Public Information and Records Integrity Branch (PIRIB)
Office of Pesticide Programs (OPP) Mail Code (7502C)
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460-0001

Attention: Docket ID Number OPP-2002-0262. Endosulfan; Availability of Reregistration Eligibility Decision Documents for Comment

Endosulfan Re-Registration Eligibility Decision, Arizona Pesticide Usage Data

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Raw data originated by Arizona Department of Agriculture, processed by Arizona Agricultural Statistics, & provided by the Pesticide Information & Training Office (PITO)

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Issue: Endosulfan is currently under regulatory scrutiny. With respect to cotton aerial usages in the West, concern has been voiced about occupational risk, specifically exposures associated with mixing/loading of the liquid insecticide. Margins of Exposure (MOEs) have been calculated based on current labelled restrictions for endosulfan use in cotton which fall below 100, the threshold for Agency concern. Based on rodent models, the Agency has suggested that a mixer/loader involved with the application of no more than 900 lbs ai / day equates to an MOE greater than 100. To accomplish this endpoint, the Agency has recommended a lowering in the maximum usage rate for endosulfan to 0.75 lbs ai / A.

Data: Arizona through the Form L1080 monitors all commercially-applied insecticides including all aerial applied pesticides. This information is required for every prescribed application and contains a variety of information that provides targets for enforcement. The forms are submitted by FAX or electronically each day to Arizona Department of Agriculture (ADA), the principal regulatory and enforcement agency for our state. These data are then processed by Arizona Agricultural Statistics. The entire database is then made available to the University of Arizona's Pesticide Information and Training Office (PITO) under the direction of Dr. Paul Baker. While UA is not involved with enforcement issues, his staff can exercise the data and provide data summaries useful in gaining insight into local management practices. All data used in this report were obtained through PITO via the process described above.

Rates & Role: Endosulfan has historically been an important active ingredient to Arizona cotton producers. For the four years examined (1998–2001), endosulfan has been either the number 2 or number 3 most popular active ingredient in terms of application-acres (Table 1). The four-year average was over 85,000 acres, in third place just behind chlorpyrifos at about 90,000 acres. Acephate has been Arizona's number one active ingredient during this period (152,000 acres).

The rates used by growers varies according to specific target and use pattern. When used alone, the 3-yr average rate is 1.37 lbs ai / A. When used in tank mixtures, the rate falls somewhat to 1.02 lbs ai / A (Table 2). Overall, however, Arizona uses rates that far exceed what is typical of the rest of the cotton belt to the East. Part of the reason for this is likely the differences in pest targets.

Endosulfan is used primarily as a *Lygus* control and rotational alternative to acephate or oxamyl, and as a whitefly control when used alone at very high rates or as an important synergist at a lower rate (ca. 0.5 lbs ai / A) with pyrethroids. In the past several years, insecticide use has plummeted to historic lows in Arizona. Over the past 4 years (1999–2002), Arizona cotton growers have sprayed insecticides between 2 and 3 times for season-long control of all insect pests. With fewer flights over any given field, the strategic choice of compounds is often more critical than when application frequencies are high. Endosulfan fills an important niche in that a full rate (1.5 lbs ai / A) has been shown to be effective in controlling *Lygus hesperus* and *Bemisia tabaci* simultaneously. The other UA recommended *Lygus* insecticides cannot control *B. tabaci,* and the whitefly IGRs are selective against *B. tabaci* only. It is also an important rotational synergist for pyrethroids that are otherwise mixed mainly with organo-phosphates.

Summary Statistics for Endosulfan Usage by Year: The use of endosulfan can be quantified in any number of ways, each useful in understanding a specific aspect of Arizona's use pattern. Table 3 details endosulfan applications for each of three years by no. of applications, no. of days applied, modal dates of use, maximum no. of applications per day, no. of growers, pest control advisors (PCAs), and pilots who used, recommended, or applied endosulfan. In general, the vast majority of applications are concentrated among a relatively small number of growers, PCAs, and pilots. This should not minimize the importance of endosulfan to this region; however, it should bolster confidence in any attempt by educational campaigns to reach all stakeholders.

The Aerial Application Industry: The applicator industry shrank in the last several years with the concomitant reduction in insecticide use here. What remains is a very small industry responsible for a disproportionately large acreage and geography. Based on L1080 data for the years under study (1999–2001), there are 12 or 13 custom applicator businesses, i.e., companies in the business of aerial pesticide application. Of these, the majority are small operations: 7 have just 1 pilot; 2 have 2 pilots; 2 have 3 pilots; and 1 has 7 pilots (Table 4). No specific information is available from Form L1080 on the number of mixer/loaders involved in the aerial application business. However, given the small number of pilots per business, an assumption of just 1 mixer/loader per business is a very conservative one, and "per pilot" usage statistics should provide a general indication of the quantity of endosulfan mixed/loaded per day. For example, there were 11 pilots in 2001, 8 in 2000, and 11 in 1999 that were involved in the application of more than 900 lbs ai / d, i.e., less than half of the pilots apply an amount of endosulfan that might be of concern to the Agency.

The "900 lbs ai / d Limit": While the Agency's interests are best served by lowering the maximum handling by mixer/loaders of endosulfan to just 900 lbs ai / d, their own mitigation recommendations erroneously address a different target, maximum labelled rates. Put another way, by merely halving the effective rate of endosulfan, the Agency cannot assure that a mixer/loader is not involved with the delivery of more than 900 lbs ai / d. Through detailed analyses of usage patterns over three typical seasons (1999–2001), we can examine instances when the 900 lb / d limit is exceeded by individual pilots (Figure 1) or entire custom application businesses (Figures 2 & 3). Pilot-level statistics might underestimate the exposure of a potential mixer/loader. For instance, if that mixer/loader is working at a multi-plane business, they may be simultaneously mixing/loading more than one airplane (though the converse may also be true). However, custom business-level statistics either exactly estimate exposure (i.e., 1 plane - 1 mixer/loader businesses), or potentially and very conservatively overestimate their exposure (i.e., assumes only 1 mixer/loader for a multi-plane

business). In fact, for the business that has 7 pilots, they have to use multiple mixer/loaders just to accommodate the large geography covered and work shifts used by this business. Thus, business level statistics should be a very conservative measure of potential exposure of the mixer/loader community to endosulfan.

Figure 1 shows pilot-level statistics for 1 year (2001) for each of 11 pilots who were involved with the application of more than 900 lbs ai / d. Due to shift changes and the availability of multiple mixer/loaders, it cannot be concluded that in all instances potential exposure was excessive. However, it does show that in most cases, there were only a few days for each of these pilots over the 900 lb limit.

An even more conservative approach would be to examine business level statistics (Figures 2 & 3). Here it becomes apparent that about half of the custom applicator businesses in 2001 applied in excess of 900 lbs ai in at least one day during the cotton season. Interestingly, our largest business employing 7 pilots exceeded the 900 lb limit only on 7 days in 2001.

Recommendations: Clearly the Arizona pesticide tracking system is capable of monitoring insecticide use patterns with great precision when it comes to applications (e.g., aerially). Furthermore, these data show an ability to infer potential mixer/loader risk based on conservative relationships (i.e., per pilot or per custom application business). Thus, despite specific documentation of individual mixer/loaders on the Form L1080, ADA has access to a powerful means to not only enforce but to educate stakeholders about endosulfan usage limits. Our recommendation based on the utility of this compound within this system and in order to preserve effective rates is to establish a daily use limit of 900 lbs ai / d. This would functionally protect mixer/loaders while allowing the cotton industry access to a valuable compound at appropriate rates. Furthermore, it provides for a monitoring and enforcement system based on pilot- or business-level use statistics. The alternative, lowering the effective maximum label rate, establishes “safety” with respect to calculated MOEs within a model; however, it does not assure that mixer/loaders are not involved in the daily use limits imposed by the model (i.e., 900 lbs ai / d). Furthermore, a maximum rate change may be less enforceable, as some rate restrictions are not tracked on an individual field basis. For example, maximum seasonal limits (e.g., 3 lbs ai / A / season) are examined on a section level basis. Thus, a seasonal use limit can only be detected if the total a.i. applied within an entire section exceeds the expected maximum use for all fields within a section. Thus, one field could be 10X over the seasonal use limits while the remaining fields within a section receive none of the regulated insecticide. This also pertains to any limits placed on the number of applications made. Thus, the traditional constraints on

labels (e.g., seasonal maximum lbs ai / A; no. of applications / A) are very difficult to enforce.

Finally, because the regulated community of interest in this case is so small, educational efforts are likely to lead to 100% compliance once stakeholders realize that the alternative may be the functional loss of this valuable compound. This type of mitigation measure could also serve as a model for coping with risk reduction requirements of other pesticides and can in fact lead to a safer work environment for those involved with the pesticide industry. To make enforcement operational and without altering the Form L1080 (i.e., to add mixer/loader information), ADA will have to develop a set of policy guidelines that center around the use of pilot-level and/or business-level endosulfan use patterns to infer potential regulatory infractions and risk to handlers.

Table 1. Ranked active ingredients (a.i.) for cotton in Arizona by year expressed in application*acres. Source: Pesticide Information & Training Office (PITO).

From AZ 1080 Database	1998–2001 Cumulative		2001		2000		1999		1998	
	App*Acres	A.I.	App*Acres	A.I.	App*Acres	A.I.	App*Acres	A.I.	App*Acres	A.I.
1	610680	acephate	203478	acephate	176377	acephate	230825	acephate	253188	acephate
2	361744	chlorpyrifos	114574	**endosulfan**	121643	chlorpyrifos	144702	chlorpyrifos	239630	chlorpyrifos
3	342936	**endosulfan**	106665	pyriproxyfen	101427	**endosulfan**	126935	**endosulfan**	166123	**endosulfan**
4	183230	pyriproxyfen	95399	chlorpyrifos	55211	lamda-cyhalothrin	96218	lamda-cyhalothrin	100917	lamda-cyhalothrin
5	178562	lamda-cyhalothrin	52304	fenpropathrin	50299	pyriproxyfen	39675	oxamyl	63393	oxamyl

Table 2. Endosulfan use pattern for cotton in Arizona by year expressed in application*acres, total lbs a.i. and average a.i. / A. Source: Pesticide Information & Training Office (PITO).

From AZ 1080 Database	1999–2001 Average			2001			2000			1999		
	App*Acres	total lbs	A.I.	App*Acres	total lbs	A.I.	App*Acres	total lbs	A.I.	App*Acres	total lbs	A.I.
Endosulfan alone	38730	53088	1.37	37770	48490	1.28	25003	34803	1.39	53417	75970	1.42
Endosulfan mix	75582	76836	1.02	76804	81521	1.06	76423	75306	0.99	73518	73681	1.00
Endosulfan total	114312	129924	1.14	114574	130012	1.13	101426	110109	1.09	126935	149650	1.18
%Used Alone	33.88			32.97			24.65			42.08		

Table 3. Endosulfan use summary statistics for cotton in Arizona by year. Source: Pesticide Information & Training Office (PITO).

Endosulfan Break Down	1999	2000	2001	Comments (generalized from 2001 data)
No. of Aerial Applications with endosulfan	1142	1168	1240	
No. of Days that endosulfan was applied	88	99	87	
Modal Dates of Use	7-Aug	14-Jul	7-Jul	
	14-Aug	25-Jul	4-Aug	
		2-Aug		
Maximum No. of Applications (fields?) in one day	65	56	58	
No. of Growers who used endosulfan	242	208	221	2 growers (and 2 pilots) responsible for 15% of all endosulfan applications
No. of Growers with less than 1% of applications	225	180	211	10 growers (and 9 pilots) responsible for 30% of all endosulfan applications
No. of PCAs Prescribing endosulfan	67	68	67	2 PCAs responsible for 28% of all endosulfan applications
No. of PCAs Prescribing less than 2% of apps.	52	53	54	13 PCAs responsible for 65% of all endosulfan applications
No. of Pilots Involved with endosulfan application	31	28	22	3 pilots are responsible for 49% of total lbs ai applied
No. of Pilots Applying less than 7.5% of ai	27	24	18	
No. of Pilots Applying more than 900 lbs ai / d	11	8	11	Does not account for 1080s, in a few instances, that might extend beyond 1 day

Table 4. Endosulfan use summary statistics by custom application business for cotton in Arizona by year. Source: Pesticide Information & Training Office (PITO).

Endosulfan Break Down	1999	2000	2001	
No. of days that endosulfan use exceeded 900 lbs ai	43	26	45	
No. of Custom Application Businesses involved	7	5	6	
No. businesses with more than 35% of days	2	2	1	
Business No.	No. of Days Over Limit			No of Pilots Employed
1	14	10	7	>= 7 pilots
7	14	10	19	3 pilots
17	1	1	8	2 pilots
21	1	0	3	1 pilot
147	0	3	1	1 pilot (0 in 1999)
187	4	2	5	2 pilots (5 in 1999)

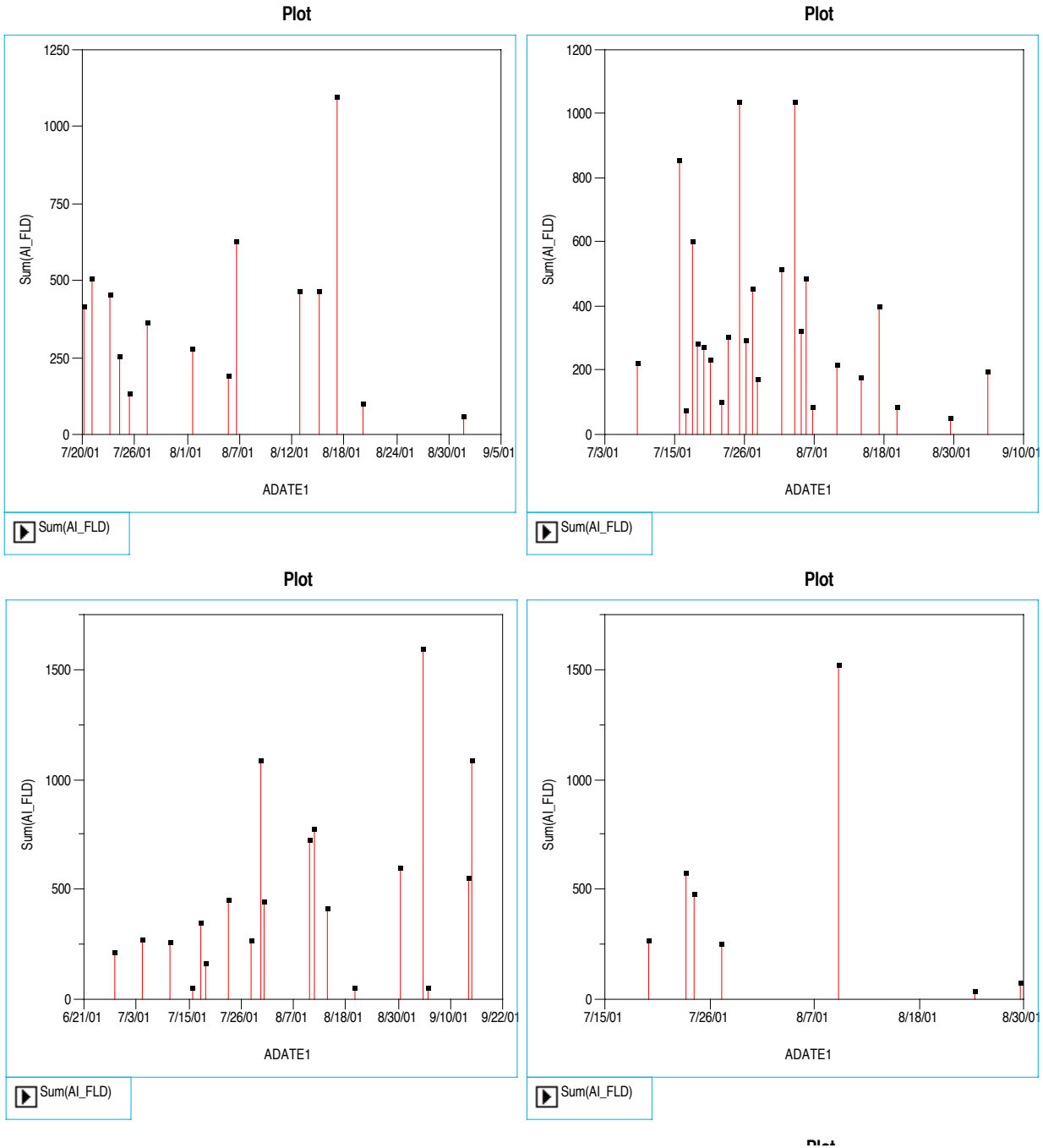
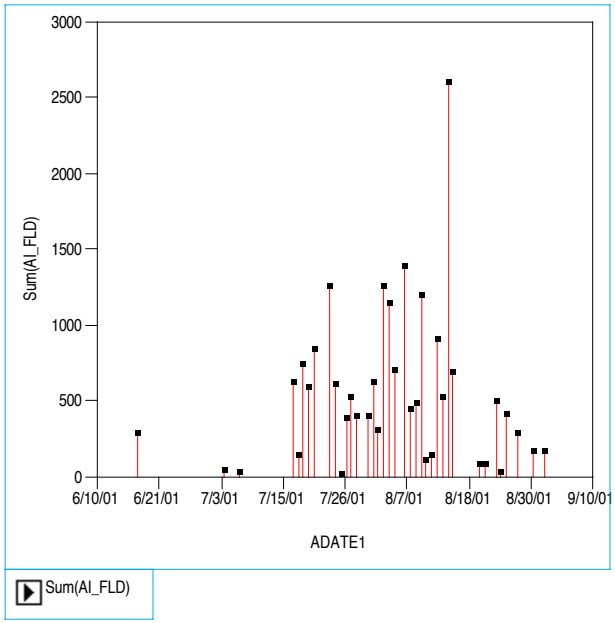


Figure 1. Endosulfan usage in lbs ai / day for each pilot that exceeded 900 lbs ai / day on at least one day in Arizona cotton (2001).

Plot



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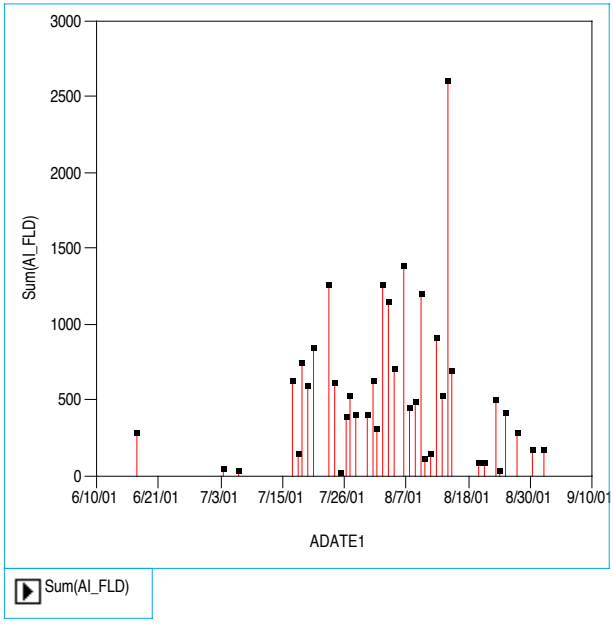

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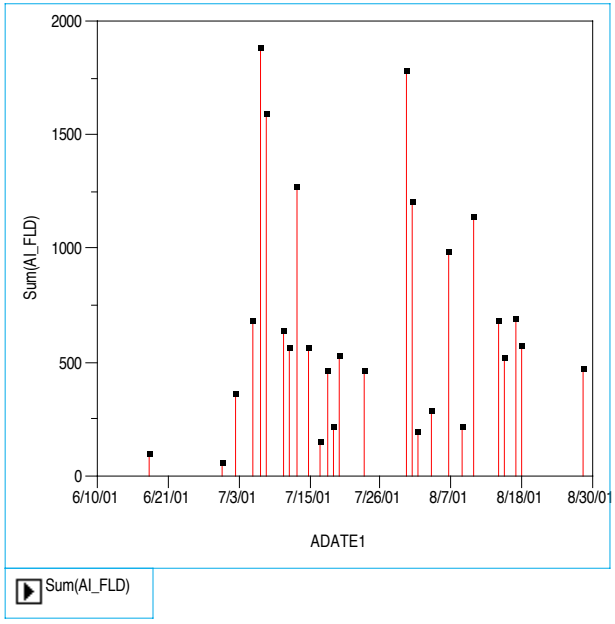

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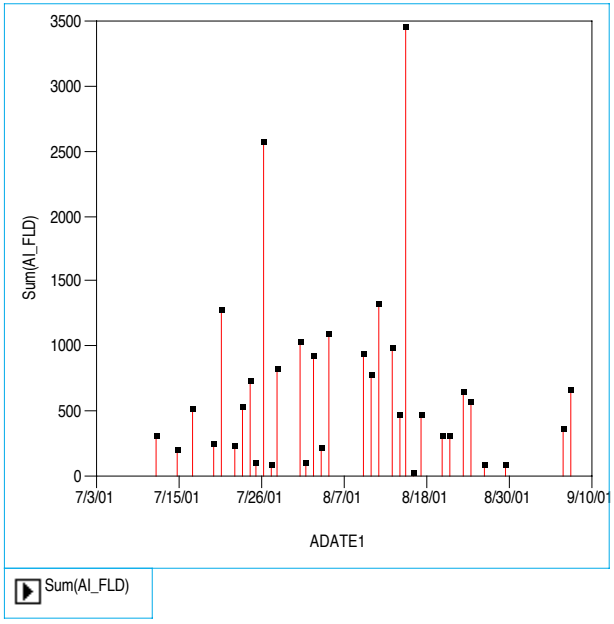

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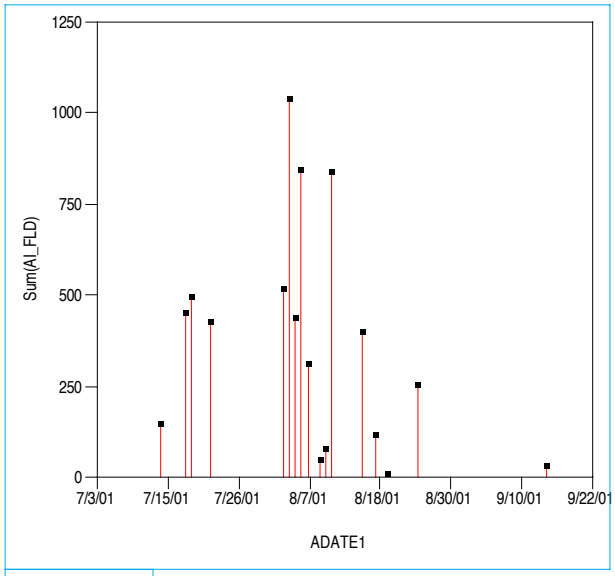

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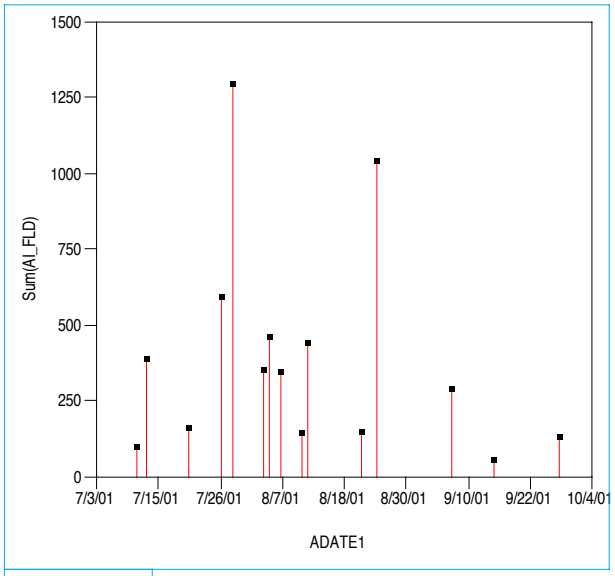

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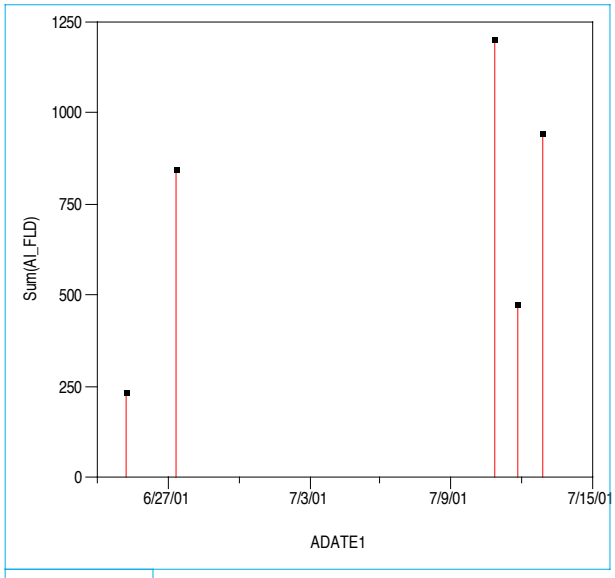

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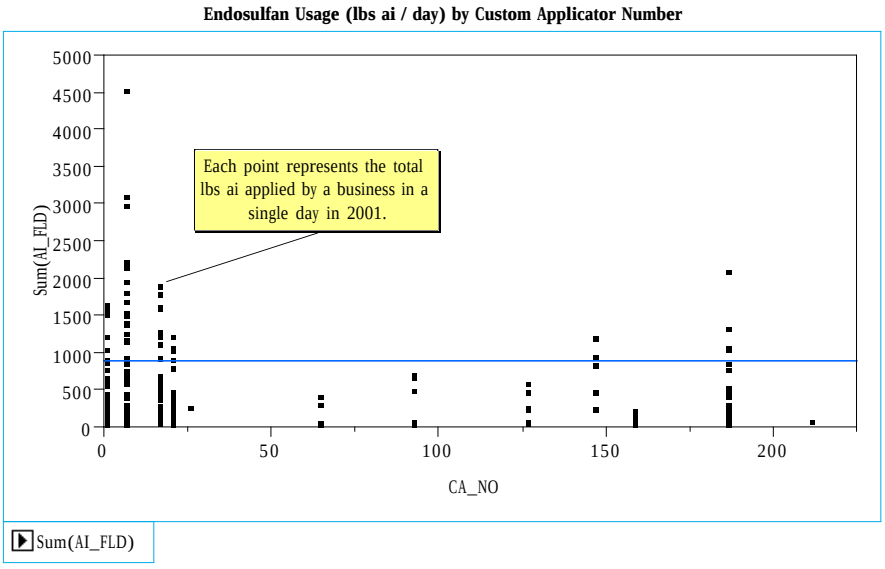
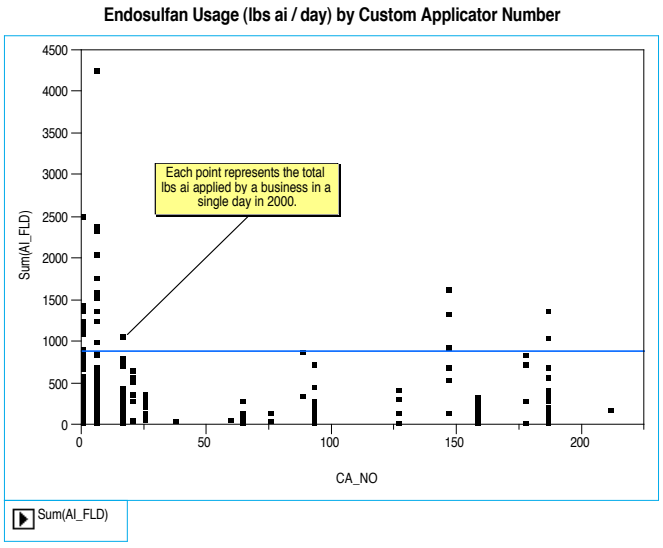




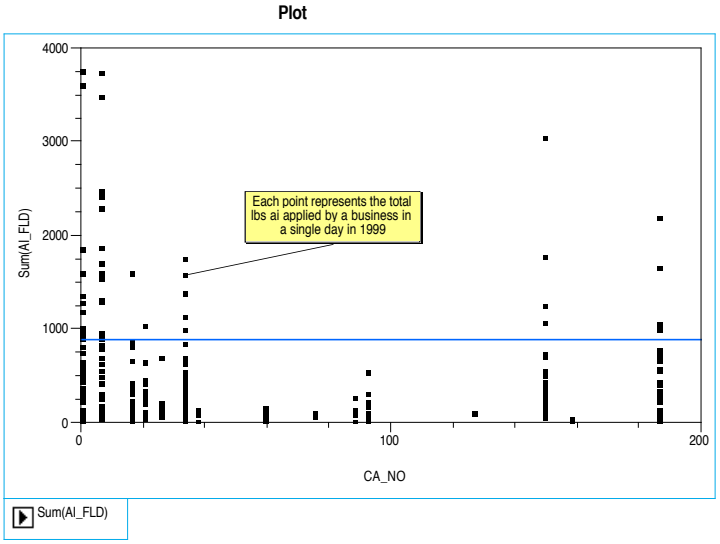
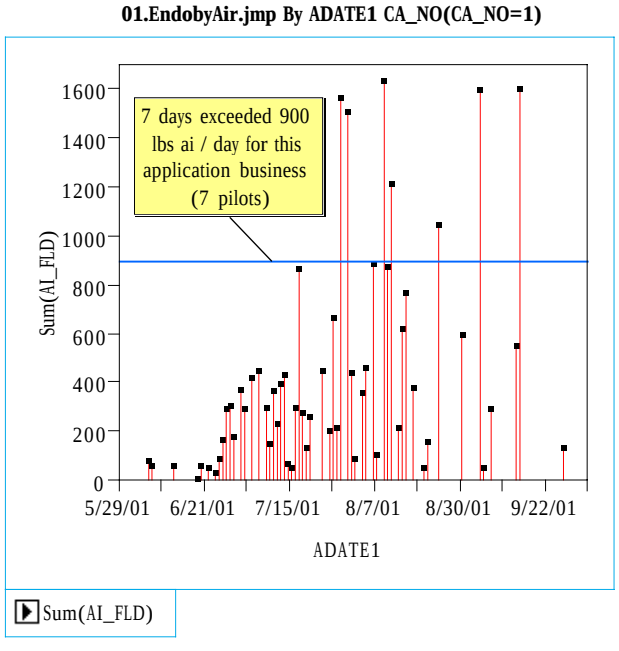
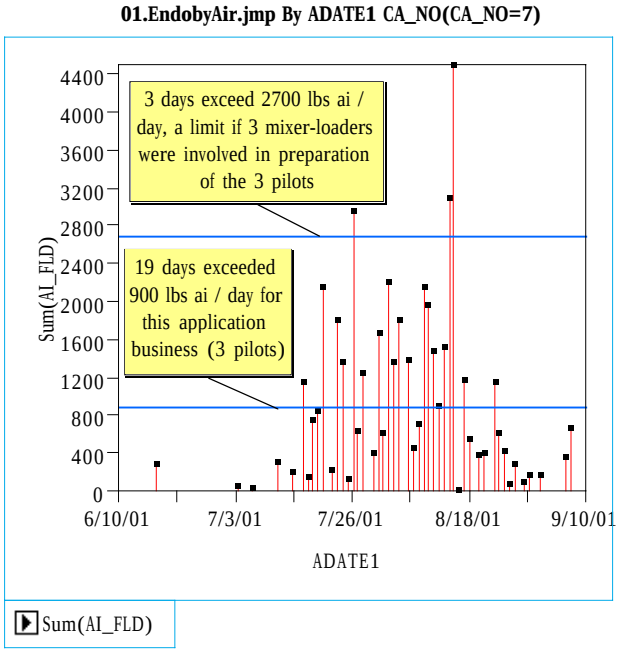
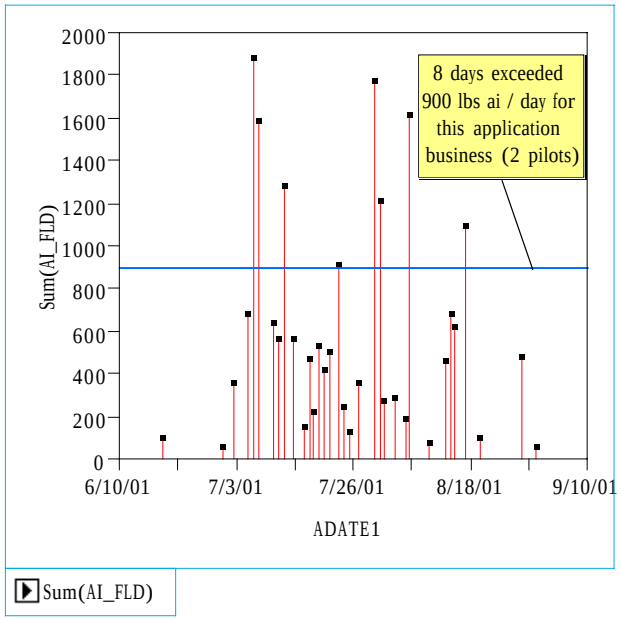


Figure 2. Endosulfan usage in lbs ai / day by custom applicator business for three years in Arizona cotton.







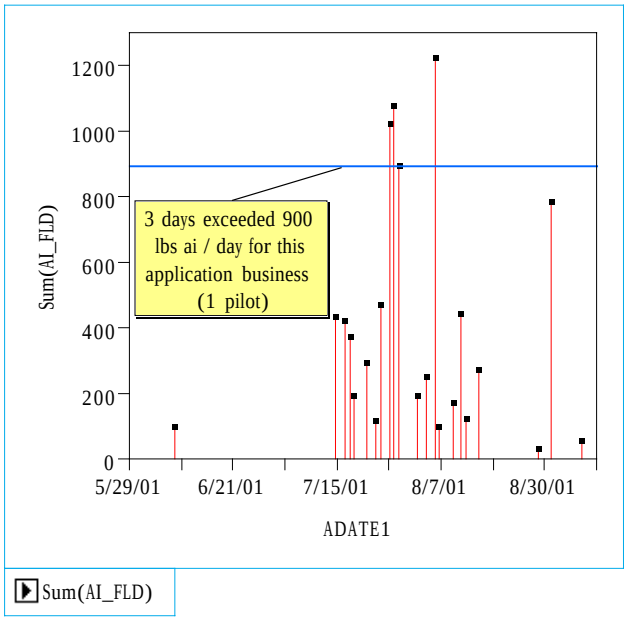


Figure 3. Endosulfan usage in lbs ai / day for each custom application business that exceeded 900 lbs ai / day on at least one day in Arizona cotton (1999-2001).

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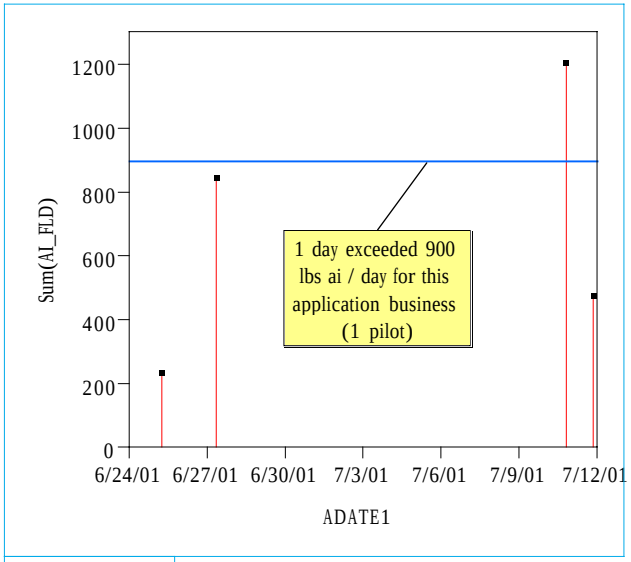

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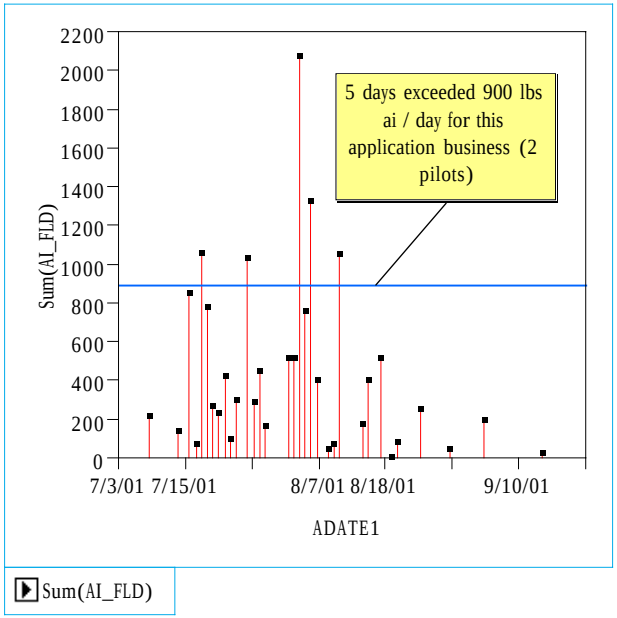

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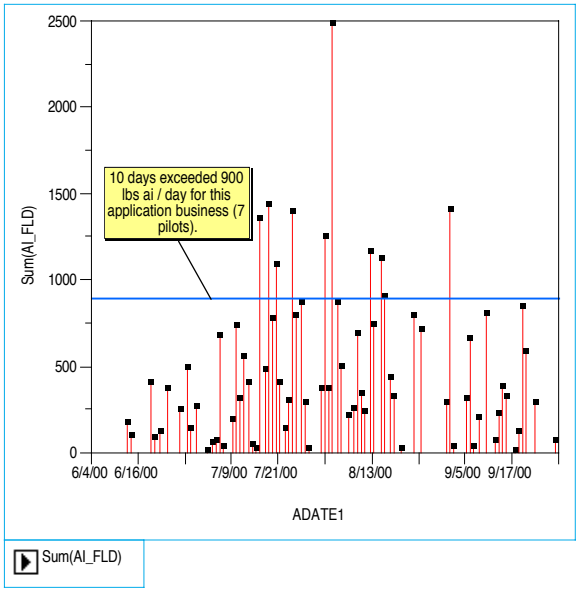

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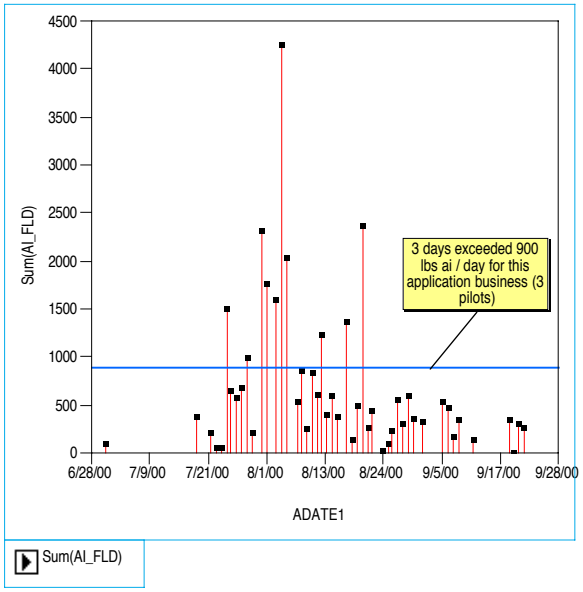

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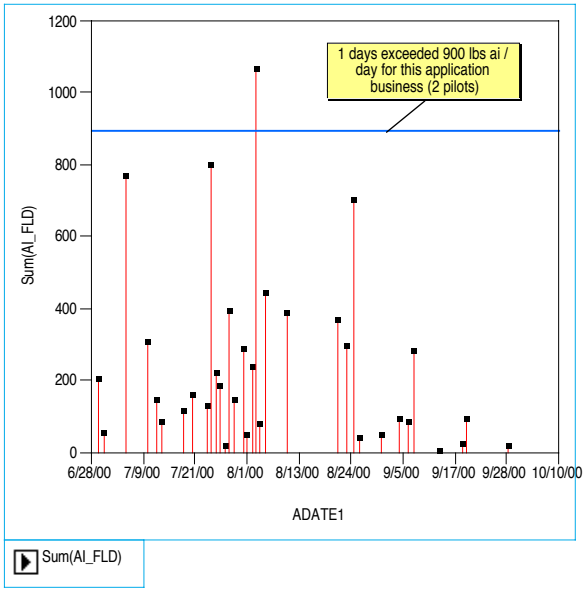

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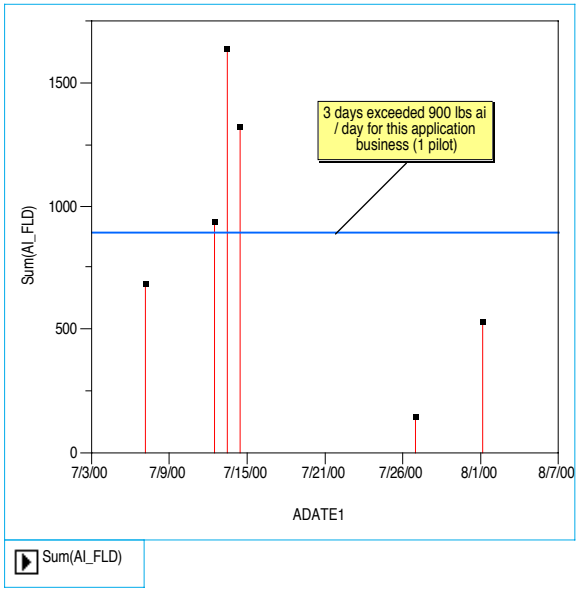

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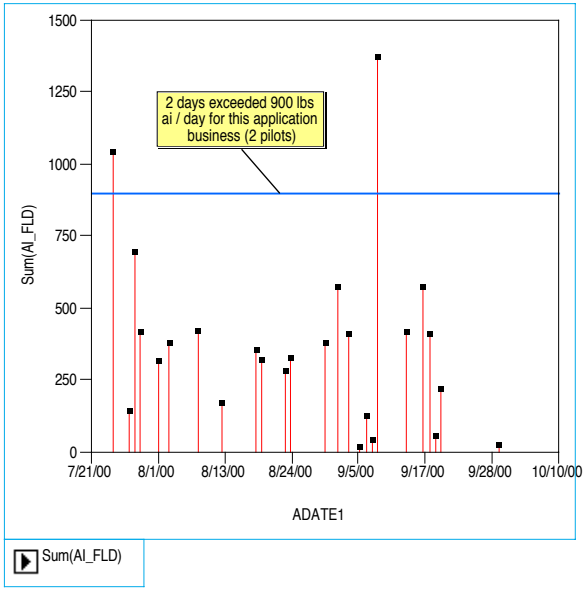

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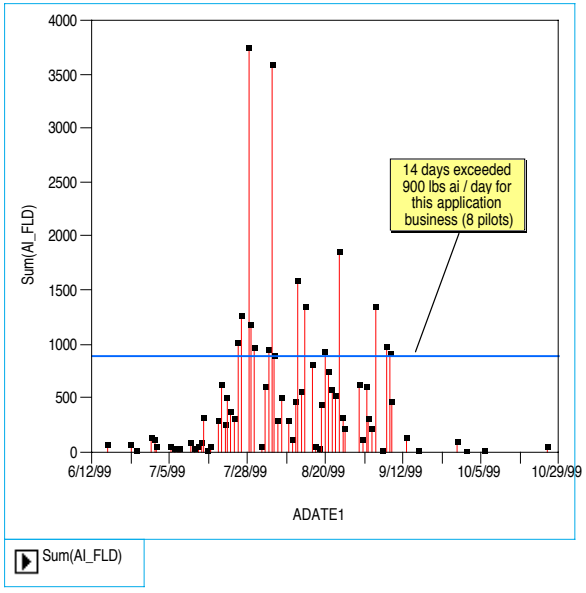

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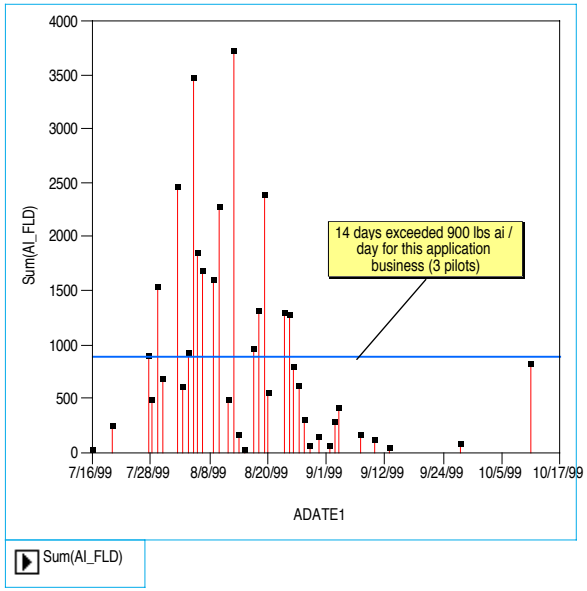

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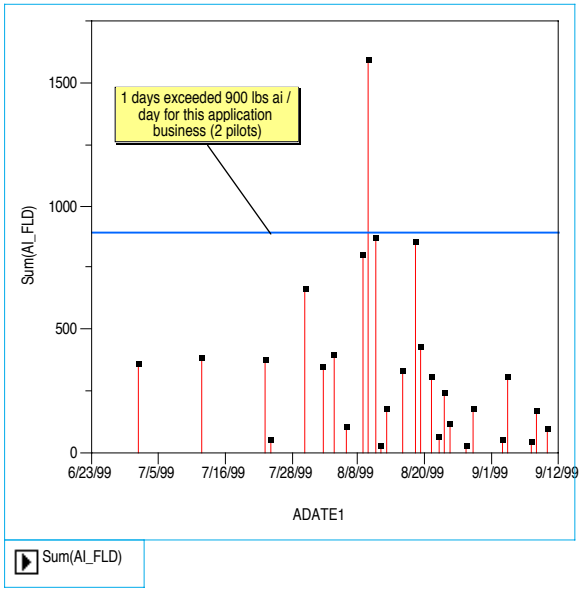

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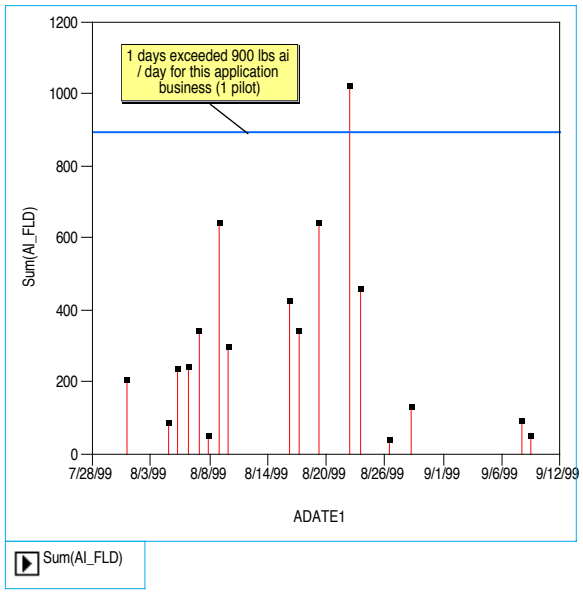

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