

Evaluation Report

539



GEHL 2650 Mower Conditioner

A Co-operative Program Between



GEHL 2650 SELF-PROPELLED MOWER CONDITIONER

MANUFACTURER AND DISTRIBUTOR:

GEHL Company
West Bend, Wisconsin
53095

RETAIL PRICE:

\$62,836.00 (January 1988, f.o.b. Portage la Prairie, Manitoba)

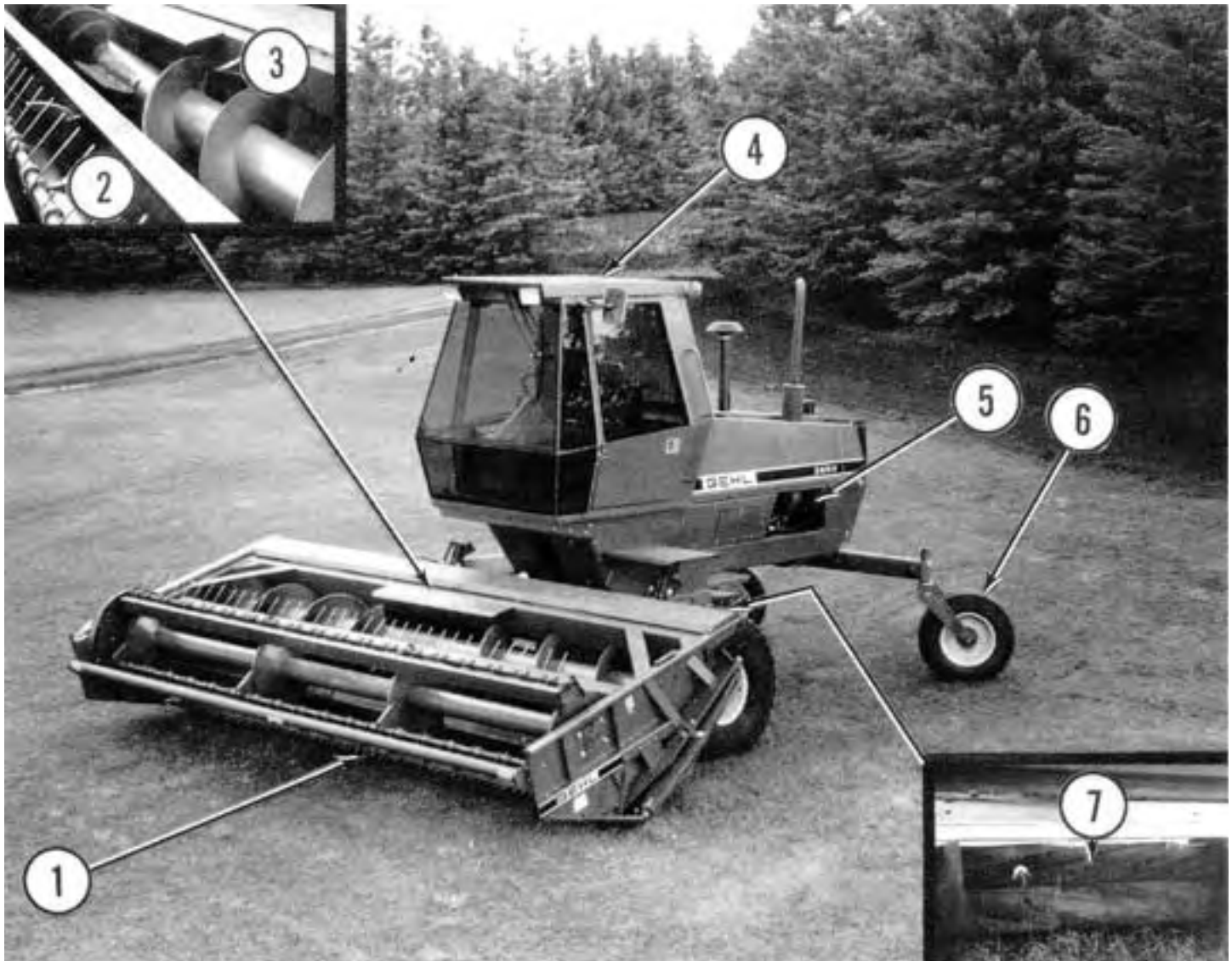


FIGURE 1. Major Components: (1) Cutterbar, (2) Bat Reel, (3) Feed Auger, (4) Cab, (5) Engine, (6) Castor Wheel, (7) Conditioning Rolls.

SUMMARY

Rate of Work: The Gehl 2650 was capable of ground speeds up to 12 mph (19.2 km/h). In heavy crops of alfalfa ground speed was reduced to about 5 mph (8 km/h) to prevent plugging of conditioning rolls. Average continuous work rate was 9 ac/h (3.6 ha/h). Field roughness and crop density determined ground speed.

Quality of Work: The Gehl 2650 performance in all crops tested was excellent. The cutter bar was very effective in cutting fine stemmed grasses as well as alfalfa and clover.

Performance of the conditioning rolls was very good in all crops. Windrow formation was very good.

Ease of Operation: Field operation, operator comfort, controls, lighting, lubrication and handling were rated good to very good by PAMI. The Gehl 2650 was easy and comfortable to operate. Steering was very responsive and allowed easy maneuvering. A complete knife could be changed in 10 minutes by one person. Lubrication was straightforward and easy and took about 20 minutes, with some grease nipples difficult to get to.

Floatation was very good and adequate for the crop field conditions encountered.

Ease of Adjustment: Overall, ease of adjustments was very good. The Gehl 2650 allowed nine separate adjustments affecting cutting and conditioning performance.

Operator Safety: The Gehl 2650 complied with all ASAE safety standards and was safe to operate if normal safety precautions were observed and followed.

Operator's Manual: The operator's manual was of excellent quality and contained much useful information.

Mechanical History: Two flange bearings that supported the conditioning rolls refused grease after 42 hours of operation.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Changing the angle of the windshield to prevent fines and dust from adhering.
2. Modifying the valve linkage that controls header height position, to make it easier to operate.

3. Repositioning the rear work light.
4. Providing a slow moving vehicle sign.

Senior Engineer - G.M. Omichinski

Project Technologist - R.K. Harris

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The angle of the windshield has been redesigned and is now a single pane of glass with forward slope to shed fines and dust. Other cab improvements include:
 - Repositioning of air ducts.
 - Addition of heater as standard equipment.
 - Addition of AM/FM radio as standard equipment.
 - Addition of sound deadening material under floor to further reduce noise levels in the cab.
2. The header control valve linkage is currently being studied to reduce required pedal force. The restrictor (referred to under Field Operation) has been added to every machine shipped in the unused port on the auxiliary valve, for convenience of the operator if slower drop is desired.
3. A bracket will be added to allow the work light to be aimed lower so the operator can observe the windrow in the rear view mirror when operating at night.
4. SMV emblems are recommended if the Gehl 2650 is to be used on public roads and are available through Gehl dealers as service parts.

Manufacturer's Additional Comments:

1. With regard to the discussion under windrow formation, the third or top forming shield is only required in extremely light crop conditions in order to achieve a windrow.
2. With regard to the PTO control lever discussed under controls, the intention of its design is to ensure the operator disengages the PTO when exiting the unit.
3. With regard to the reported difficulty in controlling the machine when the operator is looking rearward to check windrows as discussed under handling, the steering linkage has been revised to improve the condition.

GENERAL DESCRIPTION

The Gehl 2650 is a self-propelled mower conditioner with a 14.5 ft (4.4 m) centre delivery hay header. The drive tractor is powered by a 236 in³ (3.8 L) Perkins diesel, which drives a hydrostatic pump and a series of mechanical devices for the knife, bat reel and auger. Final drive is one single range hydraulic power wheel per side. The header consists of one full length sickle, bat reel, and auger. The conditioning rolls are 60 in (1525 mm) in length and are fabricated from segmented rubber tire carcass fabric. Adjustable shields attached to the header form the windrow under the tractor unit. The Gehl 2650 is equipped with an air conditioned cab and adjustable operator's seat. In addition, the steering column is tiltable to allow easy entrance and exit. The mower conditioner is supported at the rear by two fully castoring wheels.

Complete specifications are presented in APPENDIX I, and FIGURE 1 shows the location of major components.

SCOPE OF TEST

The Gehl 2650 was operated under typical prairie conditions in the crops shown in TABLE 1. It was evaluated for 265 hours while harvesting approximately 2500 ac (1012 ha). It was evaluated for rate of work, quality of work, ease of operation and adjustment, operator comfort, sound level, operator safety, and suitability of the operator's manual. In addition, mechanical problems were monitored throughout the test period.

TABLE 1. Operating Conditions

Crop	Hours	Equivalent Field Area	
		ac	ha
Alfalfa	146	1430	580
Clover & Timothy	27	220	89
Timothy & Brome	18	150	61
Native Grasses	74	700	284
Total	265	2500	1014

RESULTS AND DISCUSSION

RATE OF WORK

The Gehl 2650 was capable of ground speeds of 12 mph (19.2 km/h). Most cutting was done in heavy alfalfa during the evaluation and ground speed was limited to 5 to 6 mph (8 to 9.6 km/h) so that conditioning rolls would not plug. At this ground speed, the 14.5 ft (4.4 m) header averaged 9 ac/h (3.6 ha/h). In lighter crops, the ground speed and consequently the rate of work could be increased. Field roughness was also a factor affecting rate of work. Little time was lost at the end of a row, as the Gehl 2650 would pivot in its own length to start another row.

QUALITY OF WORK

Windrow Formation: The Gehl 2650 produced very good quality windrows (FIGURE 2). Windrow width and height were controlled by two adjustable shields at the rear of the conditioner rolls. A third shield or flap was positioned over top of the windrow shields and although adjustable for height, it appeared to be ineffective in controlling windrow form.



FIGURE 2. Typical Windrow.

Cutterbar Performance: Cutting ability of the 59 under serrated knife sections was excellent in all crops. Fine stemmed grasses or damp crops did not affect the cutting ability of the knife. Damp field conditions plugged the knife if it was passed through a mole hill or other ground abnormality. Forward speed slightly affected cutting ability if the knife sections were dull or nicked. The bat reel was very effective in forcing the crop against the knife and in scavenging the table of cut crop. The feed auger was effective and positive in delivering the crop to the centre where the two rubber paddles pushed the crop into the conditioning rolls. The Gehl 2650 produced ideal stubble in most crops. In areas that were trampled or lodged, stubble was ragged. Stubble height was controlled by the adjustable shoes and gauge wheels under the cutterbar.

Floatation: Four large tension springs provided header floatation on the Gehl 2650. Two skid shoes and two gauge wheels allowed the header to follow ground contours. After initial adjustment, header floatation was very good.

Conditioner Performance: The purpose of a conditioner is to reduce curing time of the crop, by crushing the stems of the plants so moisture evaporation will be more rapid.

The conditioner rolls performed very good in most crop conditions, crimping the stems of alfalfa plants about every 4 inches (100 mm). The stems of native grasses did not appear to be as thoroughly crimped.

FIGURE 3 graphically represents the curing time of a heavy crop of alfalfa 3.5 to 4 ton/ac (7.8 to 9.0 t/ha). An extended drying time can be considered normal if humidity is high at the time of curing. Generally the advantage of conditioning a hay crop is a 1/2 to 1 day advance in baling.

Leaf Loss: Leaf loss was minimal in most conditions, however, in very heavy alfalfa where the bottom leaves were yellowed or dead, some leaf loss was apparent. PAMI's rating was good.

EASE OF OPERATION

Field Operation: The Gehl 2650 was easy and comfortable to operate. The diesel engine was started by engaging the parking brake, opening the throttle to the 1/4 open position, placing the steering wheel in neutral, placing the hydrostatic speed lever in

neutral and engaging the starter with the key switch. The Gehl 2650 was set in motion by advancing the throttle to the full open position, releasing the parking brake and moving the hydrostatic lever forward. Speed was increased by moving the lever further forward. The knife, bat reel and auger were engaged by operating the power take-off lever on the operator's left. Header control height was controlled with a rocker pedal connected directly to the hydraulic spool valve that controlled the flow of oil to the two lift cylinders on the header lift linkage. This valve was sticky to operate. It is recommended that the manufacturer improve the work ability of this valve.

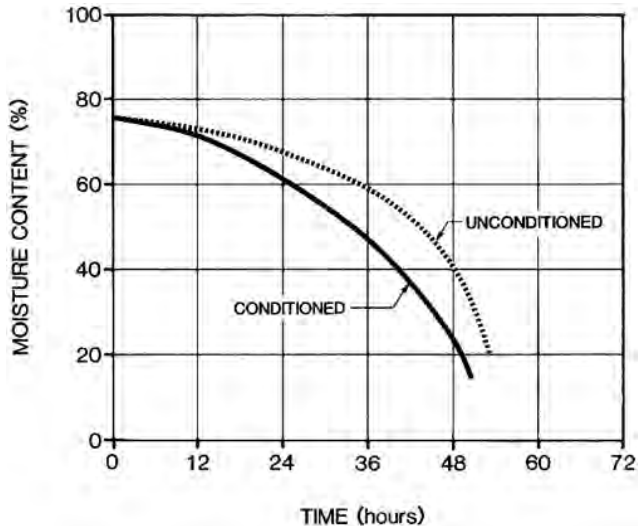


FIGURE 3. Comparison of drydown between conditioned and unconditioned crop for the Gehl 2650.

In addition, when placed in the down position, this valve allowed the header to fall to the ground quite rapidly causing the header to bounce. PAMI staff identified the problem and Gehl personnel sent a restrictor plate to place in the valve. This corrected the problem.

The steering was very responsive and took quite some time for an operator to become accustomed. The Gehl 2650 came equipped with a proportioning valve that decreased the sensitivity of the steering as ground speed was increased. Reversing the Gehl 2650 was accomplished by moving the hydrostatic speed/direction lever to the rear, gripping the steering wheel at the bottom and moving the wheel in the desired direction of travel. Overall, the field operation of the Gehl 2650 was very good.

Operator Comfort: The Gehl 2650 was equipped with an operator's cab positioned behind the header and above the traction drive wheels. Visibility from the cab was very good until the windshield and side windows became covered in dust and fines. It is recommended that the manufacturer consider changing the angle of the windshield so dust and fines do not settle and stick to it so easily. PAMI staff connected a short chain from the frame of the 2650 to the ground in an effort to remove static charges from the machine and reduce the dust sticking to the windows. However, this did not prevent nor reduce the problem.

The steering column and seat were adjustable to suit most operators.

Incoming air was effectively filtered and the air conditioning maintained comfortable cab temperatures. The test machine was not equipped with a cab heater and on cool damp days it was difficult to prevent the windows of the cab from fogging.

Operator station sound level at full speed under load was 83.7 dBA. For sound levels exceeding 85 dBA, ear protection should be worn. PAMI rated operator comfort as very good.

Controls: All engine controls and monitor gauges were situated in a console on the driver's right hand side. Gauges included: fuel level, coolant temperature, amperes, and hour meter. Warning lights included oil pressure and park brake engagement.

Ease of operating the controls was good. All of the controls for the Gehl 2650 were conveniently located and properly identified. The travel speed lever was easy to reach but very stiff to move, especially when going into reverse. The parking brake was an over centre lever that was mounted on the floor beside the operator's seat on the right hand side. Work lights, turn signals and flashers,

windshield wipers as well as air conditioning controls, key start, and preheat switch were all positioned within easy reach on the console.

The control for raising and lowering the header was a foot operated pedal on the left side of the tilting steering column. This pedal was sometimes difficult to operate with the left foot. The PTO lever was located on the floor to the left of the operator's seat. When in the engaged position, it interfered with the operator's leg if the operator attempted to leave the operating position of the mower conditioner without first disengaging the PTO lever. The PTO lever was easy to use and remained in the position in which it was placed.

The steering wheel was adjustable and was comfortable to use for a variety of operators of different sizes. It was very easy to turn and the mower/conditioner was easy to guide through the crop.

Lighting: The Gehl 2650 was equipped with two forward facing lamps and provided ample illumination for night work. The single lamp facing the rear was poorly located and did not provide adequate illumination. It is recommended that the manufacturer relocate the position of the rear facing lamp. In general, the lighting was good.

Handling: Handling of the Gehl 2650 was very good and made precise maneuvering easy. Steering was very quick and responsive. It was however, difficult to turn around in the operator's seat to check the windrow without straying slightly from the row. Some practise was necessary to turn in the seat without straying from the row.

Lubrication: The Gehl 2650 was easy to lubricate and maintain. Daily lubrication took about 20 minutes. The pressure grease fittings on the universal joints of the power shafts were difficult to reach and took the most time. Two flange bearings that support the conditioning rolls on the left hand side would not take grease after 42 hours of use. Routine maintenance such as belt tension adjustment and changing guards and knife sections were easily done. PAMI's rating was good.

Transporting: The Gehl 2650 was very easy to transport on open roads. The single range transmission provided a top speed of 12 mph (19.2 km/h). The 15.8 ft (4.8 m) overall width was too wide for meeting traffic on roads with deep ditches. The mower conditioner had to be backed into a shallow ditch or into a field to allow traffic to pass. The Gehl 2650 came equipped with free wheeling hubs for towing long distances. However, no hitch lug was provided. The two large 21.56 x 16.1 tractor tires provided very good floatation of the entire machine over soft ground. PAMI rated transporting as good.

EASE OF ADJUSTMENTS

Knife: The angle of the knife was adjusted by lengthening or shortening the two upper links in unison. The angle of the knife and guards was adjustable through a range of 10° to 16°. The upper links had metal tabs threaded on the threaded shank of the adjuster that were used as jam locks; these required a slight tap with a hammer to ensure they would stay in place. PAMI's rating was very good.

Push Bar: The push bar height was adjusted by removing three bolts with nuts on each end of the header, and repositioning them at the desired level. It was adjustable vertically over a range of 15 in (380 mm) to 24 in (610 mm). While it was not difficult to adjust the push bar, it was a little time consuming and took one person about 20 minutes. The push bar was set in the middle position, and remained there for the duration of the test. PAMI's rating was good.

Reel: The four-bat reel was adjusted to provide the clearances stated in the operator's manual and was very effective in pushing the crop against the knife and scavenging the table of cut crop. The adjustments were easy to make and took about 10 minutes. Reel tip speed was set at about 15% greater than ground speed and was adjusted by adding shims to increase speed and removing shims to decrease speed from the variable drive sheave. Reel speed adjustment took one person 20 minutes. PAMI's rating was good.

Auger: Auger speed was adjustable by changing size of drive sprockets and speeds of 164, 187 and 210 rpm were available. A factory set speed of 187 rpm was not readjusted from the factory and proved to be satisfactory for all conditions encountered. PAMI's rating was very good.

Conditioners: The conditioning rolls were adjustable for pressure and clearance. Adjustments for pressure was done by tightening the bolts at the bottom of the roll pressure springs on each side of the feeder housing (FIGURE 4). As the pressure of the

springs could not be measured while in position, trial and error was used to determine proper roll pressure. Roll pressure adjustments were easy and took one person about 5 minutes. The operator's manual suggested a clearance of the conditioning rolls of about 0.250 in (6.3 mm). However, it was found that this setting did not completely condition alfalfa. Clearance was adjusted to about 0.187 in (4.77 mm) by tightening the adjustment bolts on the side of the feeder housing (FIGURE 4). This provided more satisfactory results. Clearance could be adjusted from 0 to 1.84 in (0.47 mm). PAMI's rating was very good.



FIGURE 4. Roll Clearing Adjustment.

Windrow: The windrow forming shields were adjusted by loosening the adjustment bolts and sliding the forming shields to the desired position and retightening the bolts. As supplied, the adjustment bolts were tightened with wing nuts. These were replaced with hex nuts as the wing nuts could not be tightened enough to maintain forming shield positions (FIGURE 5). Forming shields could be adjusted from widths of 5 ft (1.5 m) to 18 in (500 mm). Adjusting windrow formation shields rated very good after wing nuts were replaced with the hex nuts.



FIGURE 5. Forming Shields Adjustment, Hexagon Nut Replacing Wing Nut.

Floatation: Floatation adjustment was accomplished by torquing a nut on the tops of the floatation springs. The gauge wheels and shoes were adjustable by moving the mounting bolts into one of seven different holes in the side plates which allowed an upward adjustment of 0 to 6 in (0 to 152 mm). Floatation adjustment was very good.

ENGINE AND FUEL CONSUMPTION

The Perkins 236 in³ (3.8 L) diesel engine produced adequate power for all conditions encountered. The average fuel consumption was 1.3 gal/h (6 L/h). The 37.5 gal (170.3 L) fuel tank permitted about 28 hours of operation between fillings. The Gehl 2650 was operated for 265 hours, 0.9 gal (4 L) of oil were added to the engine in this time. The engine started easily and ran well for the duration of tests.

OPERATOR SAFETY:

The Gehl 2650 was safe to operate if normal safety precautions were followed. All pulleys, sprockets and drive shafts were guarded in accordance with ASAE standards. All potential danger points were decaled, warning the operator of safety hazards.

Skid proof material was in place on the steps and platform, which made access in and out of the cab safe.

A slow moving vehicle sign was not provided. The Gehl 2650 was equipped with turn signals and flashing forward and rear facing lights. A rear view mirror was provided but would not remain in proper adjustment. When the header PTO lever was left in the engaged position, the operator was blocked from leaving the seat.

Care had to be taken when removing the knife from the header.

Safety switches prevented the engine from starting if the hand brake was not engaged, if the steering wheel was not in neutral position or if the speed lever was not in neutral. The header could be locked in the up position with two steel bars that prevented downward motion. The hand brake was a dual purpose device that could bring the machine to a rapid stop or lock the wheels safely for parking with the engine running. PAMI's rating on safety was very good.

OPERATOR'S MANUAL

The manual was very good. It contained useful information on setup, adjustments, operation, maintenance and service, and safety. Separate operator's manuals were provided for the Perkins engine, in addition to a parts catalogue. All information contained was found to be accurate and well illustrated.

MECHANICAL HISTORY

Two flanged bearings that support the conditioning rolls refused grease after 42 hrs of operation. The bearings were not changed in an attempt to see how long they would last before replacement became necessary. The bearings would get warm, but showed no further sign of failure for the duration of the test. The rubber rolls of the conditioner showed signs of wear after 180 hours of operation (FIGURE 6).

Knife sections were changed when they became dull or nicked.

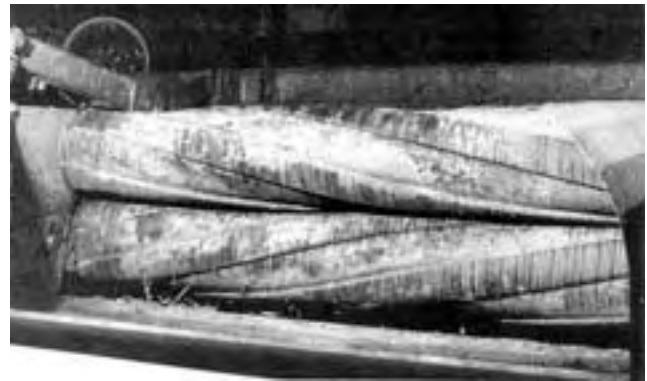


FIGURE 6. Conditioner Rolls Showing Signs of Wear.

**APPENDIX I
SPECIFICATIONS:**

MAKE:	Gehl
MODEL:	2650 Self-Propelled Mower Conditioner
SERIAL NUMBER:	7551
DIESEL ENGINE:	Perkins 236 C.I.D. (3.8 L)
OVERALL DIMENSIONS:	
-- length	19.0 ft (5.7 m)
-- width	15.7 ft (4.7 m)
WEIGHT OF TRACTOR WITH HEADER:	
-- Front: left	4250 lbs (1928 kg)
right	4062 lbs (1842 kg)
-- Rear: left	582 lbs (264 kg)
right	<u>578 lbs (262 kg)</u>
Overall Weight:	9472 lbs (4296 kg)
WHEEL BASE:	107 in (3.2 m)
WINDROW GROUND CLEARANCE:	32 in (813 mm)
TIRES:	
-- drive	2, 21.5 L x 16.1, 6-ply
-- castor	2, 9.5 L x 15, 6-ply
HYDROSTATIC DRIVE:	Vickers
FINAL DRIVE:	Power Wheel
STEERING:	Power Tilt
SPEED RANGE:	
-- Forward	0 - 12 mph (19.2 km/h)
-- Reverse	0 - 9 mph (14.5 km/h)
ELECTRICAL:	12 volts, 63 amp.
FUEL CAPACITY:	45 gal U.S. (170 L)
PARKING BRAKE:	Disc (both drive wheels)
HEADER:	
-- effective cutting width	14.5 ft (4.4 m)
-- cutting height range	-3 to +25 in (-76 to +635 mm)
-- header floatation	lateral and vertical
-- header float range	0 to 12 in (0 to 305 mm)
-- guard angle	10° to 16°
-- guard type	double forged
-- guard spacing	3 in (76 mm)
-- knife stroke	3 in (76 mm)
-- knife speed	1640 rpm
-- knife section	59 under serrated

REEL:	
-- diameter	43.75 in (1.08 m)
-- number of bats	4
-- speed	variable
-- teeth per bat	37
AUGER:	
-- length	14 ft (4.2 m)
-- outside diameter	24 in (610 mm)
-- inside diameter	9 in (229 mm)
-- flight spacing	19 in (483 mm)
-- speed	variable, 164 - 187 - 210 rpm
-- diameter of rolls	7.75 in (197 mm)
-- type of rolls	intermeshing rubber
-- roll speed	800 rpm
-- roll length	60 in (1525 mm)
CONDITIONER:	
-- number of rolls	2
-- roll construction	intermeshing rubber
-- length	60.0 in (1525 mm)
-- diameter	7.75 in (197 mm)
-- speed	8000 rpm
-- roll pressure	control spring loaded nut
NUMBER OF CHAIN DRIVES:	1
NUMBER OF BELT DRIVES:	6 (including engine)
HYDRAULIC CONTROLS:	
-- header lift	rocker pedal
-- field speed	hand lever
LUBRICATION POINTS:	
-- 5 hour	4
-- 10 hour	4
-- 50 hour	4
-- 100 hour	10
NUMBER OF PRELUBRICATED BEARINGS:	
-- sleeve oilite bearings	9
-- ball joints	10
-- nylon bearings	16
-- sealed ball bearings	22

SUMMARY CHART

GEHL 2650 MOWER CONDITIONER

RETAIL PRICE:	\$62,836.00 (January 1988, f.o.b. Portage)
RATE OF WORK:	
-average	speed 5 to 6 mph (8 to 10 km/h)
-average	workrate 8 to 9 ac/h (3.3 to 4.0 ha/h)
QUALITY OF WORK:	
-windrow formation	Very Good; controlled by adjustable shields.
-cutterbar	Excellent; fine or damp crop did not affect performance.
-conditioner	Very Good; not as effective in native grasses.
-leaf loss	Good; minimal
EASE OF OPERATION:	
-transporting	Good; wide width required caution.
-lubrication	Good; U-joints were difficult to grease.
-field operation	Very Good; sticky control of header height.
-operator comfort	Very Good; windshield prone to dust collecting.
-controls	Good; hydrostat lever was stiff.
-lighting	Good; rear light poorly positioned.
-handling	Very Good; steering sensitive.
EASE OF ADJUSTMENTS:	
-knife	Very Good; could be changed by one person in 10 minutes
-push bar	Good; adjustable over a range of 15 to 24 in (380 - 610 mm)
-reel	Good; speed adjusted by adding or removing shims.
-conditioners	Very Good; allowed adjustment of clearance and pressure.
-windrow	Very Good; wing nuts had to be replaced.
-floatation	Very Good; set by adjusting springs, gauge wheels and shoes.
ENGINE:	Excellent; started and ran well; consumed 1.3 gal/h (6 L/h)
OPERATOR SAFETY:	Very Good
MECHANICAL HISTORY:	Two minor problems

 <p>ALBERTA FARM MACHINERY RESEARCH CENTRE</p>	<p>Prairie Agricultural Machinery Institute Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-2555</p>		
<p>3000 College Drive South Lethbridge, Alberta, Canada T1K 1L6 Telephone: (403) 329-1212 FAX: (403) 329-5562 http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html</p>	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <p>Test Stations: P.O. Box 1060 Portage la Prairie, Manitoba, Canada R1N 3C5 Telephone: (204) 239-5445 Fax: (204) 239-7124</p> </td> <td style="width: 50%;"> <p>P.O. Box 1150 Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-5033 Fax: (306) 682-5080</p> </td> </tr> </table>	<p>Test Stations: P.O. Box 1060 Portage la Prairie, Manitoba, Canada R1N 3C5 Telephone: (204) 239-5445 Fax: (204) 239-7124</p>	<p>P.O. Box 1150 Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-5033 Fax: (306) 682-5080</p>
<p>Test Stations: P.O. Box 1060 Portage la Prairie, Manitoba, Canada R1N 3C5 Telephone: (204) 239-5445 Fax: (204) 239-7124</p>	<p>P.O. Box 1150 Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-5033 Fax: (306) 682-5080</p>		