

# Modified ureas meet turf managers' changing needs

By George R. McVey, Senior Research Associate, O. M. Scott & Sons

For some time, urea has been a popular choice as a nitrogen source for turf grass and ornamentals. Years ago, the chemical industry made use of the fact that urea can be chemically combined with formaldehyde, in what is known as a condensation reaction, to produce commercially important plastics—and also (by altering conditions) to produce valuable fertilizer compounds that release nitrogen slowly from their chemically bound molecules.

The extent to which the condensation reaction occurs can be altered by varying such factors as temperature, acidity and time. This means that the rate at which the final product is released under varying weather conditions can be controlled quite effectively at the time the product is manufactured.

It has taken years of field trials, of course, to determine just which of the options made available by varying the urea-formaldehyde combination are best exploited by professional turf managers. Lately, the high cost of manpower—to apply fertilizer, and to mow grass—has become one of the more important considerations. In addition, the last few years have seen much concern about water pollution caused by fertilizer run-off. Some of the modified ureas now commercially available appear to offer strong advantages in cases where labor costs and pollution are prime worries.

The plant nutrient forms of urea-formaldehyde provide a high nitrogen content, consistency of performance, are safe for all types of grasses, odorless and economical, and have earned a popular place among private and commercial growers for turf and ornamentals use. At present, urea-formaldehyde condensation fertilizers make up an estimated 90% of all the "controlled release" nitrogen products sold in the U.S.

There are essentially two categories of commercial urea-formaldehyde fertilizer materials now marketed. The more completely linked urea-formaldehydes are relatively less soluble in cold water than the di- and tri-ureas, and they make up about 75% of the products called ureaforms.

O.M. Scott has two main formulations with some carefully selected differences in properties, attributable to

their higher percentages of the di-, tri- and tetra-ureas. These are called methylene ureas or MUs. Note that the total nitrogen stays the same (38%) in all types, and that the bigger the molecules—the more ureas linked together—the less soluble the product is in cold water. Solubility can almost be tailored to meet specific needs.

## Keeping growth under control

Data from some of our recent research, as demonstrated in the accompanying tables and graphs, show quite clearly how the methylene ureas are useful to the turf care professional. Among the performance gains:

- \* Chance of burning the grass can be minimized.
- \* Fast greening can be achieved, and good color maintained.
- \* Pollution by run-off nitrogen materials is reduced.
- \* Application frequency can be minimized to cut labor costs.
- \* Cutting frequency can be reduced—also to save on manpower costs.

Many of the advantages seen in turf growing can also be obtained by those working with small ornamentals, such as *Catalpa speciosa*, juniper and Cotoneaster. Growers of these will likely choose a different mix of

methylene urea (a formulation tailored to give a higher percentage of cold water insoluble nitrogen) than the MUs used with turf. The different form, however, is available over a long period of time.

Recent investigation at Scotts pinpoints quite specifically how the advantages of methylene ureas reflect the chemical composition and physical properties of selected urea formaldehyde condensation products.

## Burning

Nitrogen salts—such as sodium nitrate and ammonium nitrate—are familiar fertilizer materials. They are readily soluble, give nitrogen in a molecule readily utilized by the plant, and are thus quick-greening. They can, however, burn both turf and ornamentals, so they are usually applied in very dilute form.

Methylene ureas, on the other hand, as illustration A shows, are able to supply useful nitrogen, but without the burning potential. Typically, a 20-pound sample of nitrogen as methylene urea/urea has a salt index of 0.61. A widely used formulation of ammonium nitrate has a salt index of 2.99 or 4.9 times the burn potential as methylene urea/urea.

Illustration A

Salt index of various nitrogen sources.

Nitrogen Source	%N	Salt index <sup>1/ 2/</sup>	
		Equal weights	Equal N levels
Sodium nitrate	16	100	6.25
Ammonium nitrate	33	105	3.18
Urea	46	75	1.63
Ammonium sulfate	21	69	3.29
Methylene urea	38	4	0.11

<sup>1/</sup> Concentration of ions in the soil solution based on sodium nitrate at 100.

<sup>2/</sup> Nitrogen is mixed with air dried soil which is brought to 75% of field capacity and stored for 5 days at 5 degrees C.

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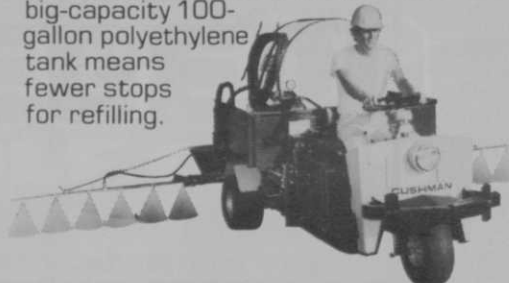


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Instead of being in a salt form, the nitrogen in MUs is largely bound in the methylene urea molecules. This keeps the burn potential low, and also determines the fertilizer's ability to "meter" its nitrogen release. This rate of release can also be gauged by a physical characteristic termed "cold water insoluble nitrogen" or CWIN. The nitrogen in ureaformaldehyde condensation fertilizers is bound into compounds that are relatively insoluble in cold water.

In the practical sense, this means that methylene ureas, with 38% or 42% CWIN, have a low burn potential to foliage, whether the fertilizer is applied to wet or dry foliage. By contrast, a conventional complete fertilizer, with its 2% CWIN index, definitely presents a burn hazard.

Cold water insolubility also tends to reduce the loss by leaching—a particularly desirable characteristic in the case of nitrogen.

In addition, the methylene urea forms of nitrogen are not particularly volatile—certainly not so compared to ammonia compounds. Thus MUs lose little of their nitrogen values due to volatilization.

Urea in its natural form is a fine, fast-greening fertilizer. In the MUs, as marketed for turf application, up to

28% of the urea is fast improvement in turf color. (In the ornamental formulations, of MUs, only 15% of the urea is unbound.) The result is a steady availability of nitrogen that keeps color at the preferred range.

Another factor in the economics of turf maintenance is the frequency of mowing, and the bulk and poundage of cuttings that must be disposed of. Our studies indicate it is the cold water solubility that is the determining factor here—with a metered percent of the nitrogen going into solu-

tion, the growth of turf is more uniform and less than with all soluble nitrogen sources. (illustration B)

In our own formulations, and in the other commercial urea-formaldehyde condensation product formulations, there are some distinct differences and advantages. We have obtained some good information concerning the guidelines for fertilizer choice—and they are particularly worth following in these times of mounting pressure on the team charged with turf and ornamentals maintenance.

Illustration B

Fresh weight of Kentucky bluegrass clippings removed from a 10,000 sq. ft. area as affected by methylene urea or urea.

Product	Lbs. N/M	Weeks after application					Total	%
		1	2	4	6	Lbs. of clipping/10,000 sq. ft.		
Methylene urea	0.9	1908	1372	2120	64	5464	68 <sup>1/</sup>	
Urea	0.9	2872	2241	2840	84	8037	100	

<sup>1/</sup> - Approximately 1/3 less clippings when turf is treated with methylene urea as compared to urea.

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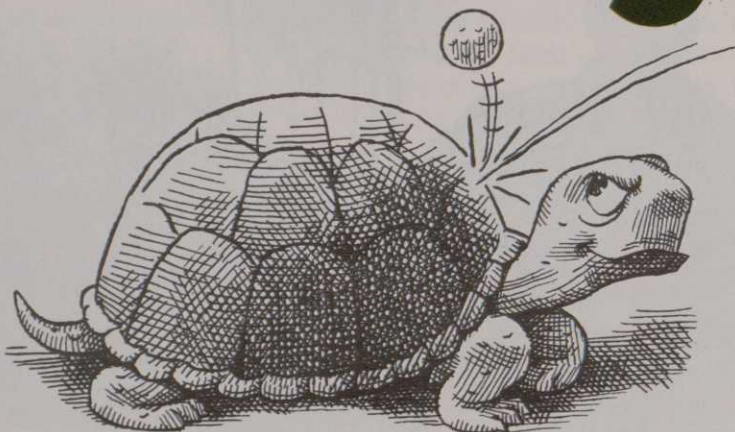
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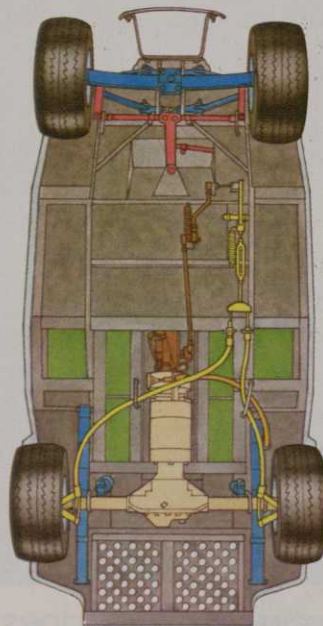
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A.	American Continental, Inc. Willmar, MN	ACE-4000	E	—	—	4	W	215	91	47.5	60	900	TS	DRF
		ACG-4000	G	4	2.5	"	W	"	"	"	"	760	"	"
		ACE-300	E	—	—	3	T	75	91	47.5	"	900	"	RF
			G	4	2.5	"	"	"	"	"	"	700	"	DRE
B.	AMF Harley-Davidson Milwaukee, WI	Master Glide IV	E	—	—	4	W	122	94.5	45	69.75	953	SST	F
		Classic America	G	2	8.5	"	"	124	102	45.25	67	1050	TS	"
		D-4	"	"	"	"	"	147	"	"	"	821	"	"
		DE-3	E	—	—	3	O	128(W)	91	45.25	60.50	881	"	"
		D-3	G	2	8.5	"	"	108(T)	"	"	"	693	"	"
C.	Club Car, Inc. Augusta, GA	DS	E	—	—	4	W	105	91.25	46	65.5	815	A	F
D.	Davis 500/Marco Inc. Greers, SC	Davis 500	E	—	—	4	W	216	91	45	66	848	W	P
E.	Eagle Vehicles, Inc. Dallas, TX	Legend-EV4-01	E	—	—	4	W	234	98	48	68	935	TS	RMU
		Legend EV3-01	"	—	—	3	"	87	91	48	65	894	"	"
F.	Electric Carrier Corporation San Antonio, TX	Electric Caddy	E	—	—	4	W	110	94	44	60	900	TS	SM
			"	—	—	3	"	90	"	"	"	875	"	"
G.	Elmco, Inc. Cooksville, IL	21E	E	—	—	4	W	119	130	48	78	1130	A	F
		11E	"	—	—	"	"	102	111	45.2	64.75	994	"	"
H.	Go-Fore Walled Lake, MI	410	G	2	8	4	W	100	96	48	65.5	800*	S	S
		310	"	"	"	3	"	"	"	"	"	745*	"	"
I.	Melex USA, Inc. Raleigh, NC	Turtle	E	—	—	4	W	111	95	48	65	1057	TS	S
		Turtle	"	—	—	3	"	99	91	"	62	1012	"	"
J.	Nordco Electric Vehicles Redlands, CA	450 V.I.P.	E	—	—	4	W	116	92	45.50	66	842	TS	F
		450 4 Runner/ Fleet	"	—	—	"	"	"	"	"	"	"	"	"
K.	Polaris E-Z-Go Division of Textron Minneapolis, MN-	GX-444	G	2	4	4	W	246	93	48	66	713*	S	S
		X-444	E	—	—	"	"	"	"	"	"	574*	"	"
		GX-440	G	2	4	3	"	210	88.5	"	60	668*	"	"
		X-440	E	—	—	"	"	"	"	"	"	528*	"	"
L.	Reed Enterprises, Inc. Grandview, TX	Sun Classic	E	—	—	4	W	251	110	50	69	950	S	F
M.	Taylor-Dunn Mfg. Co. Anaheim, CA	GT371 Custom Tee Bird	E	—	—	4	W	124	96.87	45.25	66	1105	TS	S
		GT371	"	—	—	"	"	124	102	"	"	1175	"	"
		GT370 Fleet	"	—	—	"	"	"	89.75	"	"	1125	"	SD
N.	Yamaha Motor Corp., U.S. Buena Park, CA	G1-A2	G	2	6.74	4	W	112	94.6	44.9	61	670*	TS	FRP
		G1-E2	E	—	—	"	"	"	"	"	"	528*	"	"

\*indicates does not include batteries or fuel



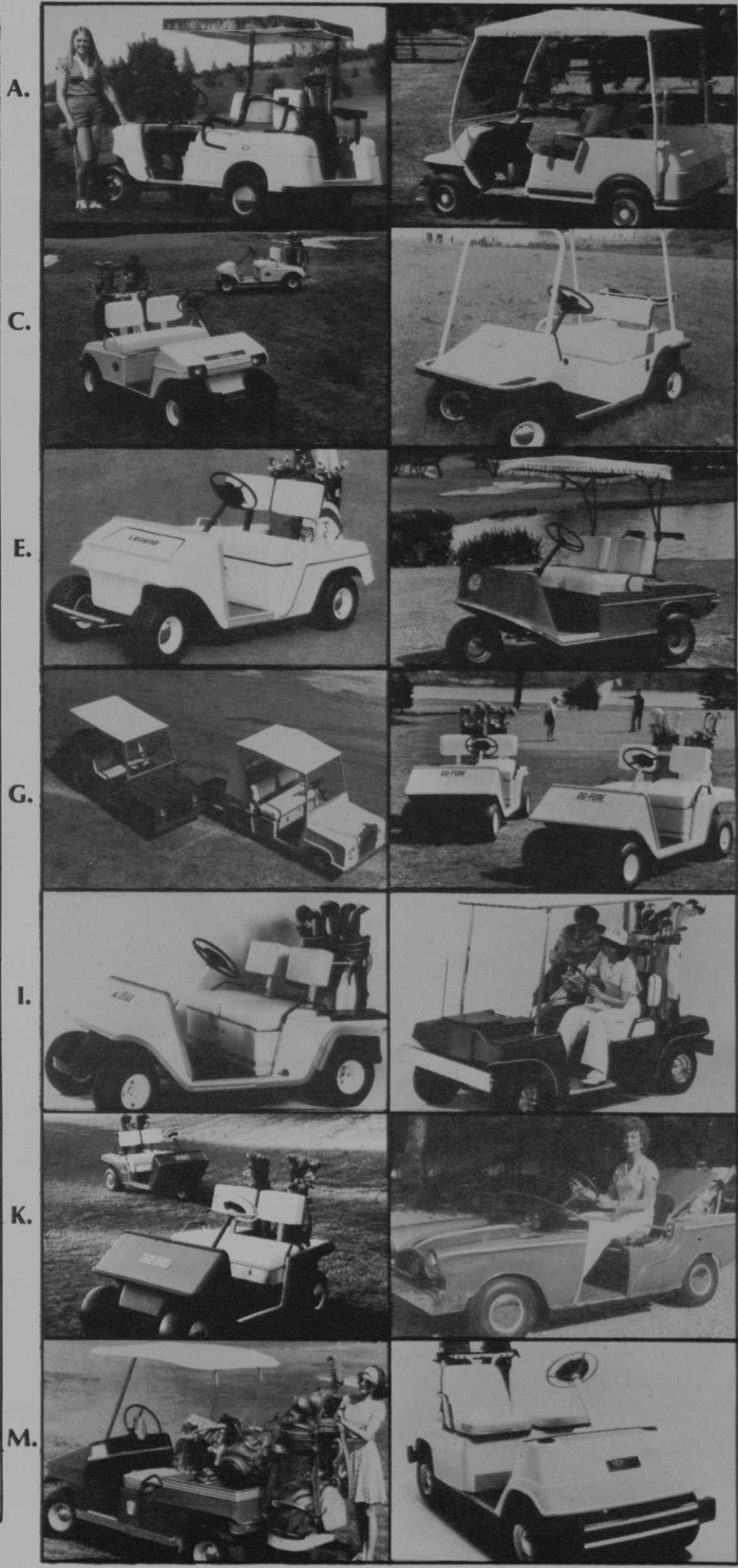
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STANDARD COLOR(S)	OPTIONAL COLOR(S)	FORWARD(mph)	REVERSE(mph)	OPTIONS	WARRANTY	PRICE(\$)**and***	INFORMATION
Al	G,R MF,	12	12	9	1 Yr.	2890	201
"	B, DI	"	"	"	"	2890	202
"	"	"	"	"	"	2610	203
"	"	"	"	"	"	2610	204
BW	—	11	11	7	2 Yr.	3060	205
T&C	—	12	12	3	"	4540	206
BW	—	"	"	5	"	3145	207
"	—	10	10	10	"	2795	208
"	—	12	12	8	"	2675	209
W.Be	Accent color stripes	13	7	14	1 Yr.	2990	210
W	None	12	12	4	1 Yr.	2495	211
W,G	DG,BE	12	12	25+	1 Yr.	2395	212
"	"	"	"	"	"	2295	213
All	Choice	10	10	12	1 Yr.	2795	214
"	"	"	"	"	"	2695	215
RG	12+	14	7	30	1 Yr.	4915	216
"	"	"	"	"	"	4140	217
W	G	Governed to request		8	Variable	1925	218
"	"	"	"	"	"	1775	219
W	G	12	12	3+	1 Yr.	2885	220
"	"	"	"	"	"	2775	221
Choice	Choice	12	12	15	1 Yr.	3995	222
W	"	"	"	10	"	2295	223
W,B,G	Extra \$	12+	12	12+	1 Yr.	3040	224
"	"	"	"	"	"	3040	225
"	"	"	"	"	"	3000	226
"	"	"	"	"	"	2915	227
W,R,Bl, Br,Y	PS	12.50	6.75	5	1 Yr.	3295	228
6	Extra \$	13	13	50	1 Yr.	3145	229
"	"	"	"	49	"	3345	230
"	"	"	"	50	"	3145	231
W	None	12	12	3	1 Yr.	2895	232
"	"	"	"	"	"	2375*	233



\*\*indicates batteries and charger not included  
 \*\*\*indicates batteries not included, charger is included

# The Front Line<sup>TM</sup>

## Proved tough enough to be a Cushman.

People in your profession naturally expect a mower from Cushman to be something special. In its first year, the Front Line proved it is just that.

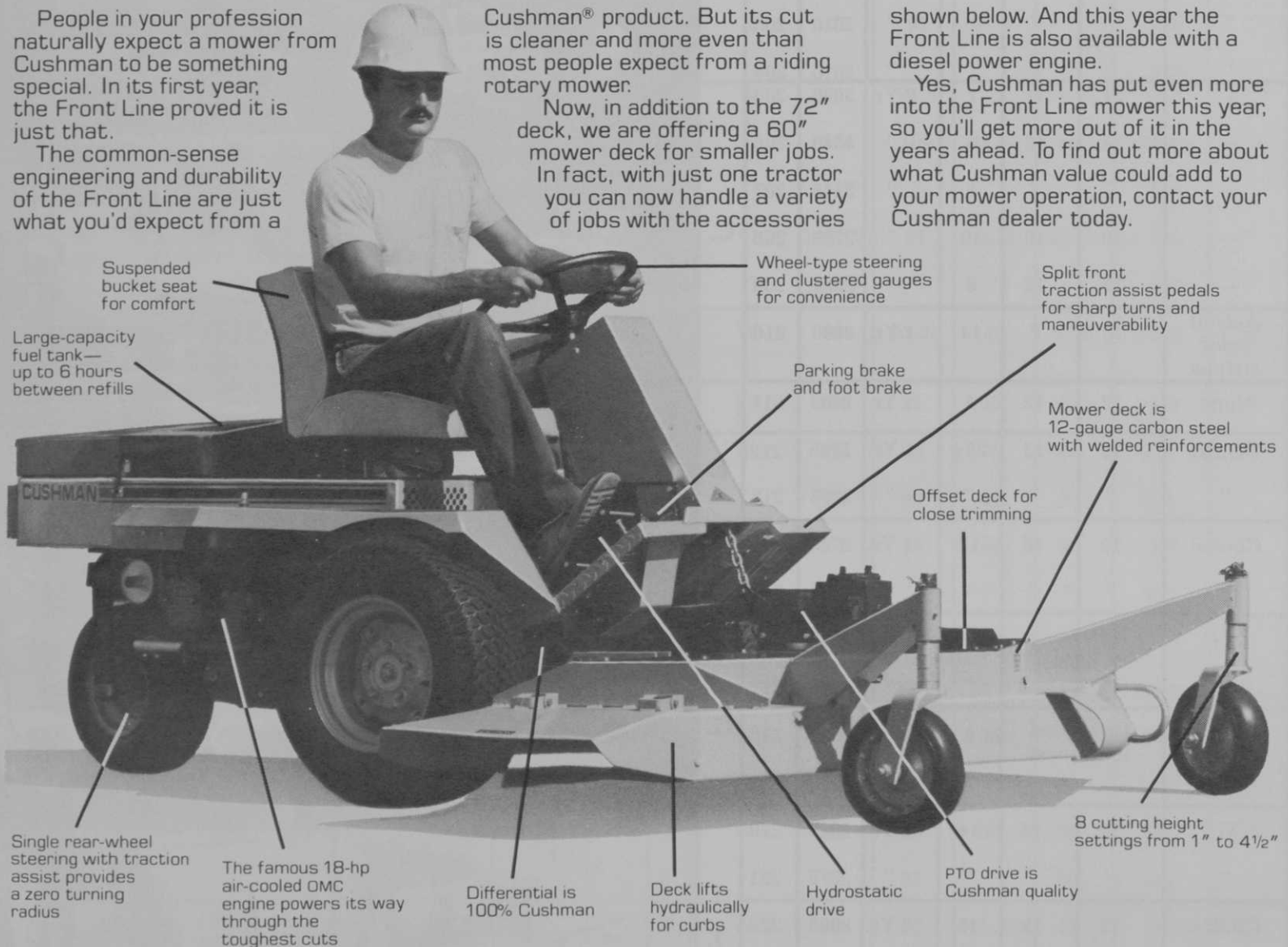
The common-sense engineering and durability of the Front Line are just what you'd expect from a

Cushman<sup>®</sup> product. But its cut is cleaner and more even than most people expect from a riding rotary mower.

Now, in addition to the 72" deck, we are offering a 60" mower deck for smaller jobs. In fact, with just one tractor you can now handle a variety of jobs with the accessories

shown below. And this year the Front Line is also available with a diesel power engine.

Yes, Cushman has put even more into the Front Line mower this year, so you'll get more out of it in the years ahead. To find out more about what Cushman value could add to your mower operation, contact your Cushman dealer today.



Suspended bucket seat for comfort

Large-capacity fuel tank—up to 6 hours between refills

Wheel-type steering and clustered gauges for convenience

Split front traction assist pedals for sharp turns and maneuverability

Parking brake and foot brake

Mower deck is 12-gauge carbon steel with welded reinforcements

Offset deck for close trimming

Single rear-wheel steering with traction assist provides a zero turning radius

The famous 18-hp air-cooled OMC engine powers its way through the toughest cuts

Differential is 100% Cushman

Deck lifts hydraulically for curbs

Hydrostatic drive

PTO drive is Cushman quality

8 cutting height settings from 1" to 4 1/2"

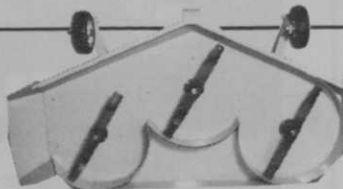
## Now versatile enough to pay off all year.

These specialized accessories make the Front Line even more productive for you.



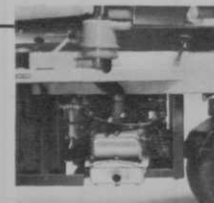
**Roll-Over Protection Structure (ROPS) and Cab**

- Weather-proof
- Meets OSHA requirements



**60", 72" Mower Deck**

- 12-gauge carbon steel
- Smooth-cutting



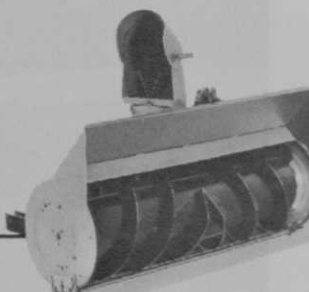
**New! Diesel Power**

- 4-cycle, 2-cylinder engine
- Water-cooled
- Economical



**60" Rotary Broom**  
(not available for diesel)

- PTO-driven
- Long-life Bristles



**48" Snow Thrower**  
(not available for diesel)

- PTO-driven
- Adjustable chute

**CUSHMAN<sup>®</sup>**

3001 Cushman, P.O. Box 82409  
Lincoln, NE 68501

**The Front Line<sup>™</sup>**

Tough enough to be a Cushman.  
Call: 402-435-7208