Spahn Engineering

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To Joe Kahn	From Janet Bowman
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Dept. DER-SED	Phone # SC 278-9730
Fax # 407-433-2666	Fax #

Tuesday, November

To: FDEP (
Attention: Janet B
Fax #: 1-904-4

From: Ed Spahn, PE
Fax #: 1-407-382-9648
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Fax: 18 pages and a cover page.

Note:

To: Janet Bowman, Attorney, General Councel
From: Ed Spahn

Janet,
For your review. Changes made per our conversation this morning at 9:15AM.

Thank you,
Ed Spahn

November 2, 1993

FLORIDA TIRE RECYCLING
ST. LUCIE COUNTY, FLORIDA
FIRE CONTROL COMMENT

AIDS TO DESCRIPTION AND DISCUSSION

Figure A; Definition of Quadrant and Side references used in discussion.
Figure B; Identification of the part of the site the St. Lucie FD can access.
Figure C; Separation of Roadbed Containing Processed Tires From Raw Tire Storage.

DESCRIPTION OF SITE

General Operational Features (Relative to Fire Control)

The Florida Tire Recycling facility is located in a remote area of St. Lucie County, Florida. Visual inspeotion of the complex by air from a helicopter and by land, walking the property, permite the following observations.

Processing whole waste tires is the principle activity pursued at this facility. The result of this processing is piles of coarsely shredded tires and smaller chips. The area of the site exceeds 30 acres. Visual inspection of the site provides no guaranteed method to determine the exact area currently dedicated to this process. Because of the proximity of whole and processed tires to the public utility high voltage power lines, it is concluded that some of the processed tires must be spilling over onto utility right-of-way.

Whole tires enter the facility by truck through the front gate. The delivered whole tires are converted into processed tires in the area identified on the attached map as the "incoming staging area." See Figure-A. Processed tire remains are subsequently transported to other areas of the facility by dump type trucks. I observed two types of dump trucks used for this purpose. One type of truck was the conventional 10-wheel dump truck. Another truck was an off road rock truck. This type truck is often used in mining operations. A representative of the facility related a similar truck is on the way to the facility.

Three principal forms of tire material are evident upon survey of the site on foot. (Fig-A)

First, whole tires are stored where shown on Figure-A. In some cases these storage areas make attempts to comply with proper storage of the tires in that they are stored in rectangles, limited in height, and separated by some distance, one from the other.

Second, processed tires, also called rough shreds, are stored throughout the complex.

Third, fine shredded processed tires, are stored alone or with limited quantities of rough shreds in piles.

Although the site is located in a remote location in St. Lucie County, it happens to be directly adjacent to an occupancy under separate ownership. Little is known about the

exact nature of this occupancy other than that which can be determined by viewing at a distance. Nevertheless, based on remote observation, it would be classified as a Hazardous Occupancy under the model Building Codes. The adjacent occupancy is operated by Miami Tank and Allied Universal. This facility stores and processes chemicals of varying degrees of hazard and quantities. These occupancies are contingent to Quadrant 4. Of particular interest is a line of tank type rail cars on this property located very close to the very large, very high, main shred pile on FTR property. Figure-A, Quadrant 4.

Lay of the Land, Standing Water

The exact numbers describing the topography of FTR property have not been discovered at this point. Nevertheless, visual inspection confirms a downward slope of the grade from the common area (intersection of Quadrants 1-4) toward the distant property lines.

On October 15, 1993, areas with large undivided areas of standing water were encountered as follows.

Quadrant 1; Left half

Quadrant 2, Top two-thirds

Quadrant 3; Virtually entire quadrant

Quadrant 4; Area designated swale

As far as the eye could see, the areas adjoining Side 2 and Side 3 had expansive undivided areas of standing water. Standing water is defined to be water which has no appearance of moving horizontally along the surface of the ground from one point to another. It was characterized by algae growth floating in the water and a thin sheen of some unidentified product upon the water surface. The sheen displayed the visible characteristics of a petroleum product spread upon still water.

For all practical purposes, the right half of Quadrant 1 and the left half of Quadrant 4 were free from standing water. In contrast to the rest of the site, water in a swale between the building (Quadrant 1) and the County Road was moving slowly, yet fast enough to allow detection of movement by eye.

Lay of the Land; Surface Characteristics

This comment relates to the current (10/15/93) lay of the ground, or supporting surface of any kind, on which one could walk, or on which one could drive some kind of vehicle.

The nature of the facility's visible surface, the part traversed upon when traveling around the site, on October 15, was as follows:

Quadrant 1; Standing water in left half.

Right half supports vehicles and personnel. Dry sandy ground, right half

Quadrant 2; Standing water essentially throughout. Some sand shows through processed tires and whole tires. Personnel foot traffic difficult. Surface support to extra heavy duty off road type motor vehicles only.

Quadrant 3; Standing water essentially throughout . Standing water essentially throughout. Some sand shows through processed tires. Personnel foot traffic is difficult. Support for extra heavy duty off road type motor vehicles only.

Quadrant 4; Dry sandy ground throughout, except for swale area middle and top of Quadrant 4. Left side of Quadrant 4 able to support personnel foot traffic and truck traffic.

In this context, *standing water* means large expanses (not puddles) of water with a depth greater than ankle high.

Personnel foot traffic means a person can walk through the area but is subject to varying degrees of standing water over unstable sandy bottom. It also means an able person can jump from tire to tire, or from one processed tire pile to another.

Truck traffic means the vehicle should be no less than a 10-wheel vehicle or a heavy duty off-road high clearance vehicle.

SUITABILITY OF THE SITE

Some determination is required regarding the suitability of the site for tire recycling operations. In the discussion that follows, three time intervals are considered. Specifically, *short term*, *intermediate term*, and *long term*.

Short Term

No changes can be made to the lay of the land in the near term because the excess quantity of water and processed tires can not be effectively moved around the site to make way for on site improvements.

I suggest that the short term use of the complex for recycling purposes presents extremely dangerous conditions relating to fire control, without regard to pollution considerations. This position is based on the fact that there is virtually no access to any part of the site, excepting the right half of Quadrant 1, and left half of Quadrant 4 by any kind of motorized vehicle currently able to mount any kind of fire control effort. Fire protection on site must be designed to provide adequate resources to combat a fire in the obviously overstocked storage areas.

Nevertheless, the fact remains that the site presently is a waste tire site. Therefore, the task at hand is to begin stabilization from a fire control point of view. Stabilization can be accomplished by a concentrated effort to remove excess processed tire waste from the site. The quantity of processed tires removed may not be replace by an input of similar weight in whole tires. Put another way, immediate abatement of much of the storage on site is necessary.

Intermediate Term

Intermediate plans include decisions regarding the site grading direction. A decision is required to either fill or drain the site. This involves a determination of the total area of the property to be turned into useful operations area during this time period. Then a certain amount of the upgraded property must be allocated to fire protection infrastructure. A certain amount of the property can be allocated to processing tires currently on site to prepare them for some market. The existing overstock may not be replenished, and must be accompanied by records demonstrating ongoing inventory reduction and destination of the inventory. When the total of on site waste is reduced, consideration can be given to modifying fire protection features to match the reduced risk.

Long Term

Ultimately, a decision is required regarding the suitability of this site for long term, or permanent, operation as a waste tire recycling operation at all.

It is safe to say that any plans to utilize the entire site as a permanent tire recycling facility should absolutely include plans to either bring in sufficient fill to raise the nominal lay of the land above its present level, or plans to initiate extensive draining of the current level. This fill or drain decision should reflect sufficient property to support not only properly stored processed waste tires, but also include area to support adequate and matched fire protection infrastructure.

It is my opinion that given the present topography, the complex is not suitable for use as a tire recycling facility at all because of the remote location and distance from organized fire protection. If operations are cleared up sufficiently to meet FDEP permit conditions, the property should not be used for waste tire operations over and above the area in the originally permitted 10 acres. This recommendation is based on the proposal that the extent of the operation must not exceed that which can be addressed by fire protection infrastructure installed on site.

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Spahn to FDEP, 10/30/93

GENERAL FIRE PROTECTION CONSIDERATIONS

Degree of Threat

It is accurate to start with the position that prudent and reasonable guidelines exist regarding fire control practices in what is called nationally and internationally practices in the form of NFPA *Outdoor Storage of Scrap Tires* principles. Design goal priorities acceptable in this facility are first, prevent the occurrence of fire. Second, suppress any fire incident early on in the event. Third, provide on site fire protection features and functions to meet the identified risk. The term *early on* in this facility means attack the fire incident within zero to five minutes after ignition. Note the term "ignition" is used; not "discovery."

Fires in waste tire accumulations historically present the following threats, if not prevented in the first place, or brought under control very early on in the fire event.

1. Generation of large amounts of black, toxic, damaging smoke occurs. The black smoke not only produces severe air pollution and hazard to fire fighters, but also, as the products of combustion cloud rises, it eventually reaches a certain altitude where the gas temperature is no longer adequate to cause rise into the atmosphere. At this point the products stratify out and begin to drift with the wind direction at that altitude. The myriad of particulate, gases, and vapors contained in this cloud now precipitate or are carried back to earth.

2. Radiant heat from burning waste tires represents a distinct threat to nearby buildings, vehicles, and other combustibles. Special attention must be given to buildings, vehicles, and vegetation located near the tire piles. The heat output from waste tire accumulations is greater than the output from a similar quantity of coal. Heat is conducted deeper into the pile of waste tires by the steel wires which are an integral part of steel belted technology tires.

3. Significant quantities of low grade oils are produced when the processed tires burn. This oil transmits fire from one area of a waste tire accumulation to another, spreading the fire quickly deep into the depths of a pile. Unburned oils are carried off by fire fighting water runoff resulting in pollution of nearby ground or water areas.

4. Required commitment of vast amounts of public and private resources upon initiation of an advanced fire event is very costly. Usually public fire fighting and other public safety agencies bear the brunt of the costs to control and suppress large tire incidents. Few if any private sector organizations typically involved in waste tire recycling operations have financial resources to pay for the required fire suppression services. Therefore, the cost for controlling a fire event in a waste tire recycling facility usually falls to the public at large.

Therefore, effective fire control planning addresses actions directed toward elimination or minimizing the probability of ignition. But when ignition occurs, the fire must be addressed within the first three to five minutes. If it is not, it will rapidly grow beyond the extinguishing resources available on site, and a catastrophe will result.

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Spahn to FDEP, 10/30/93

Available Public Fire Protection Resources

Responsibility

The public fire protection agency responsible for fire combat and code enforcement at this address is the St. Lucie Fire Control District. This is a political entity governed by a Board of appointed Fire Commissioners.

Response Time and Apparatus Type

The only method available to notify the county fire district of a fire in the facility is 911 telephone. This method of notification is useful so long as there is a human presence on the site. At this time, there is no guaranteed human presence. The conclusion is a fire incident can easily quickly grow beyond the fire control resources available in south east Florida.

The fire district response to the facility comes from Fire Station 10, and Fire Station 6. A fire station called *Central* also would respond upon special call from fire units arriving on the fire scene. Station 10 houses a Hazardous Materials Unit. However, this unit carries no equipment or sufficient consumable commodities such as foam of particular importance regarding an advanced fire on the site. Nevertheless, the Hazardous Material Team would be very busy supervising the control of pollutants resulting from the fire. The equipment expected to arrive first on the site includes two pumping engines and one rescue truck. This is called the *First Alarm Response*. Second, or greater alarms, would include more of the same, as well as the Hazardous Material unit certainly. Operations supervision would be performed by command level officers.

True fire incident response time includes more than a simple monitoring of the transit time for fire apparatus from a fire station to a fire scene. A typical, or nominal, analysis of response time is necessary here because of the extreme potential of a fire to grow to disastrous levels quickly.

The time required to place any kind of public fire department presence on the site is a function of the following time elements.

1. Fire incident ignition. Time = 0.

2. Discovery of Fire: Human presence on the site is required. Assuming a human notices smoke from an incident approximately 2 minutes after ignition.
Time to complete = 2 minutes.

3. Investigation on site of the nature of the smoke. Without doubt, because of the nature of human response, despite any pre-plan agreement, the discoverer of the smoke will first go to the site of the smoke before alerting anyone of the sighting.
Time to complete = 3 minutes.

4. Upon field verification, notification to the office results in 911 call to PSAP in St. Lucie County.
Time to complete = 1 minute.

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

5. Call received in St. Lucie PSAP. This facility is operated by the county. Fire Department Dispatch is not in the PSAP. Call taker receives call, identifies nature of the call, takes pertinent information and relays call to St. Lucie Fire District Dispatch Office in Central.
Time to complete = 1.5 minutes.

6. St. Lucie Fire District identifies proper stations to respond, equipment available, and dispatches equipment by radio.
Time to complete = 1 minute.

7. St. Lucie Fire District stations receive alarm, understand destination, take dispatch paper from printer in station, and turn apparatus wheel.
Time to complete = 1.5 minute.

8. St. Lucie Fire District stations traverse the distance and arrive on the site.
Time to complete = 35 minutes.

9. St. Lucie Fire District supervisors perform size-up.
Time to complete = 2 minutes.

10. Fire Department personnel layout suppression equipment to the seat of the fire and apply extinguishing agent.
Time to complete = 5 minutes.

Therefore it is concluded that the estimated time after actual ignition for the public fire department to apply extinguishing agent is about 52 calculated minutes. The estimated time from unattended ignition to fire department agent application is estimated to be about 17 minutes, travel time discounted. On the proposition the estimated time required to perform required tasks, other than travel, between ignition and fire department agent application could be reduced by 25% then the turn out time is about 12.5 minutes.

Assume that travel time for the fire department is 25% high, the lowest estimated time for travel is 26 minutes.

The shortest reasonably expected time for extraordinary response from ignition is then 38.5 minutes. An estimated public fire department agent application window then extends over the time period 38.5 minutes to 52 minutes.

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

Capital Resources of the Fire District

The fire district has no apparatus able to traverse further than the area identified cross hatched and marked *St. Lucie FD* on Figure-B. Reportedly the fire district has no 4-wheel drive vehicles.

The fire district has a hazardous material team. The principal service this team can provide is monitoring and managing pollutant runoff resulting from the fire. Water is the most practical extinguishing agent. Expected use of water to control a fire will provide large amounts of surface water upon which, and in which, pollutants will travel throughout the property and off property.

The fire district has the ability to move large quantities of water from one place to another with very modern and adequate fire apparatus. However, the apparatus is designed for urban and suburban fire and EMS service. It is entirely inappropriate for combating fire in this facility because of vehicle drive train design and vehicle road clearances. The Fire District does not intend to purchase apparatus and specialized equipment to provide unique service to this facility at the expense of the general revenue source.

Within the Fire District inventory, there is no known cache of suitable water additives available in meaningful quantities. A quantity of 1000 gallons of AFFF foam product would be considered a *meaningful quantity*.

Water Supply Considerations

Municipal or County Certified Central Water Service

There are no municipal or county water systems within a useful distance of this facility.

Other Available Water Sources

A canal is located approximately five to seven miles from the site. Access to the water surface is difficult. Water plants heavily infest the canal. Run off from adjacent agricultural activities contain nutrients that can only make the water plant growth become heavier. Water plant growth severely impacts reliable drafting operations by the motorized pumps available in the St. Lucie Fire District fleet.

Over the years, approximately 25,000 gallons of water has been accumulated in three water tanks on the FTR property. However, 25,000 gallons of water would last no longer than one-half hour. Added to this shortfall, there is no apparent written plan regarding use of the tanks in a coordinated fire attack. There is no evidence the tanks are part of a coordinated water supply system. No calculations are available indicating the peak water flow possible from this tank set.

REMEDIAL FIRE PROTECTION PROPOSAL

The potential for a disastrous outcome of a fire in this complex is far greater than that probable in a typical structural of similar dimensions. The high energy content of the fire load, the density of the fire load, and the unusual production of pollutants provide a scenario wherein an unchecked fire would continue burning for days, even weeks, without the prospect of efficient and timely control.

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

Access

The access principles proposed here identical to the principles used when fighting any kind of fire, inside, outside, or even a wildfire. Initial attack on the fire must be made by mobile or portable fire equipment having on board fire attack lines capable of producing fire streams able to access the seat of the fire. Fire streams must have sufficient duration to insure complete control of a fire. Inability to complete the fire control task will allow the fire to again regain a foothold in the waste tire material and the battle is lost.

Motor vehicle access to within 150 feet of the most remote location of any given pile in this facility is necessary. This access distance can be considered an industry standard for motorized equipment. Inside fire fighting access distances are typically 100 feet. This feature is required in this facility to allow trained crews on the site to bring extinguishing agent and basic fire fighting equipment in a motor vehicle to a point no further than 150 feet from a fire incident in the complex and then use appropriate hose lines to apply the agent efficiently to the burning waste.

Roadways must be constructed to reliably support the axle weights and undercarriage characteristics of the vehicles transporting the extinguishing agent. From review of the site and discussions with FTR personnel, it becomes apparent some limited effort has been expended toward establishment of "perimeter roads." *Perimeter roads* are defined to be roads providing access to piles throughout the facility. However, these roads are not able to support any motor vehicles available for fire control.

The "front part" of the facility has a surface resulting from a combination of fine shed and compacted soil. The nature of the soil is generally sandy. This surface is marginal for supporting St. Lucie Fire District fire apparatus. See Figure B. The rest of the facility will support only very heavy duty off road equipment.

From visual inspection, it is not apparent that waste tire products alone can be reliably used as road base or road surface. The attempt to construct perimeter roads using fine cut shred results in a surface that is extremely spongy, unstable in the horizontal as well as vertical mode. When walking on the road, the material yields unpredictably in the vertical direction. Similarly it seems to slip horizontally in an unpredictable fashion, similar to fish scales, one upon the other. There is no binder material to give stability to the waste tire material. It appears while the waste tire material can provide bulk, it cannot provide motion stability. Therefore, the attempt to build access roads using this processed tires alone does not appear to have merit. I would suggest some combination of sand, dirt, and fine shred might function as a road base. The emphasis here is on the word "might." Design of a road in this facility must be addressed by a qualified engineer or designer. I am not able to adequately design a road. What attempt at road installation exists is not adequate for any motorized vehicle except heavy duty tracked or very large tired mining and construction equipment.

Typical axle weights found on St. Lucie Fire District equipment are 38,000 pounds to 45,000 pounds. These axle weights would be transferred to the roadbed by four truck tires

mounted on the rear of the vehicle. Front axle weights, lower in weight, would be delivered to the roadbed by two truck tires.

The turning radius of the road layout is not based on any apparent calculated vehicle turning radius. The width of any perimeter road design must take this design feature into account. The required turning radius at intersections would be based on the motor vehicle used on the site. Even if the road surface would support St. Lucie Fire District apparatus, the turning radius and typical road width is inadequate and not well planned.

Clearance between the vehicle drive train and the access road surface is very important. The difference between the wheels in a depression and the crown of an access road cannot practically exceed eight inches in the case of existing Fire District fire apparatus. Existing attempts to define access roads do not provide this feature.

Any access road design must address the allowable angle of approach and angle of departure of the vehicle projected to traverse the roadway. Existing Fire District apparatus is not tolerant of approach or departure angles exceeding those set down in typical residential roadway design.

Any perimeter, or access road, must be constructed so they have the same probability of being above water and stable as the county road servicing the facility.

In any event, if processed waste tires are allowed in the construction of access roads, certain other restrictions must be understood. There must be at least 2-feet of clean dirt between any roadway base containing tire chips and the base of waste tire piles. This separation is necessary in all directions from a base containing processed tires . See Figure C. This separation prevents travel of fire in one pile to another pile via the combustible tire products in the roadbed.

On Site Fire Vehicle

Because of the remote location of the site, it is mandatory that some kind of on site fire vehicle be acquired. This vehicle could be a standard fire pumping engine operating on an access road system designed to carry the axle weights and turning radius of this standard vehicle. On the other hand, large tire, high clearance off-road earth moving equipment, outfitted to bring fire control equipment to the site of a fire becomes a possible choice if the access road system is marginal. Somewhere within this spectrum of options lies the most economical financial approach.

The foregoing paragraph leaves open the exact type of motor vehicle that might be used to transport fire control equipment to the site of a fire in the facility Nevertheless, once the nature of the chassis is decided upon, it becomes necessary to decide upon the features and functions mounted on the vehicle.

A water tank holding approximately 650 to 700 gallons of water is desired. This water would be applied to a fire setting by two 1 3/4 inch hand lines. Nozzles attached to these lines must provide a full spectrum of nozzle patterns. To develop proper nozzle pressures, a fire

pump, complete with integral prime mover, must be conveniently mounted. This pump, taking water from the on board tank, must develop discharge pressures of 150 psi typical at 300 to 350 gpm discharge.

At least 600 to 800 feet of supply sized hose must be stored on board the vehicle. This hose can be laid on the ground to the nearest standpipe type fixture provided as part of the facility fire protection underground infrastructure. Finally an assortment of hand tools are required to finish out the outfitting of this vehicle.

All of these features and functions must be simply assembled, and laid out to be easily maintained. Simplicity and reliability of equipment is important in view of the fact on site employees are expected to operate the equipment.

Initial Fire Attack

Once a fire extends beyond twenty or so tires, the quantity of water required to complete extinguishment and overhaul extends beyond that quantity that can be carried to a location on motor vehicles.

Therefore, since it is a given that within ten to fifteen minutes it is practical to expect a fire to extend beyond twenty tires, it becomes very important to transport and apply extinguishing agent to the fire site within five minutes or so. This implies the access road system and selection of vehicle design will determine the probability of success in holding the fire to within the parameters described above. Additives such as *Wet Water* or *Aqueous Film Forming Foams* should be injected into the attack water supply to give penetration and sealing capability to the applied water as well as reduce the surface tension of the water. This reduction of surface tension allows more efficient use of a quantity of water in the process of covering exposed surfaces with a film of water to reduce temperature rise. The AFFF mixing with any oil products produced by the fire will form a seal on any oil pooling. This seal will shield the oil from radiated heat. The seal will also minimize the tendency for molecules to jump off the surface of the heated oil to form a combustible mixture.

Water Supply

Water is not the only possible extinguishing agent that can be used to suppress a fire in this kind of commodity. At the same time, it is a practical decision that water is the only agent which can be readily, reliably, and economically stored and maintained in a ready state for a fire in this particular setting. Again, the remote nature of the site and the unusual quantity of potential burning processed tires on the site drives this decision.

Water supplies in properly designed facilities must be capable of supporting an aggressive 1000 gpm minimum fire attack after being connected to the motorized vehicle at the scene of a fire in the site. This water application rate must be available as soon as supply hose from this on site fire vehicle is connected to a standpipe type fixture. The standpipe fixture is connected to a stationary fire pump taking water from the water storage container.

Some attention must be given to a fire which, for whatever reason, is not contained by the time the public fire department arrives on site. The ultimate deliverable volume should be at

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 10

To Joe Kahn	From Janet Bowman
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least 2000 gpm. The ability to supply the 2000 gpm is expected to occur with the assistance of fire district motorized fire pumps taking water from the fire water storage containment.

Certainly, proper design would dictate the duration of water available be several days of continuous consumption at the 2000 gpm rate. Properly designed deep wells could achieve that design goal. In any case, considering the possibility that water might not be available from deep wells, some kind of water supply must be on site to deliver water at the 2000 gpm rate for at least 4 houre.

If the fire cannot be extinguished, the fire control tactics must shift to protection of adjacent segregated tire piles. Water would be rationed to keep these piles from self igniting due to radiant energy, or igniting because of unexpected fire brands. The fire in the pile of origin would be allowed to burn out. It is recognized however, that significant environmental damage would result even with one pile burning.

To provide a frame of reference relating to the size of a containment for stored water to provide the minimum quantity of water to meet the 4 hour specification, consider a container 80 feet by 80 feet by 10 feet deep. This volume holds about 480,000 gallons of water. There are other approaches to providing this resource, but this is the brute force method. Variations on a container this size would be a continuous replenishment of the container by a less reliable, lower volume pump. This pump would continuously pump from a deep well water source at a rate that would reduce the actual size of the water container. For instance with a 500 gpm pump continuously replenishing the container, the size of the container could be reduced to 70 feet by 70 feet by 10 feet deep.

The water source for contemplated wells is of importance. Certainly wells taking water from a deep water aquifer would be the only reliable and predictable configuration. Wells taking water from ground water would be subject to uncertainties in replenish rates in the area of the well head inlets. Replenishment at the rate of 1000 gpm is difficult in shallow ground water wells. .

At the same time, deep wells present some unknown level of risk to aquifer pollution if the well is located in the same area where polluted runoff water from a fire situation might find its way into the well casing penetration. The level of this risk must be determined by others.

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

Water Distribution

Presence of water in a pond, tank, or other containment is of no value unless the agent can be distributed quickly throughout the complex. Recall it is necessary to deliver fire protection water at an early on rate of 1000 gpm to points throughout the complex no further than 300 feet from a possible fire incident. This performance specification implies that a water distribution system of hard pipe or soft hose must be designed and set in place.

Fire Pumps

The water can not be moved from the storage containment to the far extents of the complex without the assistance of a fire pump. During consideration of just what this pump might look like, some level of risk must be assigned to the energy source for the pump prime mover. Electric motors provide high reliability and low maintenance. Diesel engine prime movers are a bit less reliable, require more maintenance and testing, but are independent of energy supply from public utilities Obviously the electric service to the facility must be in operation for the electric motor to perform.

A system of pumps must be installed to deliver 1000 gpm during the early stages of a fire on site. Upon arrival of the public fire district, if the fire is not contained and controlled, the potential delivery capacity must step up to 2000 gpm. A possible configuration to meet this performance requirement is to install on site a 1000 gpm pump operating into a system of underground piping. This pump would be electrically operated. Upon arrival of the public fire department, a motorized fire pump would take up a position where it also would draft from the water containment area. This water would begin to operate in concert with the on site fire pump to provide at least 2000 gpm delivery rate. Fixtures would be specified to fit fire department pumping engines.

Distribution Over the Site

The most practical method to meet the required water delivery performance would be to provide a hard piped distribution system to certain strategic locations within the facility. Properly selected and designed motor vehicles can then stretch large diameter soft hose lines from these distribution points to positions within 150 feet of a fire event. The variable here is the design of the motor vehicle. The motor vehicle design is based on the quality of the access road system.

Extinguishing Agent Additives

Water application to waste tire fires intends to cool unburned processed tires and remove heat in the waste through conversion of heat to steam. But, untreated water is not the ultimate form of extinguishing agent for this processed tires . The petroleum like nature of tires causes water application to "bead" on the surface of the tires. During the early stages of a fire incident, insertion of AFFF or wet water additives provide additional efficiency to the cooling and extinguishing characteristics of water.

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

PROCESSED AND UNPROCESSED TIRES STORAGE PRACTICES

As it now stands, the processed and unprocessed tires are stored improperly in three ways. First storage is in accumulations exhibiting unmanageable dimensions. Second, the processed and unprocessed tires are in piles located too close one to the other. Third, the vertical faces of one pile as it faces another are of excessive height.

Storage in accumulations prohibit timely attack of a fire event in a pile because of the distance fire attack lines must be stretched. Walking through and over these tire accumulations is dangerous and difficult.

Storage of piles too close one to the other produces a setting wherein radiant energy from a fire in one pile can cause a fire in another pile simply because the radiant energy causes self ignition in the distant pile. The distance required between piles in nationally accepted standards is predicated on a storage height of about 12 feet. As the height of the pile face increases, and as the length of the pile face increases, the separation dimension increases. In the case of FTR, the pile separation distance should exceed that recommended in national standards. The required separation varies throughout the facility. It must be specifically reviewed and then calculated.

In several cases, such as the high pile of fine and rough shred in Quadrant 3, the recent attempts at separation have increased the hazard risk because of an increase in exposed surface that could easily be involved in open burning.

ADJACENT EXPOSURES

One exposure is the adjoining chemical facility. A rail spur running on this property, may be noted in the top quarter of Quadrant 4. On this spur are rail cars containing hydrochloric acid, chlorine, and anhydrous ammonia. There may be other commodities present from time to time. However, there is no certainty regarding minimum quantities and the predicted presence of the chemicals.

In any case, the proximity of the high piled fine and rough shred in Quadrant 3 represents a distinct heat radiation threat to any chemical product stored in rail cars on the chemical facility rail spur.

Any credible fire plan must include some method of moving the cars to a safe location on the rail spur upon discovery of a fire progressing through the high piled waste tire shred in Quadrant 3.

The St. Lucie Fire District at this time has stated that it would find protection of these tank cars a priority action. This water would necessarily come from water stored on the FTR site. At the same time, the Fire District indicated it does not intend to be responsible for the movement of the rail cars to a safe location. This responsibility must be identified in a formal site emergency plan.

Regarding other outdoor storage and structures on the chemical facility property, the hazard from heat radiation from the FTR property is not excessive. This is not to say there is no

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93

Regarding other outdoor storage and structures on the chemical facility property, the hazard from heat radiation from the FTR property is not excessive. This is not to say there is no danger. Thisexposure danger does not exceed the need to immediately spend resources on limiting the spread or spread rate of a fire anywhere in the tire site.

A second set of exposures are the high voltage power lines adjacent to the chip and cut tire pile. I suggest heavy smoke given off by a tire fire is high in particle content that tend to contribute to ionization of air and explosions in the presence of high voltage. These particles deposit themselves on, or in the vicinity, of the insulators serving nearby high voltage lines. When the accumulation becomes sufficient, a damaging explosion occurs. The insulators can be damaged. Interruption of power results on the power grid. Since this power line is a major feeder, it is suggested the impact of an outage could affect thousands of power customers. Therefore, one of the highest priorities in this site is the removal of waste tire shreds and whole tires from the utility right of way and from that part of the site nearest the power lines. The waste product should be moved off site.

The proximity of the high voltage power lines increases to some degree the operating hazard to fire fighting personnel in the area. Water spray, presence of organic and products of combustion that can conduct electrical currents are very difficult to predict absolutely. Therefore, prudence requires that the power lines be given ample clearance.

CONCLUSION

1. The site as it now stands is not suitable for waste tire processing and storage. The processed tires are currently stored too close together. The processed tires are stored too high. The hazards can produce propagation of fire from one pile to another, and increased difficulty in accessing the seat of a fire. This delay provides time for the fire to expand beyond control of on site resources.
2. Fire prevention is top on the list of priorities. The following steps must be taken to move in the direction of minimizing probability of ignition of the pile by accidental means.

a. The tire and waste tire storage area must become a no smoking area. It is recognized that the probability of a match or smoldering cigarette can actually ignite any form of waste tires or whole tires is very low. But smoking in the vicinity of heavy equipment used in waste tire operations, refueling operations, or in the vicinity of trash and other combustible waste can lead to a fire large enough to ignite the tires. It is suggested that no smoking be allowed in the waste tire storage area.

b. All flammable and combustible liquids must be segregated and stored in appropriate containers and configurations.

c. Spark arrestors must be installed on all internal combustion prime movers. Particular attention must be given to large diesel equipment.

d. Cutting, welding, heating devices, open fires must be prohibited in the whole tire and waste tire storage area unless a specific fire watch is posted during the operation. This fire watch should be provided with adequate extinguishing equipment to address a problem in the event of a fire.

3. Access roads must be designed and installed. Decisions on the type of access roads provided must go hand in hand with decisions regarding design of the on site fire protection motorized equipment. The access roads must be wide enough to accept the vehicles proposed. Road intersections must mate with vehicle turning radius. The road base must be stable enough to meet model code requirements for a stable, all weather road surface. Either raising the elevation of the roads or draining the property fall under possible tasks to be completed.

4. If tires are to be stored throughout the property now owned, the base of the storage piles must be either raised or drained to allow tire piles to rest on surfaces free from standing water. The need to access the piles for fire protection precludes the consideration of waste tire shred piles of any kind setting in water pools.

5. If it is not feasible to drain the parts of the property that have a tendency to become covered by water, the facility should design its operations around that part of the originally permitted 10 acres that can be demonstrated to be free of standing water in the same way the county road passing in front of the facility is free from standing water. This implies that very careful management of throughput becomes a principal task of the facility management.

6 Site security is an absolute necessity. Site security exhibits the following distinguishing characteristics;

a. At least two security personnel must be on duty at all times, i.e. 24 hour per day. The task of these personnel is to continuously survey the site for fire, intrusion, or unsafe practices.

b. The entire site shall be surrounded with an six foot fence, with barbed wire or equivalent intrusion deterrent on top. Entry points through the fence should be kept to a minimum. However, entry, or exit, points for fire suppression vehicles and personnel should be established to facilitate efficient and safe fire fighting.

c. Security equipment must be installed to detect unauthorized intrusion. This is contemplated to be in the form of either seismic detectors, fence intrusion detectors, and/or camera surveillance.

d. The site must possess sufficient electrical lighting to effectively observe, while on foot patrol, or surveillance camera, movements of intruders or incidents of fire within the confines of the site. This feature dictates lighting within site interior

areas as well as perimeter areas because of the large geographical area over which processed tires are stored.

e. A guard shack, or trailer, must be brought onto site to provide a suitable area from which the guard staff may operate. Depending on the space available and the nature of operations in the existing steel building on site, the office area of this steel building might be considered as a work place for guard service.

7. Site fire protection systems must be installed. This requires the following;

a. Water containment must be established to provide 1000 gpm early on during the first 60 minutes. Then a 2000 gpm capability for the next 3 hours must be built in, as a minimum This water supply can be in the form of a single properly designed containment area or a combination of containment and deep well pumps. If design analysis can prove reliability and duration is attainable with deep well pumps, this design alternative is acceptable and preferred since it requires less geographic area in the facility dedicated to water containment. In any case, all design proposals must be proven designs developed by licensed engineers operating within their declared area of expertise. Combinations of engineers collaborating on the design are desirable.

b. A method to integrate fire department motorized fire pumps into the water delivery system must be designed and developed.

c. A water distribution system must be designed and developed to insure the ability to deliver 1000 gpm to any location in the site during the early parts of the first 60 minutes after ignition. After 60 minutes, the gpm delivery shall be a demonstrated 2000 gpm to distribution points located a minimum of 300 feet from any point, and a maximum of 600 feet from any point on the site. It is understood that more than one standpipe fixture is required to provide this level of flow.

8. Some kind of motor vehicle, designed to meet the level of access road development decided upon, must be provided to deliver the first attack at a fire event. This vehicle must carry at least j650 to 700 gallons of water, deliver extinguishing agent at a maximum rate of 300 gpm, and carry a decided upon amount of supply line soft fire hose and tools.

A method of treating the extinguishing water with an additive, like AFFF, shall be provided. At least 60 gallons of foam product must be carried on board the vehicle. The vehicle must have at least two 1 1/2 inch hose lines, each 150 feet long and provided with a suitable nozzle. A hose reel with 250 feet of 1 inch line must be provided on board the vehicle. A self contained fire pump shall be provided. It shall be gasoline driven, and include all piping and apparatus required to safely control water flow to the hand lines. The vehicle shall also carry adequate equipment and fittings to supply two 2 1/2 inch

hand lines. Finally, adequate fittings shall be provided to accept water supply from the on site fire pump and water distribution system.

9. A training program shall be developed to insure the personnel on site are capable of driving the motorized fire attack equipment to the site of a fire event on the site. This training shall include driver training for the motor vehicle, and operation of the fire pump, hose lines, and other equipment. This program is necessary because the extended response time of the public fire department to the fire site requires site employees to assemble a brigade to attack a fire as soon as possible. A key feature of this plan is intensive planning regarding cooperation between the brigade and the public fire department.

10. A resource list of at least five front end loaders, five 10-wheel dump trucks, and five bulldozers must be assembled. The list should include equipment deliverable to the scene within one hour after call. It is especially important that night time hours, weekends, and holidays be adequately covered. The location and method of transporting this equipment to the scene must be part of an operations plan developed for the site.

11. Since this site is currently out of compliance, the first processed tires storage configuration goal should be in conformance with NFPA 231D, *Storage of Rubber Tires*, Appendix C. The storage area of principal concern is the high piled fine shred processed tires facing onto the chemical facility property. The height of the pile is abnormal and unsafe. Fire would penetrate into the pile and become an unmanageable fire for all practical purposes. The processed tires must be transported off site since there is inadequate room to rearrange the processed tires on site. Processed Tires height should be in accordance with the above document.

12, After viewing the fire protection operations plan, it is concluded that renewed emphasis must be placed on revisiting this topic by both the owner and operator of FTR and the St. Lucie Fire District. The depth and detail of the report are inadequate. Identification of responsibility for agreed upon command and control of specific critical tasks is missing. Location and availability of heavy equipment resources also are not well spelled out. These references cover only a few of the topics that need amplification.

Please review and accept this report and analysis.

Respectfully submitted,

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Fire Protection

FTR Facility Fire Protection Analysis - Rev 1
Spahn to FDEP, 10/30/93