next tower. Both towers then move until the next tower is activated, and this continues down the pivot until all towers have moved.

Click the image above or click **here** to watch the short video



In the video below, you can see the two microswitches and the rotating cam plate/switch arm located in the tower box. As the outer spans move, the control rod rotates the cam plate toward the run microswitch. As the inner tower catches up to the outer tower, the cam plate rotates in the opposite direction until the run microswitch is disengaged – stopping the tower. This process is repeated as the machine walks around the field.



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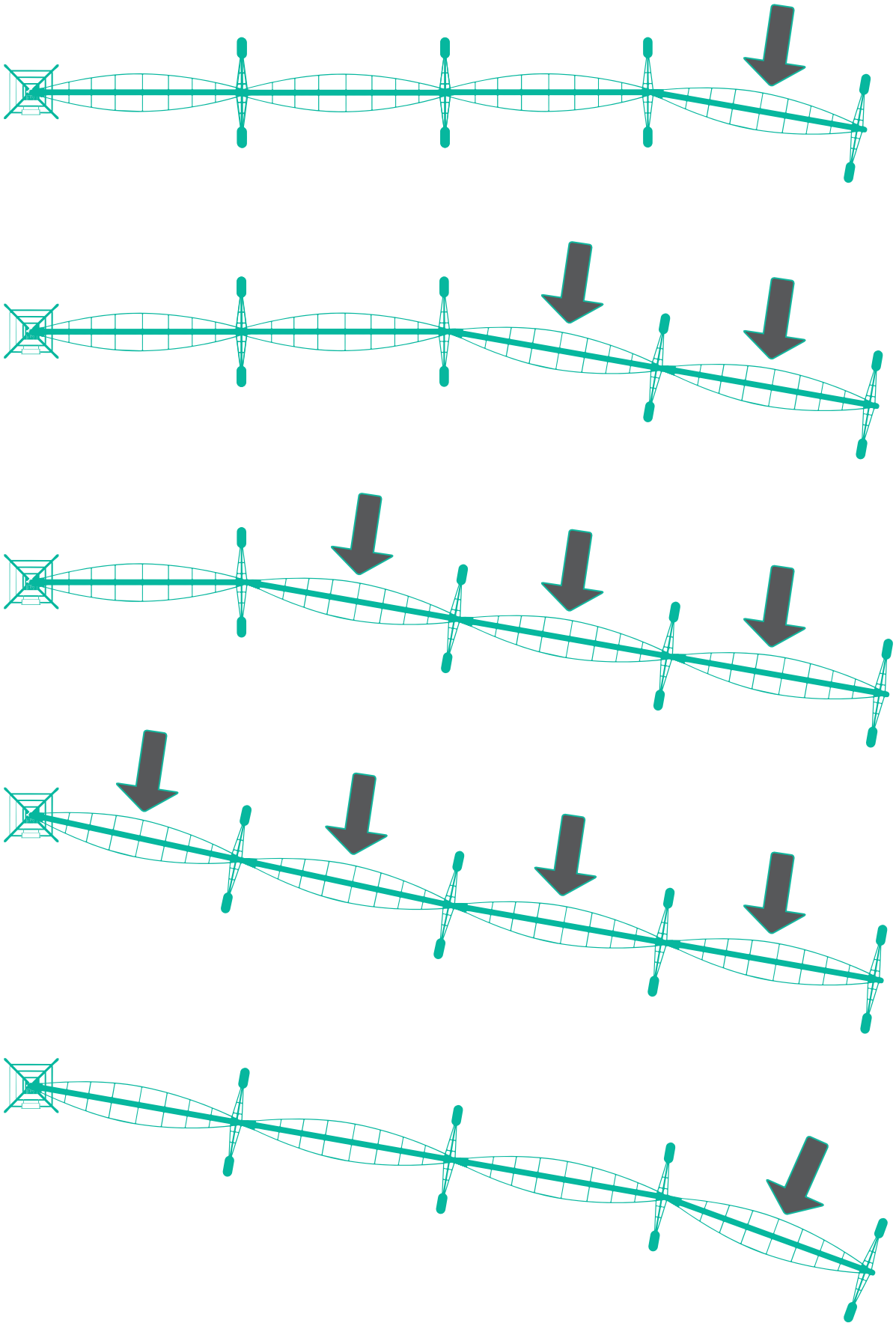
MOVEMENT IS A CHAIN REACTION



YOU MIGHT ALSO LIKE

Now that you know how a center pivot works, you may be interested in learning more about mechanized irrigation. Check out these additional resources.

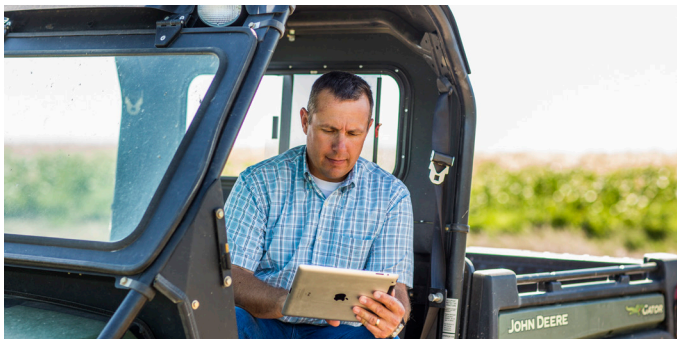
OUR BLOG POSTS:

DISCOVER CENTER PIVOT COMPONENTS

HOW A CENTER PIVOT IRRIGATION MACHINE WORKS

A LOT IS RIDING ON YOUR GEARBOX

IRRIGATION CONTROL TECHNOLOGY



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