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Instruction Manual / GRAIN CLEANER

DESIGNED AND DEVELOPED BY
THE INTERNATIONAL RICE RESEARCH INSTITUTE
Los Baños, Laguna, Philippines

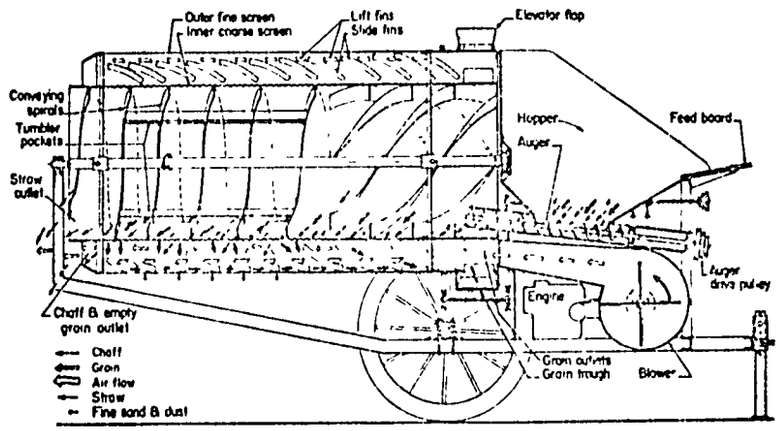
MANUFACTURED BY

Grain cleaner

Grain cleaners that use an oscillating screen with an air blast are too complicated and expensive for most tropical countries. They have three major shortcomings: the oscillating screens do not perform well when the grain has many large impurities, the grain is not exposed to air long enough to remove all the unfilled and immature kernels, and the complex oscillating-screen drives are often sources of mechanical problems.

The IRRI grain cleaner overcomes some of these problems. It uses rotary screens in conjunction with an air blast. This combination simplifies the design and permits extended exposure of a tumbling mass of grain to air. The long exposure improves the removal of unfilled, immature grain from mature kernels, and results in high-capacity and improved-quality cleaning.

This manual explains how to operate and maintain the IRRI cleaner for trouble-free, economical performance.



Schematic drawing of Rotary Screen Grain Cleaner

Operating principle

The cleaner has two concentric cylindrical screens -- an inner and an outer screen -- which are rigidly connected, with a 10-cm space between them. An auger delivers the grain to the inner screen which has 9.5-mm round perforations. The inner screen retains the large impurities, such as straw, and lets the grain through. The 9.5-mm screen size allows the cleaner to handle many grain crops such as

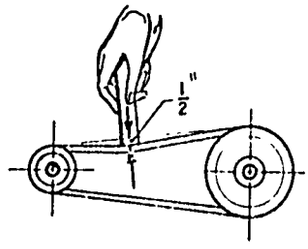
rice, wheat, and sorghum. Spiral baffles inside the inner screen move the larger impurities axially to the impurities outlet. The grain and small impurities that pass through the inner screen are tumbled inside the outer screen. The outer screen retains the grain but allows small impurities such as sand, dust, and weed seeds to pass through. While the grain is tumbled in the outer cylindrical screen, spiral fins in the concentric space move it axially against the air stream. During tumbling, the lighter-than-grain impurities are blown toward the impurities outlet. The vigorous tumbling action allows the air to separate impurities from wet or extremely dirty grain. Cleaned grain is finally delivered into a trough where rubber flaps lift the grain to a bagging attachment.

Safety precautions

- Do not add fuel while the engine is running. Always make sure there are no flammable materials (e.g., gasoline) near the exhaust. Be extremely careful about fuel leakage. Tighten or adjust loose screws, nuts, or bolts only when the machine is not operating.
- If it is necessary to direct grain into the auger, use a soft wooden stick. Do not help deliver grain into the hopper auger with your hands. Serious accidents can occur if fingers are caught in the auger.
- When working indoors, ensure proper ventilation. Locate the impurities outlet of the cleaner near the door so that the dust is blown out of the room.

Before operating the cleaner

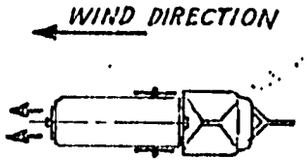
- Lubricate all grease fittings. (See instructions on lubrication, p. 7).
- Make sure there are no loose bolts and nuts. The set screws of the drive pulleys must be tight to ensure proper operation.



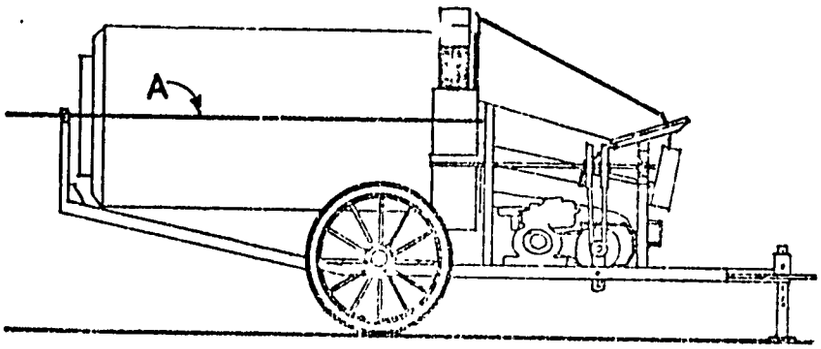
- Check that all belts have the proper tension. Tighten any loose belt by adjusting the idler pulley. Check engine fuel, oil, air cleaner, and air passage according to the

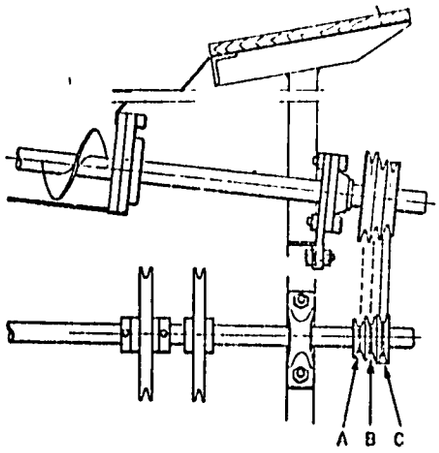
manufacturer's recommendations. Set the engine governor or throttle lever to operate at the normal engine speed of 3200 rpm.

Operation

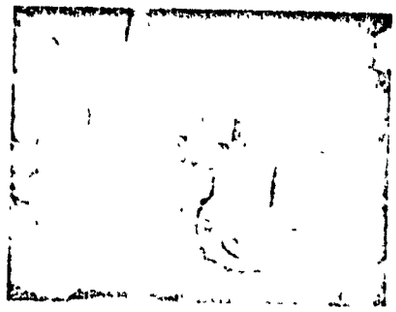


Place the cleaner along the direction of the wind so that dust and impurities coming out of the machine are blown away from the machine. Failure to do so will hamper proper cleaning. Adjust the height of the stand to level the rotary screen cylinder. If the machine is not level it will not perform well because the movement of the grain in the cylinder will be affected. The axis of the rotary screen (A) must be level with the ground.

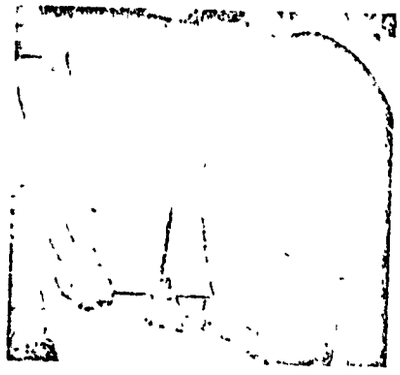




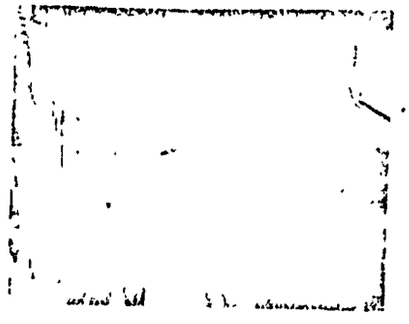
The three pulley settings (A, B, C) result in approximate cleaning capacities of 1.6 (A), 2.0 (B), and 2.5 (C) metric tons per hour. Before starting the engine, set the auger drive belt for the desired output.



Engine position locking



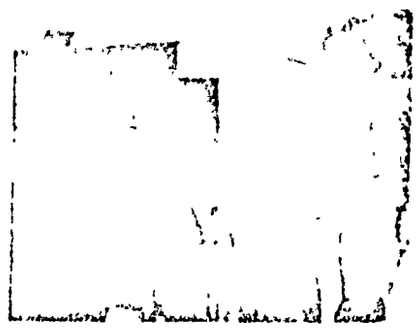
Air control



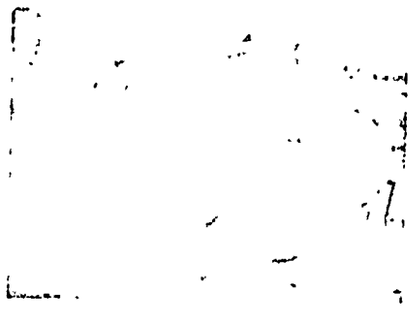
Idler clutch

It is easier to start the engine with a slack engine belt. Loosen the engine drive belt by loosening the thumb screw and moving the engine. Start the engine and allow it to idle briefly to warm up. Then slowly slide the engine away from the countershaft until the drive belt is fully engaged and the correct tension is achieved. Sudden tightening of the drive belt will overload the engine and may stall it. Lock the engine in position by tightening the two fly screws. Open the air control partially so that a small amount of air passes through the space between the two cylindrical screens. Dump grain into the hopper. Remove any pieces of long string from the grain so they won't wrap around the auger. Engage the auger drive with the idler clutch lever and gradually open the air control until some grains are blown out with the impurities. Then move the air control lever to the next lower setting which is the proper adjustment for normal blower opening. The grain that passes through the machine while the air adjustment is being set should be returned to the hopper for recleaning.

The cleaned grain is delivered from the chute through two spouts. A frame with hooks is mounted below the double-spouted chute to hold two bags open. By using the "cut-off" the operator can switch the flow of grain from one spout to the other. Thus, when one bag is filled, the operator can replace it after switching the flow of grain to the other bag.



Bagging attachment



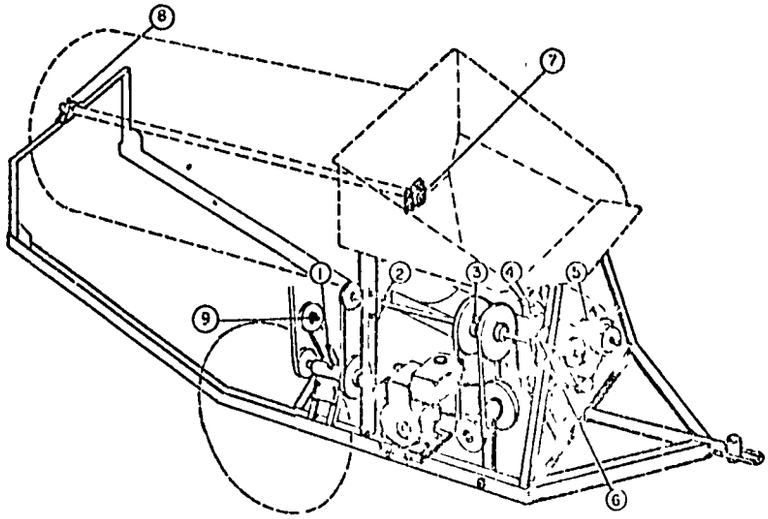
Lifting drawbar to empty

For improved cleaning quality, use a slow auger feed rate. A high air setting is often desirable, it allows some grain to be blown out with the impurities. The good, heavier grain drops near the impurities outlet and can be easily collected for recycling through the cleaner. While one man can operate the machine at the low auger setting, two men are needed to operate it at full capacity -- one to feed the paddy and the other to tend the grain outlet.

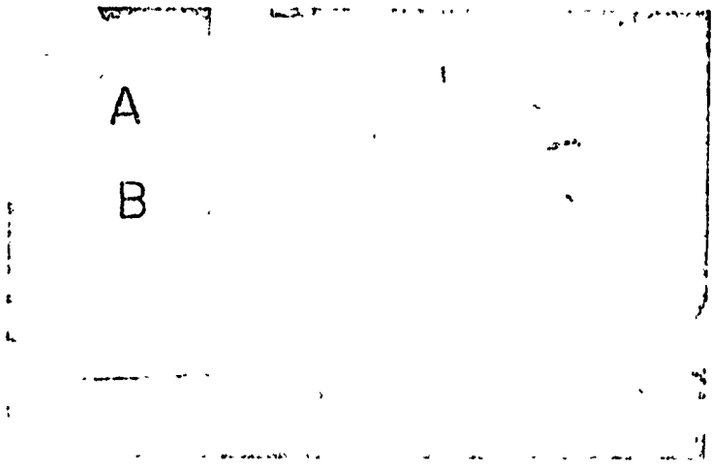
Just before the cleaning operation ends, reduce the air flow. As the quantity of grain being tumbled in the screen is reduced, less air is required to blow out the impurities. Tilt the machine while it is operating by raising the end of the drawbar. This will remove any residual grain and impurities left in the machine. Disengage the auger lever and loosen the engine drive belt.

Lubrication

- Lubricate grease fittings (1), (2), (3), (4), (5), (6), (7), (8), and (9) once a day with a general-purpose grease before operating the machine.



- Lubricate fan bearings A & B daily.



- Check engine oil and oil level in the air filter regularly. Keep the air passage around the cylinder block free from straw and other trash.

Storage

- Clean the machine thoroughly. Remove any residual grain and straw from the cleaner.
- Repair any damaged or worn parts.
- Clean and rub oil on bare metal parts that may rust. Paint the parts from which paint has been worn.
- Disengage and reduce all belt tensions.
- Store cleaner in a dry, covered place.
- For long storage, lower the elevator trough by loosening the mounting bolts. This will keep the elevator flaps from bending and being damaged.

Trouble shooting

Problem: Too much good grain being blown with impurities from between the two rotary screens.

Cause
- Slow rotation of the rotary screen cylinder. Normal speed is 20 rpm. Tighten drive belts.
- Too much air. Reduce with air control.
- Machine is not level, it slopes toward the impurities outlet. Set the adjustable stand to level the cleaner.

Problem: Grain coming out from the central cylinder with straw.

Cause
- Auger setting too high for the specific grain conditions, such as variety, amount of impurities, etc.
- Machine not level. Use adjustable stand to level the cleaner.
- Grain size too large for screen hole.
- Excessive amount of large impurities with the grain. Lower auger setting.
- Screen holes blocked by wet chaff sticking to the screen. Clean the screen Lower auger setting.
- Slow screen cylinder revolution caused by loose drive belts. Tighten belts and check pulley lock screws.

Problem: Poor cleaning quality.

Cause
- Machine not level, low on hopper end. Use adjustable stand to level the cleaner. Air setting too low. Increase air blower setting, check blower fan belt.

- Auger speed too high. Set auger speed to lower setting.

Problem: Auger stopped.

Cause
- Wrapped string, straw on auger, or solid object stuck in auger. Remove grain from hopper and belt from auger drive. Rotate auger in reverse by hand and remove the stuck or wrapped object.
- Auger drive belt too loose. Adjust belt by sliding idler clutch mounting. Change belt if it is too large.
- Weak or defective idler spring. Change spring.

Problem: Insufficient air.

Cause
- Slipping fan belt. Adjust fan belt. Change worn belt.
- Blocked air passage. Clean the air passage by removing the screen cylinder.
- Incorrect air control setting. Increase air opening by control.

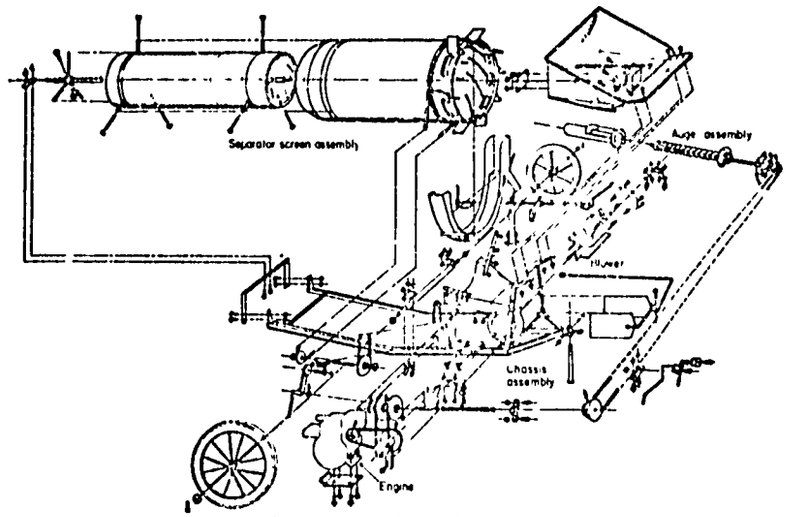
Specifications

Grain cleaner

Weight without engine (kg)	340
Height (cm)	148
Width (cm)	143
Length (cm)	355
Output	
Auger speed 1 (Pulley A) (mt/hr)	1.6
Auger speed 2 (Pulley B) (mt/hr)	2.0
Auger speed 3 (Pulley C) (mt/hr)	2.5
Rotary screen (rpm)	20
Blower (rpm)	1400

Engine*

Make	Briggs & Stratton Model 80302
Horsepower	3
Fuel capacity (liter)	2.85
Oil capacity (liter)	0.70
Fuel consumption (liter/hr)	0.8
Normal operating speed (rpm)	3200



Exploded drawing of Rotary Screen Grain Cleaner

*A 3/4-hp electric motor can be used with the cleaner. The appropriate diameter pulley must be attached to the motor to attain proper operating speed.

Outstanding features

- Excellent cleaning output up to 2.5 mt/hr.
- Improved air separation due to long grain-air exposure.
- Cleans high-moisture or extremely dirty grain through vigorous tumbling action in the air.
- Removes weed seeds, sand, and other small impurities through the outer screen.
- Low power requirements.
- Lightweight construction.
- Adjustable grain feed rate.
- Adjustable air control for quality cleaning.
- Mounted on wheels for easy movement.

Developed at the Agricultural Engineering Department, The International Rice Research Institute, Los Baños, Laguna, Philippines, under a research contract with U. S. Agency for International Development, Washington, D. C.

Philippines and U. S. patents pending. Illustrations in this booklet are of the original IRRI prototype machine. Manufacturers may incorporate modifications resulting in slight deviations from the basic design.