On the Surface: Conventional Earthmoving vs. Tractor Pull Scrapers

Presented by:
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• Making a wise equipment investment
• Earthmoving job and equipment assessment
• Tractor pull scraper advantages
• Selecting the right model of scraper
• Selecting the right combination of scrapers: single, dual, or triple
Earthmoving Job Assessment

**Material to be Moved**

**Soil content:** heavy, wet, with big rocks and/or stumps

**Equipment:** excavator used with articulated trucks or bulldozer (pusher) and self-propelled scraper

- self-propelled scraper has difficulty operating on soft ground
Earthmoving Job Assessment

Material to be Moved

Soil content: light to heavy with some moisture and no appreciable rock

Equipment: tractor pull scrapers
Earthmoving Job Assessment

Haul Distance

What is the hauling cycle distance on your job site?

- Under 200 feet = bulldozers
- Under 2,000 feet = pull scrapers
- Over 2,000 feet = excavators, self-propelled scrapers, and articulated trucks
Equipment Investment

Purchase: Many millions
Fuel: For many machines
Manpower: 4

Purchase: Under 1 million
Fuel: For 1 machine
Manpower: 1
**Conventional Earthmoving Equipment**

**Capital Cost – Equipment Investment:**
- **Per job site:** 1 Excavator, 1 Motorized Scraper, 1 Articulated Truck, 1 Dozer.
- **Wear Parts** – 4 pieces of equipment.
- **Operators** – 4 pieces of equipment need 4 operators.
- **Fuel Cost** – 4 pieces of equipment need 4 engines.
- **Maintenance and Repairs** – 4 pieces of equipment.
- **Mobilization** – 4 pieces of equipment to move to each job site.

$465,000
**2013 CATERPILLAR 336EL HAM TRACK EXCAVATORS**

$160,630
**2013 VALEW 4000V WT DUMP TRUCK**

$976,445
**2012 CATERPILLAR 627H WHEEL TRACTOR SCRAPER**

$112,000
**2013 CATERPILLAR 420FIT BACKHOE LOADER**
Operating Cost Comparison

Tractor Pull Scraper
Capital Cost – Equipment Investment:
  Per job site: 1 Tractor, 1 Pull Scraper.
Wear Parts – 2 pieces of equipment.
Operators – 2 pieces of equipment need 1 operator.
Fuel Cost – 1 piece of equipment has 1 engine.
Maintenance and Repairs – 2 pieces of equipment.
Mobilization – 2 pieces of equipment to move to each job site.

$293,500
2013 JOHN DEERE Model 9460R / tires: front and rear duals

$90,500
2013 IMC 225 CS
Conventional earth-moving:
- 1 min. to load 15yd³ dump truck with 23-ton tracked excavator
- 2 min. to tip the load and level with bulldozer
- soil still not compacted
- equipment and operators stand idle waiting on other equipment

Mid-size Gated Ejector Scraper pulled by a 350hp tractor:
- 20 seconds to cut and load 15yd³
- 10 seconds to eject soil to finish grade level and compacted in same run with non-stop productivity
- ability to maintain access road on return trip

➢ Time is Money
How Do Tractor Pull Scrapers work?

While being pulled, the scraper:

- cuts the upper layer of dirt
- loads
- transports
- ejects to finish grade (Gated Ejector)
- OR dumps material (Carry All)
- compacts
Choosing the Right Pull Scraper

- **Horse Power of Tractor** – determine correct scraper size for the HP that will be pulling it
- **Haul Road and Working Area** – length, width, obstacles
- **Material being moved** – weight, moisture content
- **Yardage** – amount of material to be moved
Choosing the Right Pull Scraper

*Carry-Alls* have a gate for transporting material and a bowl that pivots then dumps the material out.
Choosing the Right Pull Scraper

Carry-All Fixed Blades with or without a Walking Tandem have a gate for transporting material and a bowl that pivots then dumps the material out. The bowl pivots while the blade remains in a fixed position. A walking tandem helps to eliminate bounce and reduce the "duck walking" allowing for better accuracy and control.
Choosing the Right Pull Scraper

*Gated Ejectors* have a gate for transporting material and the rear wall of the scraper moves forward to eject material from the bowl.
Motorized vs. Tractor Pull Scraper

**FIXED BOWL-CAPACITY**

1

**FLEXIBLE LOADING CAPACITY: SINGLE-, DOUBLE-, TRIPLE-OPERATION**

1 2 3

**FRONT-AXLE TRACTION ONLY**

**4 WHEEL DRIVE TRACTION**

**RUBBER-TRACK TRACTION**
Motorized vs. Tractor Pull Scraper

EXPENSIVE PUSH-LOADING with BULL-DOZER

HIGH COMPACtion FORCE

LOWER COMPACtion, LOWER ROLLING RESISTANCE, SAVE FUEL

32 lb  32 lb

6.6 lb  14.3 lb  11.6 lb  7.7 lb
Motorized vs. Tractor Pull Scraper

Different turning circle of typical earthmoving equipment.

42° Turning Circle

ARTICULATED - WHEEL-TRACTOR (4 WD) pulling 2 SCRAPERS
Tractor/Scraper Combination

Zones Of Operation

**POWER ZONE:**
In the power zone, maximum power is required to overcome adverse site or job conditions.

**SLOW-SPEED HAULING ZONE:**
The slow-speed hauling zone is similar to the power zone since power, more than speed, is the essential factor.

**HIGH-SPEED HAULING ZONE:**
In the high-speed hauling zone, construction has progressed to where ground conditions are good, or where long, well-maintained haul roads are established.
Non-gated, Ejector Finishing Scrapers are designed for GPS or laser controlled land forming of roads and building sites with higher horse powered tractors. The walking tandem helps eliminate bounce and reduce the "duck walking". Larger tires on some models provide superior flotation and clearance while leveling.
Non-gated Finishing Scrapers without ejection are a precision maintenance finishing scraper for use with low to medium horse powered tractors. The walking tandem helps to eliminate bounce and reduces the "duck walking" effect allowing greater control & precision while leveling. They have a rigid blade or some models have a folding blade for easier transport.
Construction Industry Applications

➢ new property development
Construction Industry Applications

➢ mining operations, landfill construction
Construction Industry Applications

➢ airport construction
Construction Industry Applications

➢ highway construction
Construction Industry Applications

➢ building levees, fish ponds, reservoirs
Construction Industry Applications

➢ rural road work
Earthmoving Technology

GPS and Laser Systems

- Increase Productivity
- Lower Costs
- Improve Accuracy
- Sustain our Natural Resources by Increasing Fuel Efficiency
Tandem Benefits of Pull Scrapers

Two IMC GECS2214 Scrapers pulled in tandem behind one 400 HP tractor can carry up to 44 yd$^3$.

➤ increase productivity with multiple scrapers
Tandem Benefits of Pull Scrapers

Two IMC GECS2214 Scrapers pulled by a 400 HP tractor traveling an average of 8 mph on a ¼ mile haul cycle can move up to 11,264 yd$^3$ of material in an 8 hour work shift.

8 miles x 4 hauls = 32 hauls in 1 hour

32 x 8 = 256 hauls in an 8 hour work day

44 yd$^3$ x 256 = 11,264 yd$^3$
Tractor with Pull Scraper Advantages

- **Operator friendly** – shorter training period and easy to use controls

- **Tractor-scraper combination versatility** – tractor can be used for other applications when not used with scraper

- **Multiple scraper capabilities** – ability to run as singles or in trains of two or three depending on haul length and changing job-site conditions

- **Lower mobilization costs**
Tractor with Pull Scraper Advantages

• *Flexible* - when moving around the building sites and coping with difficult terrain.

• *Loads quickly* – pull scrapers load in half the time it takes excavators and dump trucks

• *Better floatation and Higher clearance* – especially in wet clayey soil
Conventional Earthmoving
vs.
Tractor Pull Scrapers

What will you choose?