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CASE STUDY – TOLKO MILL YARD, HEFFLEY CREEK, BRITISH COLUMBIA

HIGH-VOLUME, HIGH-PRESSURE PERMANENT SPRINKLER SYSTEM

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This case study contributes to the state-of-practice review of water delivery systems (sprinklers) in the wildland-urban interface. Funding for this review was provided by the Forest Resource Improvement Association of Alberta (FRIAA).

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Sprinklers are used to protect structures from wildfire during wildland-urban interface events across Canada. Traditionally, standard forestry equipment has been used in conjunction with impact sprinklers. FPInnovations is reviewing common practices and equipment used during sprinkler deployments, in Canada, to determine if they are the most appropriate for community structure protection, or if alternative approaches should be considered.

This case study documents the use of a high-volume, high-pressure permanent sprinkler system that is installed in Tolko's millyard at Heffley Creek, British Columbia to maintain wood quality and protect the company's assets. Permanent high-volume, high-pressure systems may present a viable option for protecting community and other critical infrastructure.

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CASE STUDY

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- Highlands Irrigation Services – Kamloops, British Columbia
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- Nelson Irrigation – Walla Walla, Washington

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1. INTRODUCTION

The use of forestry equipment (hose and pressure pumps) to support sprinkler systems is a common approach to protecting values at risk from wildfire in Canada. This case study is one in a series that explores the viability of various types of sprinkler systems for protecting residential and commercial structures from wildfire.

The use of high-volume pressure pumps to run a sprinkler system has long been identified as a potential approach to protect industrial assets that are at risk from wildfire. Understanding whether a high-volume, high-pressure sprinkler system is a viable option for protecting infrastructure and industrial assets is a priority for many provincial fire managers.

Tolko Industries Ltd. is a privately owned forest products company based in Vernon, British Columbia (B.C.). The company has installed a permanent industrial sprinkler system at their Heffley Creek, B.C. sawmill. The primary purpose of this system is to wet the logs in the millyard to maintain wood quality during storage. This high-volume, high-pressure sprinkler system also provides protection from wildfire as an ancillary benefit.

FPInnovations examined this high-volume, high-pressure system to determine if, or how, a similar system could be used to protect a community from wildfire. The objectives of this case study were to:

1. investigate and document the sprinkler system used by Tolko at its Heffley Creek sawmill; and
2. determine if a permanent sprinkler system similar to the one used by Tolko is a viable option for protecting a community from wildfire.

2. DATA COLLECTION

FPInnovations obtained approval from Tolko Industries Ltd. to collect information on its millyard sprinkler system. We conducted a telephone interview with the system designer and equipment supplier, Highland Irrigation,[1] and conducted a site visit at the mill.

A representative from Highland Irrigation provided an overview of the high-volume, high-pressure system, and specifics on system pressures, volumes, and type of sprinklers used. The site visit to the mill provided an opportunity to observe and document the system during operation.

[1] Highland Irrigation Inc. 782D Tagish St., Kamloops, B.C.

3. FINDINGS

Tolko's sprinkler system consists of 18 Nelson SR100 Big Gun sprinklers[2] with a 12.7-mm (1/2-in.) orifice (Figure 1). Water for the system is supplied by a water reservoir located approximately 36.6 m (120 ft.) above the millyard. Gravity provides 552 kPa (80 psi) of pressure head for the system. A 15-hp electric motor boosts the water pressure to 793 kPa (115 psi) and delivers approximately 655 kPa (95 psi) at the sprinkler head. The supply line is a 100-mm (4-in.) high-density polyethylene water pipe that runs 274 m (900 ft.) to the north from the pump station and 427 m (1400 ft.) to the south, for a total length of 701 m (2300 ft.). The supply line runs above ground where there is little elevation gain. The sprinklers are fixed to a tripod with a 65-mm (2-in.) water supply line (Figures 2 and 3). A TWIG TD200 Controller runs the system, and the wireless TWIG decoders are mounted on the risers next to the valves in order to activate the valves wirelessly.

Figure 1. The Big Gun SR100 sprinkler with a TWIG wireless decoder box.

Figure 2. A Big Gun sprinkler riser fixed to a sturdy tripod.

The Big Gun sprinkler can deliver 454 L (120 gal.) of water per minute over a radius of 37 m (120 ft.). The arc and trajectory can be adjusted to achieve specific spray patterns. Most of the sprinklers in the Tolko system are set to a spray pattern of 180° (Figure 4).

The system's manufacturer indicates that optimal performance occurs when 3 of the 18 sprinklers are activated at one time.3 Optimal performance is achieved by optimizing pipe size and pump capacity. During the site visit, up to five sprinklers were operating at the same time for approximately 3 minutes each. The total time for all the sprinklers together was 12 minutes, during which approximately 20 441 L (5 400 gal.) of water were applied. Once the 12-minute sprinkler cycle is complete, the sprinklers are idle until the next programed application. The Tolko sprinklers were programed to activate two or three times each day depending on the

[2] http://www.nelsonirrigation.com/products/family/big-gun-sprinklers/100-series-big-gun
[3] Personal communication with Highland Irrigation

weather conditions. The sprinklers are arranged to provide an overlap of 50% to ensure complete coverage.

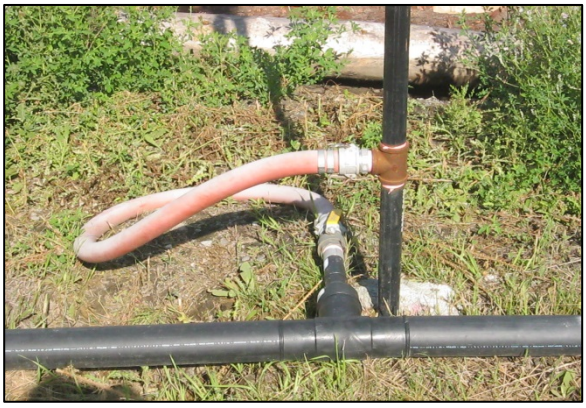

Figure 3. The connection from the high-density polyethylene supply line to the sprinkler.

Figure 4. The Big Gun sprinkler in operation at the Tolko millyard at the Heffley Creek saw mill. Spray distance is approximately 30-61 m (100–120 ft.).

The estimated equipment cost for this permanently mounted high-volume, high-pressure system (18 sprinklers with a TWIG controller) is between $40 000 and $50 000 Canadian dollars. The water supply line and installation of the system were both provided by Tolko, but these costs were not available. According to Highland Irrigation, once ordered, the sprinkler equipment can be delivered in 2–3 weeks.

4. DISCUSSION

4.1 System type

Tolko's sprinkler system is a permanent, above-ground system. All the components are easily accessible, which makes operation and maintenance straightforward. Tolko drains the supply line in the fall and recharges it in the spring.

An advantage of a permanent system for infrastructure protection is its immediate readiness in the event of a wildfire. A system set up in the spring could be activated remotely as needed to provide protection throughout the summer. The remote activation and automated capabilities of the Nelson Irrigation controller would provide a high degree of safety by eliminating the need for an operator to access a site that is threatened by wildfire.

A disadvantage of a permanent system is the risk of theft and vandalism. The Tolko millyard is a 24-hour industrial operation, so this risk is low. However, a community would need to take precautions to protect its system from theft and vandalism.

Tolko uses an electric pump to drive its system. Power outages are likely during a wildfire event, so a community would need to plan for an alternative or backup power source.

Nelson Irrigation has developed a mobile sprinkler attachment for the Big Gun sprinkler.[4] But a difficulty with the short-term use of a high-volume sprinkler is the need to couple it with an adequate water supply, pump, and hose. The manufacture advised that riser stability is very important in the Big Gun sprinkler system design.

Irrigation equipment manufacturers, suppliers, designers, and installers are all very familiar with the various applications of sprinkler systems and the unique challenges of each application. These professionals would be a valuable resource when it comes to planning and developing a high-volume, high-pressure sprinkler system at the community level.

4.2 System operation

The Big Gun sprinkler can spray water up to 37 m (120 ft.). Multiple Big Gun sprinklers require a significant water source, properly sized pump, and carefully planned plumbing to provide sufficient and reliable water volume, and pressure for the system. The desired number of sprinklers activated at one time dictates the diameter requirements of the supply line and the size of the pump required.

The 100-mm (4-in.) supply line that Tolko uses, limits the volume of water that can flow to the sprinklers at one time. A larger diameter supply line matched with a more powerful pump would allow more sprinklers to operate at the same time. If using a similar system for wildfire protection, limiting the number of sprinklers operating at one time because of volume restrictions may compromise structure protection.

The force at which the spray hits the ground was not measured. Diffusers and various adjustments that can alter the trajectory of the water spray and reduce the impact force are available for the Big Gun sprinkler. Further investigation into the impact force of these systems would be prudent to ensure that the risks to infrastructure are well understood.

5. CONCLUSION

The strategic placement of a high-volume, high-pressure system to protect critical infrastructure adjacent to forested lands would be a proactive way to prepare for wildfire. These large-scale systems would not necessarily stop fire spread, but they could protect structures by immediately applying water when needed.

[4] http://www.youtube.com/embed/gzMaO8-XNJQ?controls=0&autoplay=1&rel=0

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