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U.S Department of Agriculture
Agricultural Outlook Forum 2003
February 20 & 21, 2003

NEW MARKETABLE PRODUCTS FROM ANIMAL WASTE
POTENTIALS FOR ENERGY FROM ANIMAL MANURE
DIGESTERS

Dennis D. Haubenschild
President
Haubenschild Farm, Inc.

Agricultural
Outlook
Forum
2003

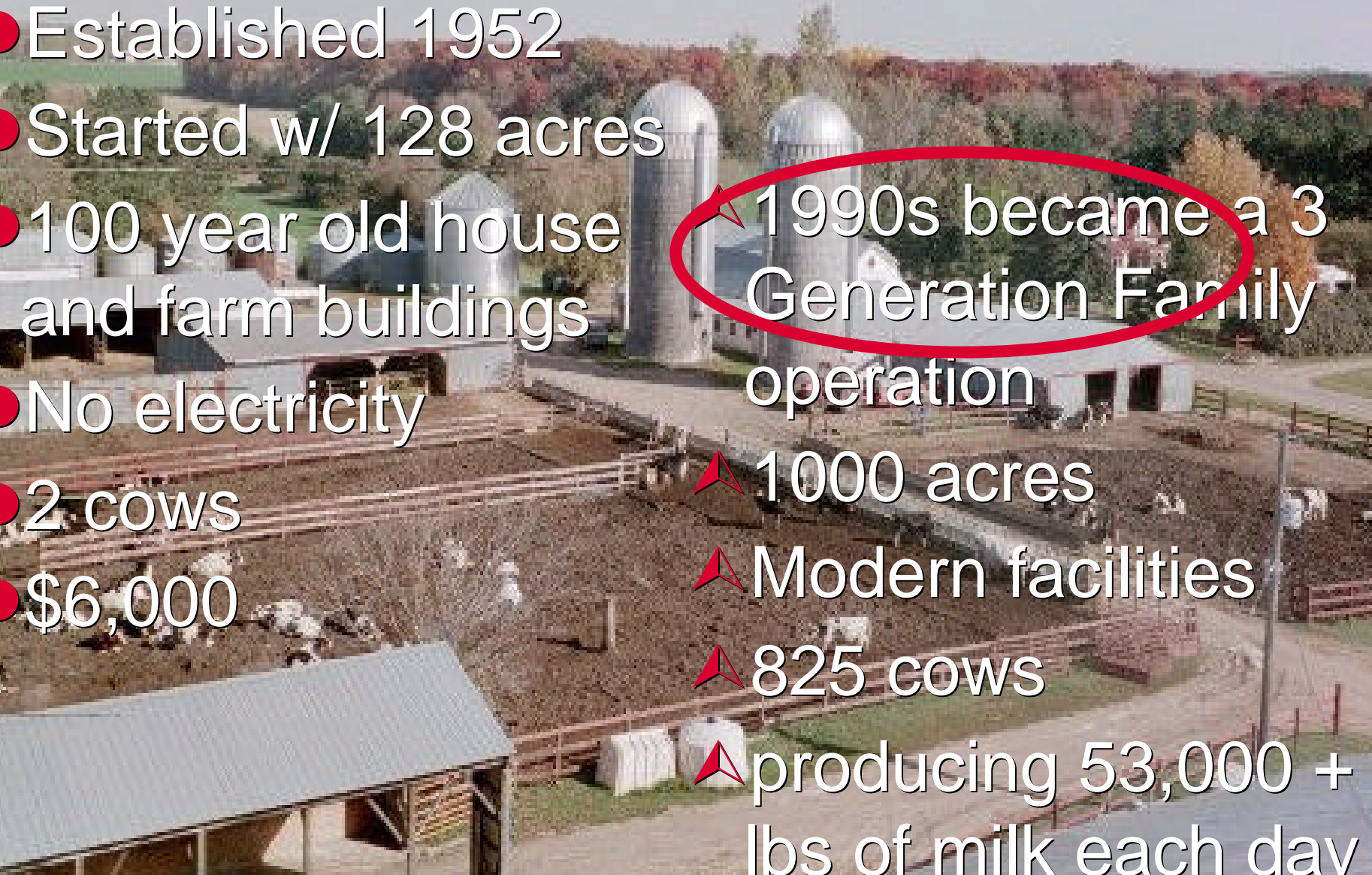


Haubenschild Farm



Producing many deliverables in an environmentally safe manner

Haubenschild Farm History

- 
- Established 1952
 - Started w/ 128 acres
 - 100 year old house and farm buildings
 - No electricity
 - 2 cows
 - \$6,000
 - ▲ 1990s became a 3 Generation Family operation
 - ▲ 1000 acres
 - ▲ Modern facilities
 - ▲ 825 cows
 - ▲ producing 53,000 + lbs of milk each day



Farm Objectives

environment-friendly farm management

Milk production

Electricity
production

Heat recovery

Minimized odors

Soil preservation

Effective feed program

★ Recycled newspaper

★ Recycled water

★ Improved nutrients

★ Family-oriented

★ Fair profit

★ Fun





Milk Production-Today

- 850 cows in production
- 100 in dry lot
- milking 3X per day
- ★ 59,500 pounds per day
or 7000 gallons





Milk Production

- no human handling
- closed sterile system
- minimal agitation



3F to 36F instantly



2 - 6,000 gallon tankers

Feed Management

- Computer generated TMR
- Minimal shrinkage

- Once a day feeding
- Recovery of unused portion
- Cost effective program





Manure Digester



30'LX30'WX14'D

1/2 million gallons

10,000 gallons each day

constant 100F degrees

1,800' of piping

➤ Methane production
via anaerobic decay

72500 cf of biogas per day

51 cf/min

23 cf/kWh



Methane Facts

- Naturally occurring gas
- Produced by many sources
(swamps, rice cultivation, animal husbandry, waste management)
- Captured and used as a commodity
- The conversion of wastes into value-added products represents the positive solution to pollution problems that are often caused by the accumulation of underutilized byproducts.



Manure Digester

- ★ Capturing methane
- ★ Reduced odors after processing



gas pipes



3.5 million gallon lagoon

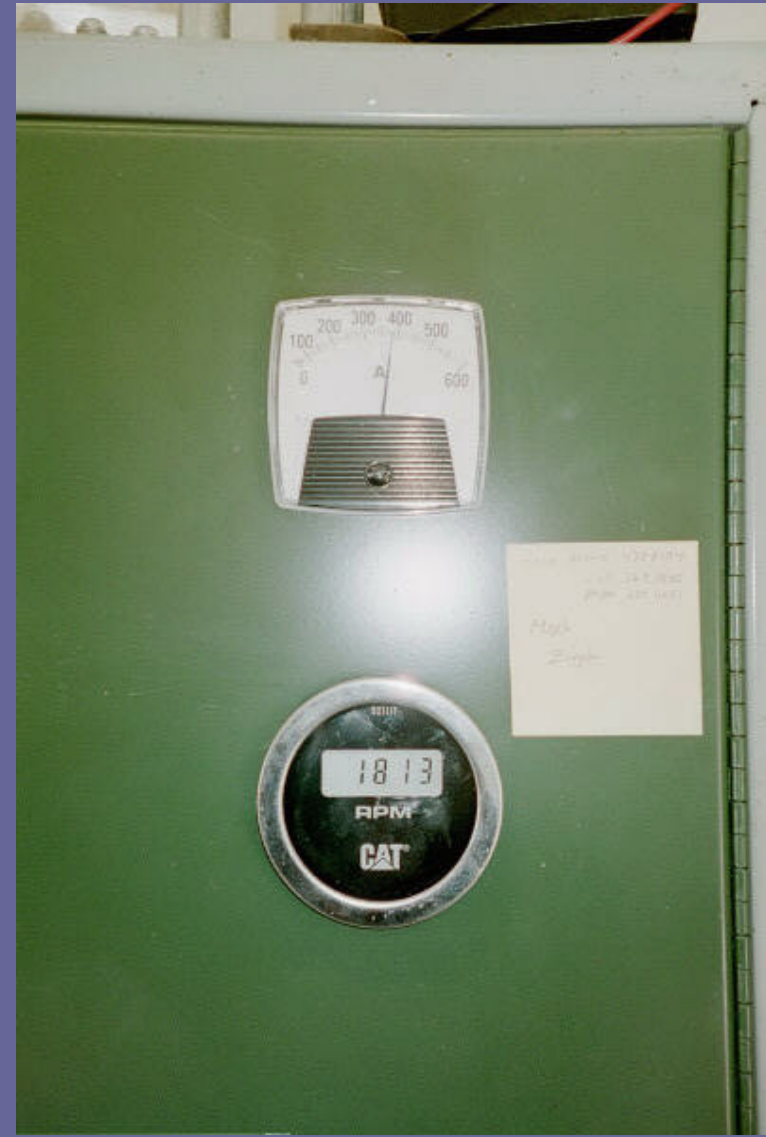


Methane Powered Co-gen Electricity Production

- Started project June 1999
- Fully operational Oct 1999
- 150Kw generator
- Waste heat recovery for digester operation and building heat



Methane Powered Co-gen Electricity Production



Electrical Transfer



connection to power company

Heat Recovery



heat exhaust recovery



hot water storage - 180F

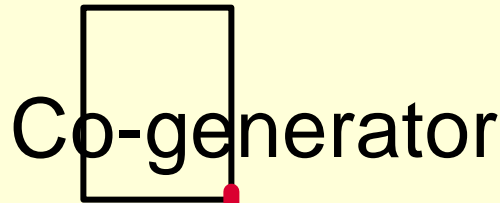
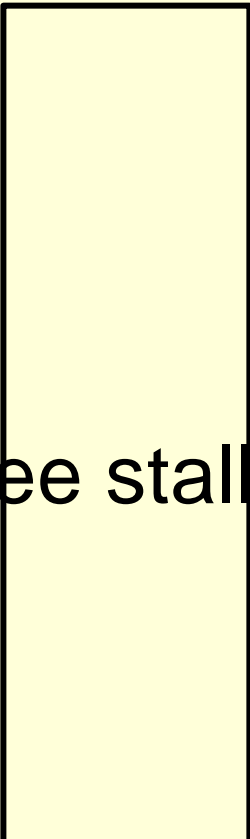
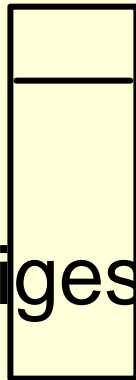


heat exchanger



boiler & pump

Layout





Soil Preservation

- Increased nutrient value of the processed manure
- More readily available to crops



- estimated \$40,000 savings in fertilizer
- manure is a commodity
- Digestate is a soil amendment

Recycled Water



- Reused many ways
- Milk cooling water goes to cow drinking water
- Milk equipment wash water goes for floor washing
- Floor wash water goes to digester/lagoon

Recycled Newspaper for Cow Bedding



- 4 tons per week
- minimal costs

- Optimal bedding
- Excellent anaerobic



Table 1: Projected and Actual Costs of Haubenschield Farm Digester System

Component	Projected \$	Actual \$
Mix Tank/ Manure Collection		
Excavation/grading	3,400	0*
Cement work	12,500	18,800
Manure pump	10,000	11,300
Other (piping, installing)		2,300
Subtotal	25,900	32,400
Digester		
Excavation/grading	10,600	8,500
Digester tank	68,500	88,700
Heating	8,500	19,800
Cover	4,600	8,100
Start-up	5,000	0*
Miscellaneous	7,800	0*
Subtotal	105,000	125,100
Energy Conversion		
Building	17,400	16,400
Gas pipes	2,000	2,100
Gas pump/meter	6,000	2,000
Engine-generator/hot water recovery	87,000	106,000
Components and installation	13,700	31,000
Subtotal	126,100	157,500
Miscellaneous		
Engineering	25,000	40,000
Contingencies	25,700	0*
Subtotal	50,700	40,000
TOTAL	307,700	355,000
COST/COW (assuming 1000 cows)	\$307	\$355

*Costs for these items are embedded in other items for which costs are shown

01/12/2002	54968	505	20200	45748	10181	218	45	9170	11030	\$811.10	\$1,454.50	63372000	114200	480900	90	2.2	18951.6	167.2
01/18/2002	55403	434	18130	45882	10216	215	54	9060	9100	\$873.52	\$1,316.80	63820000	114250	487000	30	0.8	20120.9	168.1
01/25/2002	55803	400	18030	46178	10288	214	53	9050	6910	\$814.48	\$1,180.00	64230000	114200	388800	30	0.0	20298.9	148.0
02/01/2002	56388	685	23430	46401	10323	225	55	9550	13850	\$1,018.15	\$1,368.50	64705700	114275	477100	15	0.4	20448.3	178.4
02/05/2002	56674	263	17460	46597	10375	199	52	9360	8090	\$838.66	\$829.40	65107700	114290	420000	10	0.4	20603.1	154.0
02/15/2002	57134	463	18430	46812	10429	214	51	9100	9000	\$868.02	\$1,334.00	65577100	114320	489400	30	0.8	20773.8	170.5
02/22/2002	57931	497	18690	47023	10486	212	55	9070	10810	\$798.77	\$1,441.30	66035400	114330	486300	10	0.3	20945.5	169.9
03/01/2002	58146	616	20600	47230	10540	207	52	8800	11800	\$869.76	\$1,483.50	66546200	114300	492800	100	2.7	21105.3	169.8
03/08/2002	58508	463	18630	47438	10584	209	44	8760	9780	\$715.82	\$1,342.70	66863700	114480	421500	50	1.4	21254.3	145.0
03/15/2002	59156	543	21930	47647	10628	203	44	8800	13150	\$955.82	\$1,582.10	67476900	114540	508100	180	4.4	21428.6	174.0
03/22/2002	59584	535	21440	47848	10679	201	51	8560	12890	\$847.63	\$1,554.40	67953100	114840	477300	200	-5.5	21581.2	162.3
03/29/2002	60218	624	20980	48050	10731	202	52	8800	12390	\$809.58	\$1,519.90	68438400	115050	485300	260	6.8	21757.9	168.3
04/05/2002	60736	621	20640	48247	10800	197	55	8570	12270	\$807.17	\$1,510.90	68930700	115260	492300	170	4.6	21925.7	169.0
04/12/2002	61254	615	20630	48448	10857	199	57	8530	12070	\$888.61	\$1,485.90	69417500	115400	489300	150	4.4	22093.8	168.9
04/19/2002	61778	624	20930	48638	10902	223	45	9370	11550	\$851.75	\$1,519.60	69916300	115710	500700	280	7.8	22263	169.4
04/26/2002	62303	625	21000	48867	10964	199	82	8540	12490	\$919.10	\$1,522.50	70405800	116110	487800	400	10.8	22428.4	165.4
05/03/2002	62776	473	18920	49088	11019	201	55	8590	10330	\$762.95	\$1,371.70	70873900	116290	488000	120	3.3	22595.4	167.0
05/10/2002	63246	472	18880	49304	11084	206	38	10050	8790	\$863.85	\$1,388.90	71412900	116320	488700	90	2.5	22762.3	194.0
05/17/2002	63743	495	18800	49492	11145	189	31	8130	11670	\$861.63	\$1,435.50	71929900	116470	411300	150	4.1	22932.4	142.1
05/24/2002	64275	532	21280	49702	11201	213	55	8060	12320	\$807.48	\$1,542.90	72321800	116590	487900	180	4.4	23103.2	169.8
05/31/2002	64771	408	15840	49955	11254	267	53	11210	8630	\$839.19	\$1,630.40	72902900	116800	490600	170	4.8	23287.6	195.6
06/07/2002	65256	489	18620	50238	11304	267	50	11180	8340	\$817.40	\$1,415.20	73395200	116980	492800	180	4.6	23461.1	167.3
06/14/2002	65719	463	18430	50531	11358	295	54	12340	6950	\$603.12	\$1,334.00	73763800	117080	470400	100	2.7	23632.4	167.3
06/21/2002	66280	611	20440	50830	11403	304	46	12610	7630	\$679.15	\$1,481.90	74263700	117190	500100	110	3.0	23772.4	170.0
06/28/2002	66723	493	19720	51148	11451	313	48	13000	6720	\$499.44	\$1,429.70	74756500	117290	481800	120	2.7	23942.9	169.3
07/05/2002	67155	478	19040	51467	11492	313	61	12850	6110	\$453.43	\$1,380.40	75254800	117470	488300	180	4.8	24109.3	167.4
07/12/2002	67573	474	18980	51776	11536	313	44	13160	5800	\$491.72	\$1,374.60	75737700	118050	482900	780	51.2	24275.6	162.3
07/19/2002	68187	624	20950	52101	11576	322	40	13280	7680	\$867.00	\$1,519.50	76231100	118920	493400	1570	42.9	24437.8	167.2
07/26/2002	68726	623	21180	52421	11622	323	46	13260	7900	\$884.46	\$1,534.10	76726200	121260	495100	1440	99.3	24601.1	168.3
08/01/2002	69254	523	21130	52748	11668	327	36	13440	7680	\$865.98	\$1,531.20	77228500	121570	502300	310	8.5	24775.1	169.0
08/09/2002	69741	497	19480	53062	11712	314	54	13100	6390	\$479.22	\$1,412.30	77700200	121890	471700	320	6.7	24942	169.8
08/16/2002	70260	614	20580	53394	11750	322	36	13260	7300	\$653.64	\$1,480.90	78167500	122290	487900	340	9.3	25111.7	163.3
08/23/2002	70756	501	20040	53698	11787	315	47	13070	6970	\$617.81	\$1,452.90	78633600	122500	476100	270	7.4	25278.2	169.3
08/30/2002	71283	627	21080	54018	11829	319	42	13180	7900	\$663.48	\$1,528.30	79109100	122820	485500	420	11.5	25445.9	167.7
08/09/2002	71806	625	21000	54332	11866	314	47	13350	7070	\$689.81	\$1,522.50	79666400	123600	487300	680	18.8	25612.2	169.3
09/13/2002	72316	609	20320	54643	11900	311	34	12780	7540	\$665.32	\$1,673.20	70152300	124070	486900	470	12.8	25780.1	164.8
09/20/2002	72840	624	20980	54938	11971	292	51	12190	8770	\$648.83	\$1,519.80	70696900	124290	488500	180	4.4	25948.9	168.8
09/27/2002	73369	628	21160	55180	12020	245	45	10250	10870	\$803.67	\$1,524.10	71144800	124500	494000	270	7.4	26117.6	188.3
10/04/2002	73880	611	20440	55444	12061	264	41	10870	9470	\$697.03	\$1,481.90	71635200	124580	488400	80	2.5	26284.3	168.3
10/11/2002	74395	613	20520	55674	12102	230	41	9810	10910	\$801.43	\$1,487.70	72130000	124700	481800	110	3.0	26453.4	169.1
10/18/2002	74906	613	20520	55899	12140	225	43	9430	11080	\$814.89	\$1,487.70	72611600	124800	486900	100	2.7	26621.1	167.3
10/25/2002	75367	491	19940	56122	12187	223	42	9340	10300	\$757.48	\$1,475.90	73092200	125150	480600	330	9.0	26795.8	168.7
11/01/2002	75829	632	21280	56348	12230	227	45	9510	11770	\$864.29	\$1,542.90	73581300	125190	499100	80	1.6	26959.6	168.0
11/08/2002	76387	608	20320	56572	12267	223	27	9190	11130	\$813.81	\$1,675.20	74065500	125215	484200	25	0.7	27128.5	167.3
11/15/2002	76900	483	18520	56787	12312	225	55	9550	8970	\$684.55	\$1,342.70	74549400	125250	489300	25	1.0	27294.4	167.8
11/22/2002	77461	651	22040	80	12367	225	45	9460	12580	\$824.25	\$1,567.90	75036800	125280	487400	30	0.8	27463.1	168.3
11/29/2002	77960	506	20380	272	12411	192	54	8220	12140	\$893.92	\$1,476.10	75517800	125300	480800	20	0.5	27630.1	167.0
12/05/2002	78469	638	20360	486	12468	224	17	9330	10930	\$799.71	\$1,476.10	75997000	125310	479700	10	0.3	27797.6	167.3
12/12/2002	78922	433	18120	720	12516	224	46	8440	8880	\$641.54	\$1,315.70	76450000	125360	452700	50	1.4	27964.1	166.5
12/19/2002	79456	614	20580	949	12562	225	26	9520	11040	\$809.68	\$1,480.90	76930000	125415	490000	55	1.5	28123.6	156.5
12/27/2002	79918	492	19280	1171	12597	222	45	8330	9950	\$732.85	\$1,387.80	77408200	125510	478200	165	5.9	28292.1	168.9
01/03/2003	80395	477	19080	1384	12648	223	49	8410	9670	\$713.57	\$1,383.30	77884700	125780	476500	120	3.2	28460.1	168.0
01/10/2003	80879	484	19360	1615	12694	215	48	8240	10120	\$745.94	\$1,403.90	78365800	128100	481200	370	10.1	28628.2	188.1
01/17/2003	81340	481	18440	1846	12735	235	41	8810	8830	\$638.13	\$1,336.90	78831700	128380	456800	280	7.7	28795.4	172.2
01/24/2003	81764	414	16560	2089	12772	230	37	8770	6780	\$601.71	\$1,200.30	79272000	128420	440300	40	1.1	28968.2	188.8
01/31/2003	82218	482	16480	2313	12809	230	37	8670	8310	\$655.41	\$1,339.80	79722400	128710	456400	2250	62.6	29131.8	162.6
Total kWh made		3,335,480			Total kWh sold	1												

Advantages

- ✓ Reduce Odor
- ✓ Generation of Electricity
- ✓ Thermal Energy Production
- ✓ Increase in Fertilizer Value
- ✓ Pathogen Reduction
- ✓ Weed Seed Reduction
- ✓ Greenhouse Gas Reduction - Carbon Credit Value



SUMMARY

"Even if you are on the right track,
you will get run over
if you just sit there..."

Will Rogers

**"Even if you're on the right
track, you'll get run over if
you just sit there."** —Will Rogers

