

# 2021 INNOVATION CHAMPIONS CONTEST

## Oil Saver System

COUNTY: Billings County Highway Department

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**PROBLEM STATEMENT:** The system used for collecting and disposing of used oil was difficult and labor intensive, requiring the manual handling of 55-gallon barrels and half barrels of used oil. Some barrels weighed more than 100 pounds. The work was backbreaking and the probability for injury was high.

**SOLUTION:** Designed and fabricated an oil saver system to eliminate heavy lifting and backbreaking labor. The components of the oil saver system are a portable low-profile trailer, a stationary oil collection table and a chemical holding tank. The system makes the job of collecting and disposing of used oil more efficient and user friendly.

The 3x3 foot portable low-profile oil collector trailer is 8.5 inches high. On the beveled floor of the trailer is a metal perforated pipe which runs the length of the trailer and is welded to the floor. A 3x3 foot collector screen is positioned inside the trailer bed at a height of 7 inches. Pipes at each corner are used to hold the adjustable vertical collection pipe with funnel when draining oil from a vehicle, on a lift, into the oil collector trailer. The bottom of the collection pipe has divots, so oil flows easily. The funnel is retrofitted with a splash guard to prevent spilling of used oil. The adjustable handle and the 4 caster wheels make it easy to roll the oil collector trailer under a vehicle, store it under the stationary oil collection table, or move it wherever needed.

The 5-foot wide x 40-inch deep stationary oil collection table was designed to handle small amounts of oil collected and serves as an oil filter drainage pit. The height of the table top is 36 inches and has triangular splash shields on three sides. The back shield is 24-inches high. However, 12-18 inches would have been sufficient. The side panels are tapered from the back panel to the front (24 inches to flush with the table top front to back.)

The metal collector screen at the top of the table allows oil to drain into the beveled floor 12 inches below the screen. A perforated pipe, which runs the width the table, is

welded to the bevel in the floor. (This pipe has a clean out drain plug on the outside of the table.) An air pump is mounted on the bottom shelf. The air pump is powered by an air compressor. The outlet hose on the air pump is used to feed waste oil into a 250-gallon chemical holding tank. The outlet hose is equipped with a close and open valve.

The table's bottom shelf is 9 inches above the shop floor which serves as a storage site for the oil collector trailer when not in use. The 4 rectangular slots (two in the front and two at the back) on the bottom of the oil collection table shelf make it easy to move with a forklift. The chemical holding tank is mounted on a wood pallet so it also can be easily lifted and moved using a forklift

On the left side of the stationary oil collection table is a quick connect. Waste oil is fed from the bevel floor with perforated pipe through the quick connect hose to the air pump, and ultimately into the holding tank.

On the portable oil collector trailer, the quick connect is under the trailer's adjustable handle. Waste oil is fed from the bevel floor with perforated pipe through the quick connect hose to the air pump and then into the holding tank.

## **EQUIPMENT, MATERIAL, AND LABOR:**

### Equipment used

Welder

Shop tools

### **Materials:**

#### Salvage material:

250-gallon chemical holder

#### New material:

Air pump

Caster wheels (4)

Tiedown bolts came with the pump (4) 3/8"x1.5"

Sheet metal – 16 gauge

- (4) 3'x9" for trailer sides
- (2) 3'4"x5' for table
- (1) for back table panel 50"x24"
- (2) for table sides-2-0'x24"x40" (sheet 24"x40")
- 3'x38" bevel bottom for trailer
- 5'x3'8" bevel bottom for table
- (4) 6"x36" for trailer sides

Collector screen: (1) 3'x3' for trailer, (2) 30"x40" for table

Metal perforated pipe 1/2" diameter: 3' for trailer, 5' for table

Trailer handle:

- 1"x1" metal tube 16' trailer top edge and trailer handle top portion.
- 1-1/4" metal tube 4' trailer handle 1- 1/2"x 14" thread stock,
- (2) nuts for trailer handle hinge

- (1) homemade extension lock bolt 3/8"x4"
- (1) nut – 3/8" (welded to handle)

Collection pipe (extendable)

- (1) 3-foot (1-3/4" diameter)
- (1) 4-foot (2" diameter)
- 3/8"x4" homemade extension lock bolt
- 3/8" nut (welded to collection pipe)

3/8" thread stock rod

(1) Quick connect air hose

(2) Quick connect oil hoses

(4) 2"x6" rectangular slots

(1) Oil collection funnel

(1) Oil collection pan (cut for panel and attached to funnel)

**Total Labor Hours:** (No. of persons, number of hours for each)

*(Note: Consider time required for design and discussion.)*

1 person: 10 to 12 hours

**COST SUMMARY:**

Air pump.....	}	\$450
Caster wheels		
Bolts	}	\$500
Sheet metal		
Collector screen		
Perforated pipe		
Collection pipe		
Metal tube		
Bolts and nuts		
Rectangular slots		
Thread stock rod		
Quick disconnect air hose		
Quick disconnect oil hose		
Perforated metal pipe		
Funnel		
Oil Pan		

Total Cost: \$ 1,450 plus labor

**SAVINGS AND BENEFITS:**

Changing oil on vehicles has become more efficient, effective, and less labor intensive. With the oil saver system, used oil is transferred into a chemical holding tank using an air pump and hoses. Employees no longer manually lift 55-gallon barrels of used oil. There are fewer injuries and increased safety. This means there is also a savings in employee time off and/or the need for medical care. Less time is needed for cleaning

spills, so more time can be spent working on other tasks and responsibilities. The oil saver system improves employee safety, and saves time and money for the county.

#### **ANNUAL OPERATING COSTS:**

**Before using the innovation** – Employees manually lifted containers of used oil weighing more than 100 pounds to pour them into a chemical holding tank. This was unsafe and could result in injury, which could lead to time off and medical expenses. The awkwardness and excessive weight of the heavy barrels would result in spills on the shop floor, requiring time for cleanup.

**After using the innovation** – With the oil saver system, the heavy lifting is done with a forklift. Used oil drained into the portable oil collector trailer or the oil collection table is pushed into the chemical holding tank using an air pump and hoses. There is no manual lifting done except to move a funnel and extendable pipe onto the collector trailer and again back to its storage location on the table.

Oil Saver System – Low profile oil collector trailer, stationary oil collection table, chemical holding tank



Portable low-profile oil collector trailer, adjustable vertical collection pipe with funnel is put under vehicle on a lift when time for oil change.



Trailer with collector screen, corner pipe for collection pipe, caster wheels.



Funnel with retrofitted splash guard.



Vertical collection pipe is adjustable with extension lock bolt.



Divoted pipe at outflow point



Quick connect under adjustable trailer handler connects to air pump. Hose with valve switch on left with open/close valve and hose into holding tank, controls oil flow.





5' x 40" x 36" Stationary oil collection table.



Metal collector table top. Drain plug on side for clean out.



Air compressor connection for air pump.



Oil Saver System

