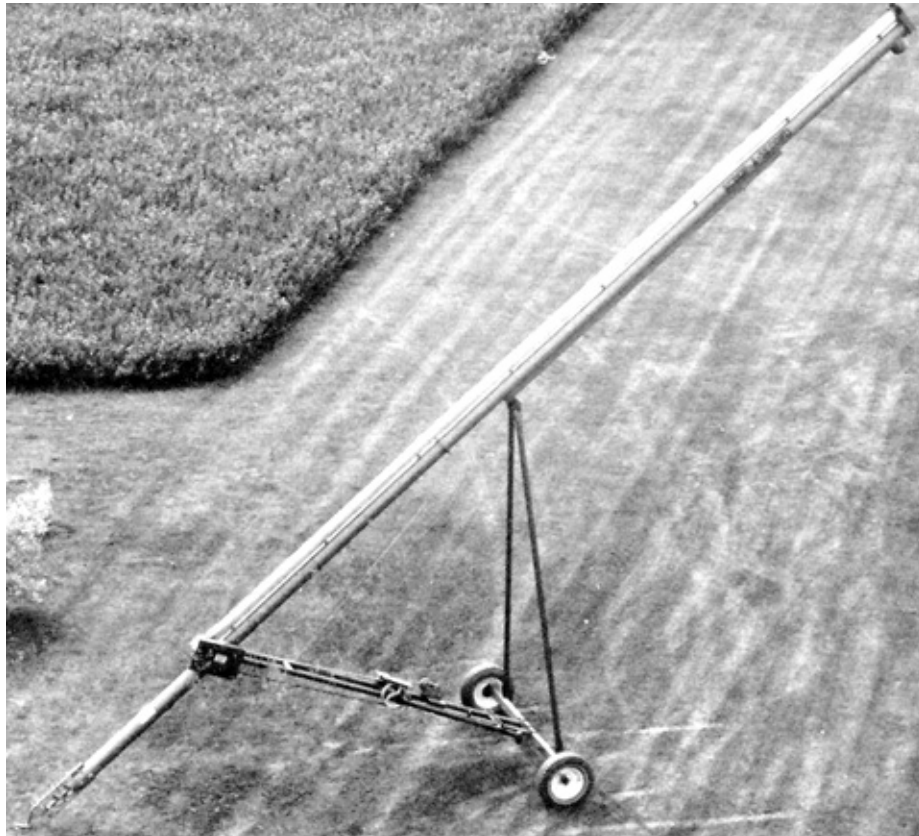


Evaluation Report

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Scoop-A-Second 8 x 46 Grain Auger

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE

PAMI

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

SCOOP-A-SECOND GRAIN AUGER

MANUFACTURER AND DISTRIBUTOR:

Power-matic Industries Ltd.
Box 759
Morris, Manitoba
R0G 1K0

RETAIL PRICE: \$2,558.00 (July 1983, f.o.b. Morris, Manitoba)

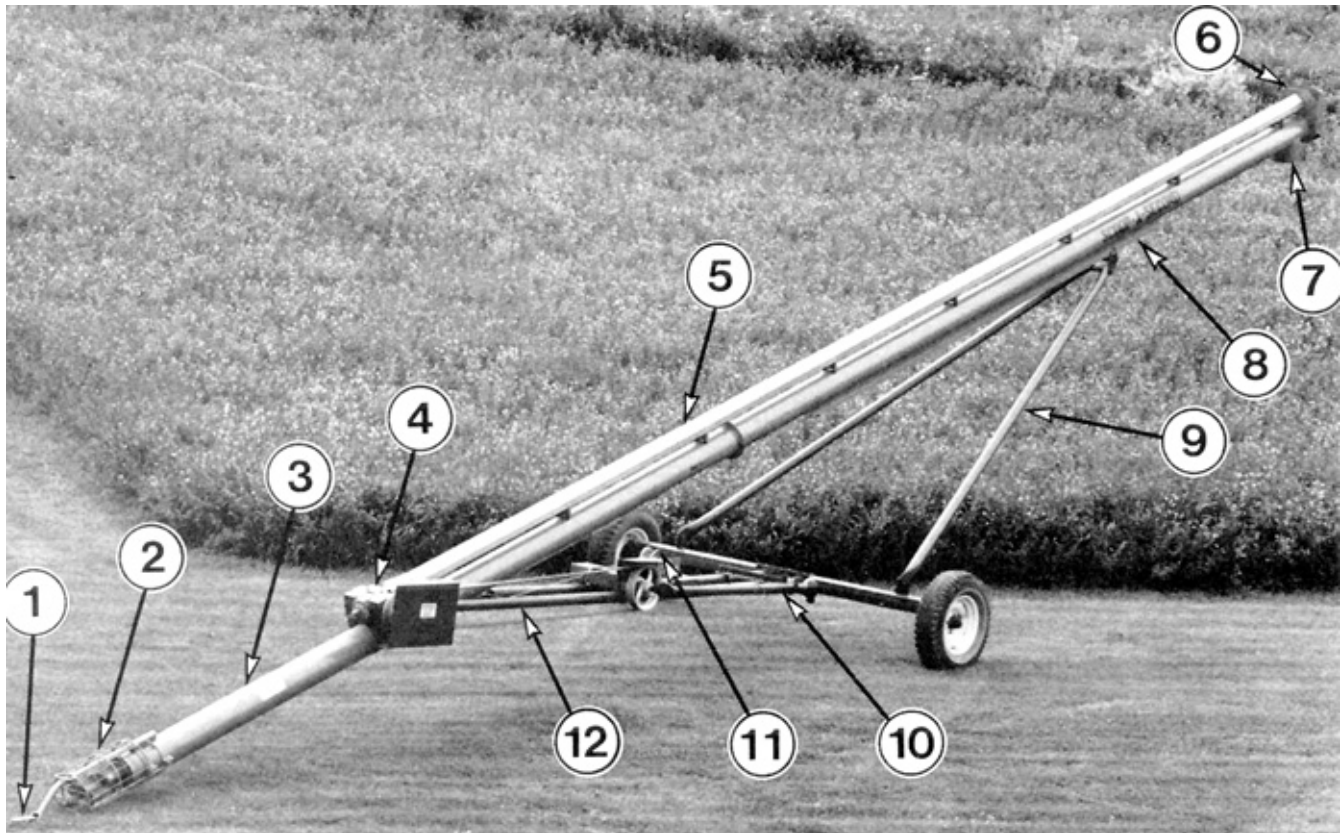


FIGURE 1. Scoop-a-Second 8 x 46 Grain Auger: (1) Tow Hitch, (2) Inlet, (3) Auger Tube, (4) Gear Box, (5) Drive Shaft, (6) Upper End Drive, (7) Discharge Spout, (8) Elevating Track, (9) Lift Arms, (10) Power Take-off Driveline, (11) Cable Winch, (12) Lower Arms.

SUMMARY AND CONCLUSIONS

Overall Performance: Performance of the Scoop-a-Second 8 x 46 Grain Auger was good¹. At the 30° elevation angle, corresponding to a discharge height of 22.4 ft (6.8 m), maximum capacities were 2380 bu/h (64.8 t/h) in wheat, 3870 bu/h (44.4 t/h) in oats, 2120 bu/h (54.0 t/h) in corn and 2160 bu/h (49.1 t/h) in rapeseed. Maximum capacities were obtained at flighting speeds between 650 and 750 rpm.

Power Requirement: This ranged from 7 to 20 hp (5 to 15 kW) in dry grain. Capacity and power depended on flighting speed, elevation angle, grain type and moisture content.

Grain Damage: In dry wheat damage was less than 0.2% for each pass through the auger.

Maneuverability: This was regarded as good at low elevations, but due to the transfer of weight to the hitch when the auger was raised, maneuverability was fair at high elevations.

Safety: All pulleys, nip points, rotating drive shafts and inlet flighting were guarded, in accordance with current safety standards².

Operator Manual: The manual provided adequate instructions for operating the machine.

Durability: A leaking seal on the side of the gearbox was the only durability problem that occurred during the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to the undercarriage to slightly reduce the hitch weight at high elevations and improve maneuverability.
2. Providing support for the shaft on the gearbox to prevent stress on the gearbox mechanisms.

Senior Engineer -- G. M. Omichinski

Project Engineer -- C. W. Bolton

¹See rating table APPENDIX III

²American Society of Agricultural Engineers Tentative Standard ASAE S361.1T

"Safety for Agricultural Auger Conveying Equipment," December 1981.

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. This will be initiated on our 1983 production model.
2. This has already been corrected by using a different gear box.

GENERAL DESCRIPTION

The Scoop-a-Second 8 x 46 Grain Auger (FIGURE 1) is an 8 in (203 mm)³ diameter, 46 ft (14.0 m) long portable screw conveyor. The auger tube is mounted on a tubular undercarriage. A hand-operated cable winch is used to adjust the discharge height.

The test machine was equipped with a 540 rpm tractor power take-off belt drive. The Scoop-a-Second may be equipped with a power take-off direct drive, gasoline engine or electric motor.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST⁴

The Scoop-a-Second 8 x 46 was operated for about 15 hours while conveying dry wheat, oats, corn and rapeseed. A standard test material (APPENDIX II) was also used. The machine was transported over gravel and paved highways for a distance of 30 miles (50 km). It was evaluated for ease of operation and adjustment, rate of work, power requirements, quality of work, operator safety and suitability of the operator manual.

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Discharge Height: The discharge height could be varied from

9.3 to 29.5 ft (2.8 to 9.0 m) with the hand operated cable winch. Corresponding elevation angles varied from 12° to 40°.

With the auger empty, and the lift mechanism well lubricated, it took a maximum winch handle force of 16 lb (73 N) to raise the auger. It took about 150 turns of the winch crank to fully raise or lower the auger.

Auger Reach: The bin eave clearance and horizontal reach of the Scoop-a-Second 8 x 46 are shown in FIGURE 2. Bin eave clearance, measured from the ground to the foremost part of the undercarriage, varied from 7.5 ft (2.3 m) at 12° to 18.0 ft (5.5 m) at 40° elevation. The reach measured from the foremost part of the undercarriage to the centre of the discharge, ranged from 8.5 ft (2.6 m) to 13.6 ft (4.1 m).

Maneuverability: Hitch weight varied from 43 lb (20 kg) at minimum elevation to 140 lb (64 kg) at maximum elevation. This heavy hitch weight made maneuvering of the auger by hand difficult. It is recommended that the manufacturer modify the undercarriage to reduce the weight on the hitch at high elevations.

The Scoop-a-Second 8 x 46 transported well and was stable at speeds up to 50 mph (80 km/h) on paved highways and up to 30 mph (50 km/h) on gravel roads. The removable clevis hitch provided a reliable coupling to the tow vehicle. The operator should use a suitable hitch pin and safety chain to prevent accidental unhitching when transporting on public roads. Clearance under power lines was adequate when fully lowered. The transport height was 11.3 ft (3.5 m).

Adjustments: Drive belt tension was adjusted by pushing the "slide mounted" drive pulley along two threaded bolts. Care must be taken to ensure the belts are properly aligned.

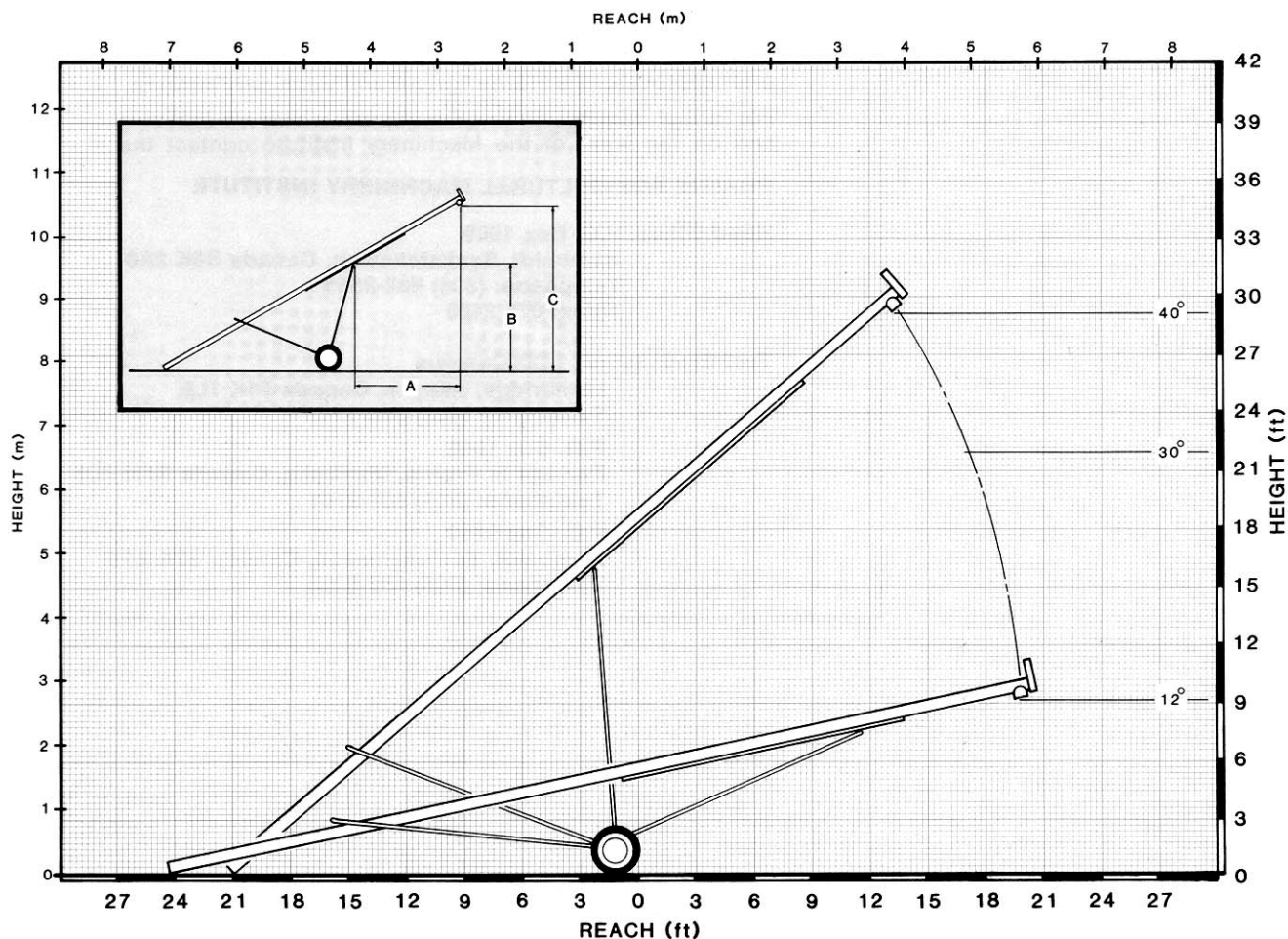


FIGURE 2. Reach and clearance at various heights (A) Reach, (B) Bin Eave Clearance, (C) Discharge Height.

³A conversion table is provided in APPENDIX IV.

⁴Prairie Agricultural Machinery Institute Detailed Test Procedure for Grain Augers.

⁵Since the capacity is greatly dependent upon grain properties, such as variety and moisture content, FIGURE 3 should not be used for comparing different augers. The data presented in FIGURE 5, APPENDIX II, using a standard medium, may be used for comparisons of different augers.

RATE OF WORK

Capacity: FIGURE 3 shows the capacities⁵ of the Scoop-a-Second 8 x 46 in various grains at 30° elevation angle. Maximum capacities were 2380, 3870, 2120 and 2160 bu/h (64.8, 44.4, 54.0 and 49.1 t/h) in dry wheat, oats, corn and rapeseed respectively.

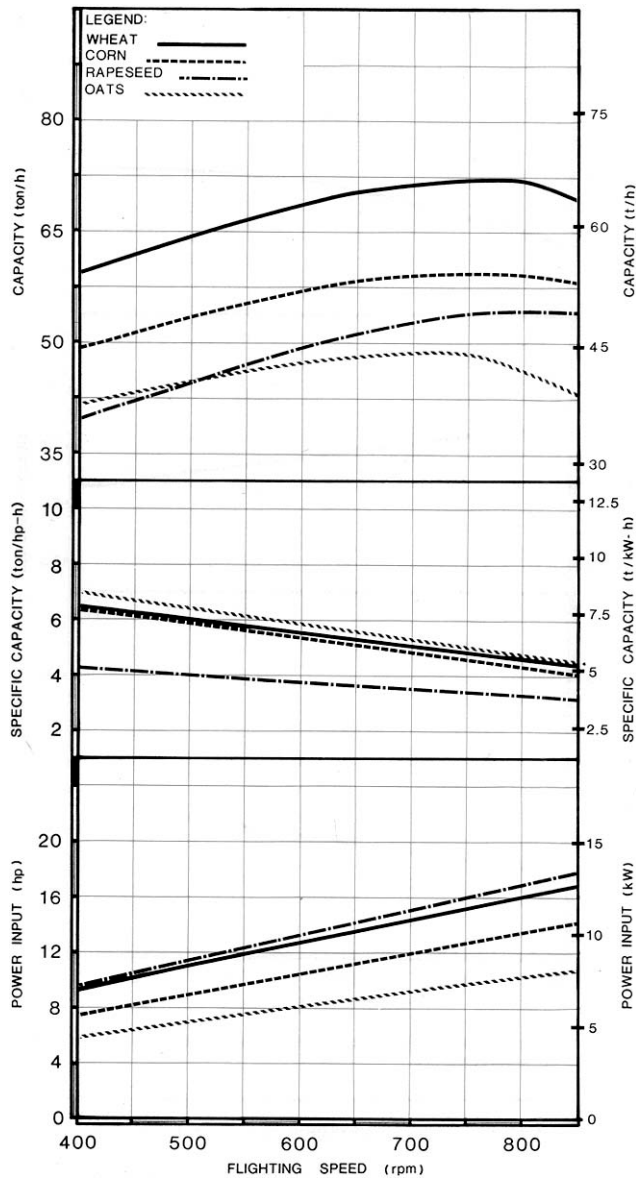


FIGURE 3. Capacity, specific capacity and power requirement for various flying speeds at 30° elevation angle.

As flying speeds are increased, the capacity of screw conveyors increases to a peak, then levels off or decreases. Maximum or peak capacities for the Scoop-a-Second occurred at flying speeds ranging from 650 to 750 rpm, which corresponds to power take-off speeds of 540 to 625 rpm.

The effect of elevation angle on capacity is illustrated in TABLE 1. Peak capacities in wheat dropped 21%, from 2760 bu/hr (75.3 t/h) at a 20° elevation to 2200 bu/hr (60.0 t/h) at maximum elevation.

Specific Capacity: Specific capacity is the amount of grain moved per horsepower hour (kilowatt hour). A high specific capacity indicates efficient use of energy. FIGURE 3 shows capacity varies with grain type and flying speed. In general, specific capacity decreases (less grain is moved per horsepower hour) with increasing flying speed and elevation angle. FIGURE 4 shows that at 30° elevation, specific capacity ranged from 8.03 to 3.11 ton/hp-h (9.79 to 3.80 t/kw-h) in wheat, oats, corn and rapeseed. TABLE 1 indicates the effect of elevation angle on peak and specific capacities for the Scoop-a-Second 8 x 46.

TABLE 1. Peak Capacity, Specific Capacity and Power Requirement vs Elevation Angle (Wheat).

ELEV. ANGLE DEG.	DISCHARGE HEIGHT FT.	(M)	PEAK CAPACITY BU/H (T/H)	SPECIFIC CAPACITY TON HP.H (T/KW.H)	POWER INPUT HP (KW)
20	16	(05)	2760 (75)	6.0 (7.4)	14 (11)
30	22	(07)	2380 (65)	5.3 (6.5)	13 (10)
40	30	(09)	2200 (60)	4.7 (5.8)	14 (11)

Critical Speeds: At certain critical flying speeds, auger vibration becomes excessive. This phenomenon, known as resonance, is common to all augers and varies with grain type and operating conditions. Care should be taken not to operate at or near critical speeds.

Power Requirements: FIGURE 3 gives power requirements for the Scoop-a-Second in dry wheat, oats, corn and rapeseed at a 30° elevation angle. Power requirements ranged from 7 to 20 hp (5 to 15 kW). Power requirements would be greater in high moisture grain.

QUALITY OF WORK

Grain Damage: Damage in dry wheat was less than 0.2% for each pass through the auger. This was insignificant as long as the same grain was not augered many times. Cragage would be lower at higher moisture contents.

OPERATOR SAFETY

The Scoop-a-Second 8 x 46 met current safety standards² for grain augers. It was safe to operate if normal precautions were observed.

Shielding was provided for all rotating shafts, pulleys and pinch points. An adequate inlet safety guard (FIGURE 4) was provided. All capacities were determined with this inlet safety guard. The Institute strongly recommends that grain augers be operated with all safety equipment in place. Safety signs were appropriately displayed, alerting the operator of potentially hazardous areas.



FIGURE 4. Inlet Safety guard.

OPERATOR MANUAL

The operator manual contained appropriate operating, servicing and safety instructions.

DURABILITY RESULTS

The Scoop-a-Second was operated for about 15 hours. The intent of the test was evaluation of overall performance. An extended durability evaluation was not conducted. A seal on the drive side of the gearbox was leaking at the end of the test. This may have been caused by the inadequate support of the gearbox drive shaft. It is recommended that the manufacturer consider providing a more adequate support for the shaft.

APPENDIX I

SPECIFICATIONS

MAKE: Scoop-a-Second
MODEL: 8 x 46
SERIAL NUMBER: 46-67-82

OVERALL DIMENSIONS:

-- length 46.7 ft (14.2 m)
-- width 12.2 ft (3.7 m)
-- transport height 9.4 ft (2.9 m)

DRIVE:

-- 540 rpm tractor power take-off
-- belt drive
-- auxiliary drives
-- belts 3 (B-320)
-- chains 1 (#60)
-- gearboxes 1
-- power take-off
to flighting speed ratio 1:1.2

LUBRICATION:

-- pressure grease fittings 1
-- sealed bearings 10
-- packed wheel bearings 2

AUGER TUBE:

-- inside diameter 7.83 in (199 mm)
-- material thickness 0.11 in (2.7 mm)
-- discharge spout (elliptical) 8.3 x 7.7 in (210 mm x 196 mm)

FLIGHTING

-- diameter 7.0 in (180 mm)
-- pitch
-- exposed (cupped) 7.1 in (180 mm)
-- covered 7.1 in (180 mm)
-- exposed length 16.0 in (400 mm)

INLET SAFETY GUARD:

-- material dimensions 0.20 in dia (5.0 mm)
-- overall size 20 in L x 12 in alia (508 mm x 305 mm)
-- grill openings
-- maximum open area 7.60 in² (49.0 cm²)
-- maximum open dimension 2.75 in (70.0 mm)

WINCH:

-- make: Dutton-Lainson
-- model: B-2500
-- maximum handle force 16.4 lb (72.8 N)

WEIGHT:

	Maximum Elevation		Minimum Elevation	
-- right wheel	655 lb	(298 kg)	705 lb	(320 kg)
-- left wheel	655 lb	(297 kg)	702 lb	(319 kg)
-- hitch	140 lb	(64 kg)	43 lb	(20 kg)
TOTAL	1450 lb	(659 kg)	1450 lb	(659 kg)

APPENDIX II

Performance with Standard Test Material

The standard test material is a high density granular polyethylene. The material is consistent and not subject to damage or changes in physical properties as are grains.

FIGURE 5 gives the capacity, specific capacity and power requirements for the Scoop-a-Second 8 x 46 in a standard test material. These data may be used for comparison of different grain augers.

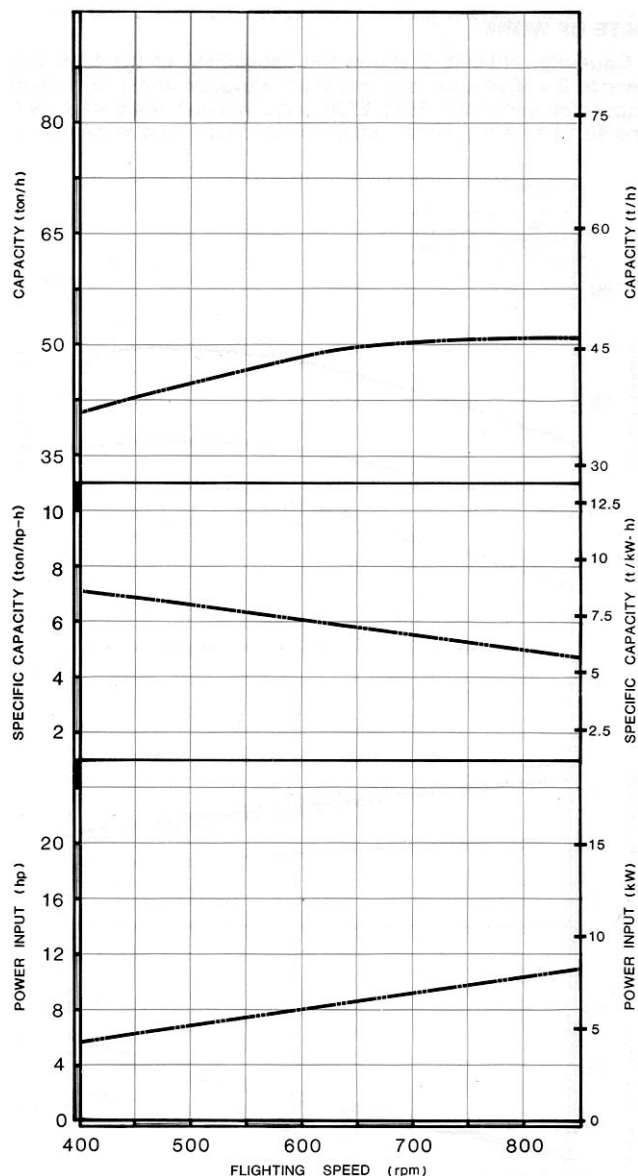


FIGURE 5. Capacity, specific capacity and power requirements with a standard test material at 30° elevation angle.

APPENDIX III

The following rating scale is used in Machinery Institute Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

APPENDIX IV

CONVERSION TABLE

Acre (ac) x 0.40	= Hectare (ha)
Foot (ft) x 0.305	= Metre (m)
Inches (in) x 25.4	= Millimetres (mm)
Horsepower (hp) x 0.75	= Kilowatt (kW)
Miles/Hour (mph) x 1.61	= Kilometre/Hour (km/h)
Pounds Force (lb) x 4.45	= Newton (N)
Pounds Force/Foot (lb/ft) x 14.6	= Newton/Metre (N/m)
Pounds Force-Feet (lb-ft) x 1.36	= Newton-Metre (N-m)
Pounds Force/Square Inch (psi) x 6.89	= Kilopascal (kPa)
Pounds Mass (lb) x 0.454	= Kilogram (kg)
Tons Mass (ton) x 1.1	= Tonnes (t)



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