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CORRECTION #2

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Grain Dust Explosions Up in 1994*

There were 15 grain dust explosions reported for the U.S. in 1994 according to Robert W. Schoeff, Professor Emeritus and Consultant, Kansas State University and Ralph Regan, Safety Director, USDA-FGIS. This compares to 13 in 1993 and a ten-year average of 15 explosions.

There was one fatality and 14 persons injured.

Seven of the fifteen incidents occurred in grain elevators, three in flour mills, and one in a wet corn milling and malt plant.

The bucket elevator (leg) continues as the leading location for the primary explosion, 9 of 15.

The **probable cause** of ignition was bearing failure (3), sparks in grinder (3), welding and cutting (2), fire from burning belt, hot metal surface and unknown (5).

Fuel sources were identified as corn (8), wheat (2), rice, sorghum, oat hulls, barley malt and protein supplement pellets.

Most of the grain dust explosions occurred in the midwest with four in Iowa, three in Kansas, and one in Arkansas, Illinois, Indiana, Minnesota, Nebraska, North Carolina, Oregon, and Pennsylvania. Dust explosions have occurred in 25 states during the past ten years with Iowa the leading state with 21 reported explosions.

Property damage was estimated to be \$7,228,000.00.

Appreciation is expressed to the many persons who provided the information that allowed us to compile data on grain dust explosions as a service to the grain storage and processing and allied industries, trade associations, and government agencies.

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*This report subject to revision as additional information is received.

REPORTED GRAIN DUST EXPLOSIONS IN U.S. - 1994**

<u>NO.</u>	<u>DATE</u>	<u>COMPANY AND ADDRESS</u>	<u>FACILITY</u>	<u>DAMAGE*</u>	<u>KILLED</u>	<u>INJURED</u>
1	Jan. 11	ADM Milling Co. Mt. Vernon, IN	Flour Mill	Moderate	0	0
2	Feb. 20	Farmers Co-op Lawrence, KS	Grain Elevator	Minor	0	1
3	Apr. 14	Grant Co. Feeders Ulysses, KS	Feed Mill	Minor	0	4
4	Apr. 18	ADM Co. ¹ Peoria, IL	Grain Elevator	Moderate	0	2
5	Apr. 21	Roush Products Co. Cedar Rapids, IA	Bakery Mix Plant	Moderate	0	0
6	May 2	Spanglers Flour Mills Mt. Joy, PA	Flour Mill	Moderate	0	0
7	May 28	Penford Products Cedar Rapids, IA	Starch Plant	Moderate	0	0
8	June 16	Rahr Malting Co. Shakopee, MN	Malt Plant	Severe	0	2
9	July 22	Kroft Feed Inc. Harrisburg, OR	Feed Mill	Severe	0	4
10	Aug. 25	Fort Kearny Feeders Minden, NE	Feed Mill	Minor	0	0
11	Sept. 14	Riceland Foods Jonesboro, AR	Grain Elevator	Minor	0	0
12	Sept. 25	Tama-Benton Co-op Dysart, IA	Grain Elevator	Moderate	0	0
13	Oct. 30	Consolidated Co-op Gowrie, IA	Grain Elevator	Moderate	1	1
14	Nov. 23	Healy Co-op Healy, KS	Grain Elevator	Moderate	0	0
15	Dec. 26	W.L. Pryor Feed & Farm Supply Ruffin, NC	Grain Elevator	Moderate	0	0
TOTALS					1	14

*Minor: Less than \$50,000; Moderate: \$50,000-\$500,000; Severe: Over \$500,000

¹Company will not cooperate in providing basic information.

**Report is subject to revision as new information is received.

In cooperation with Ralph Regan, FGIS, USDA, Washington, DC

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April 10, 1995

TABLE 1. U.S. GRAIN DUST EXPLOSION STATISTICS*

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>TEN YEAR TOTAL</u>
Number	23	23	16	12	13	15	12	6	13	15	148
Dead	4	2	0	8	2	0	1	1	2	1	21
Injured	20	14	18	10	7	7	4	8	20	14	122
Est. Damage to Facility (\$ Mil.)	65.0	1.6	8.3	8.7	3.9	5.0	.3	.4	4.0	7.1	104.3
Type of Facility:											
Grain Elevator	19	13	11	7	7	8	4	5	9	7	90
Feed Mill	1	5	4	1	1	1	4	0	0	3	20
Flour Mill	0	1	0	0	0	2	1	0	1	2	7
Other:											
Corn Milling, Dry	2	0	0	2	1	1	0	0	0	0	6
Corn Milling, Wet	0	0	0	0	2	1	0	0	1	1	5
Soybean	0	0	0	0	0	0	0	0	0	0	0
Rice Mill	1	2	0	1	0	1	1	0	0	0	6
Oat Mill	0	0	0	1	0	0	0	0	0	0	1
Other	0	2	1	0	2	1	2	1	2	2	13

*Source: Robert W. Schoeff, Kansas State University, in cooperation with Ralph Regan, FGIS-USDA, April 10, 1995

TABLE 2. GRAIN DUST EXPLOSIONS
BY COMMODITY HANDLED AT TIME OF EXPLOSION

<u>COMMODITY</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>TEN YEAR TOTAL</u>
Corn	14	6	13	7	4	2	5	4	9	8	72
Sorghum	2	6	0	0	2	1	0	0	0	1	12
Soybeans	0	1	1	1	1	1	0	0	1	0	6
Wheat	0	2	0	1	0	1	1	1	1	2	9
Barley	1	1	0	0	0	1	1	0	0	1	5
Oats	0	0	0	1	1	0	1	0	0	1	4
Beet Pulp	0	0	0	0	1	0	0	0	0	0	1
Corn Starch	1	0	0	0	1	0	0	1	2	0	5
Corn Gluten Meal	2	0	0	1	1	0	0	0	0	0	4
Distillers Feed	0	0	0	0	0	1	0	0	0	0	1
Feed By-Products	0	0	0	0	1	1	0	0	0	0	2
Grain Screenings	0	0	1	0	0	1	0	0	0	0	2
Mixed Feed	0	0	1	0	0	0	0	0	0	0	1
Rice (Bran)(Flour)	1	2	0	1	0	1	0	0	0	1	6
Wheat Flour	0	0	0	0	0	1	0	0	0	0	1
Wheat (Starch) (Gluten)	0	0	0	0	1	0	0	0	0	0	1
Other	2	5	0	0	0	4	4	0	0	1	16
TOTAL EXPLOSIONS	23	23	16	12	13	15	12	6	13	15	148

Source: Robert W. Schoeff, Kansas State University, Manhattan, KS 66506-2201, April 10, 1995

TABLE 3. U.S. GRAIN DUST EXPLOSIONS

LEADING STATES - 1958 to Date

<u>STATE</u>	<u>1958-1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>10-YEAR TOTAL</u>
Iowa	41	2	2	2	1	3	0	4	2	1	4	21
Kansas	21	1	6	0	0	3	3	1	0	0	3	17
Illinois	41	4	1	2	1	2	2	0	1	0	1	14
Minnesota	29	2	1	1	3	1	2	0	0	1	1	12
Nebraska	52	4	2	0	0	1	0	1	0	3	1	12
Indiana	13	2	1	2	1	0	0	1	0	1	1	9
Louisiana	8	0	2	0	1	2	2	0	0	2	0	9
Ohio	17	2	0	2	0	0	1	1	0	2	0	8
Texas	34	1	2	1	1	0	1	0	1	0	0	7
Missouri	23	0	1	2	0	0	1	0	0	0	0	4
South Dakota	4	2	1	0	0	0	0	0	1	0	0	4
Washington	2	0	1	0	0	1	1	1	0	0	0	4

Source: Robert W. Schoeff, Kansas State University, Manhattan, KS 66506-2201, April 10, 1995