



JOB DEMANDS ANALYSIS

Company: Greater Vancouver Regional District **Location:** Annacis Island

Job Title: Wastewater Treatment Plant Operator **Classification:** Regular Duty

Purpose of Activities

The purpose of the duties of the WWTP Operator is to make certain that the sewage treatment plant runs effectively and safely. They are responsible for its moment to moment total operation at any given time. They maintain the processes and act as surveillance for emerging difficulties.

Tools and Equipment

The operator will use the following tools and equipment to perform their duties:

- Gloves.
- Safety Hat
- Safety Boots.
- Coveralls.
- Computer keyboard and mouse.
- Valve keys.
- Buckets
- Skimming pole.
- Hose (up to 2”).

Usual Methods

Much of the operator's day (or night) is spent moving around the site and making adjustments to controls and valves, charting information from panels. Other elements of the job include monitoring plant functions from the control room and assisting other people with maintenance projects. They also carry out some light labour duties like cleaning, handling sample rods, hoses, turning valves with a key or by hand. Usually, the plant is divided up amongst the operators so that each operator has responsibility for a certain part of the plant. During the day shifts there is overlap to allow for lockouts and assistance with other maintenance tasks. During the night shift, coverage is much thinner and especially during a chlorine cylinder change (which requires two people) it only leaves one person in control and one free to respond for the entire plant.



During the summer months they are responsible for changing the chlorine and SO₂ tanks.

They may have to respond to emergencies from time to time.

They are responsible for lockout procedures in preparing equipment for maintenance. The position involves a lot of walking, sitting, standing and regular stair-climbing.

One of the operators is a crew leader. The crew leader typically spends most of his or her time in the main control room. They oversee all aspects of the plant's operation at all times and interact with field personnel via radio. They can make changes to processes by interacting with the computer software. Most of the time in this role is spent seated at a long desk populated with several 20-inch computer monitors that cover different plant functions. They are also responsible for monitoring the alarms from Lulu Island and the Northwest Langley treatment plants during the late afternoon and night. The crew leader is also responsible for all phone calls coming to the plant after 1530. They can monitor several key areas of the plant via closed circuit cameras. The work in this position can become very complex during the day shift because of all the work being done in the plant by the trades people, this is especially true early in the morning. Depending on the crew leader, they may switch off these duties with another operator for parts of the shift.

Administrative Issues

The operator works throughout the plant on a twelve-hour day or night shift. There are four operators at Annacis during the nights and up to eight during the day with one foreman. They work four shifts followed by four days off and alternate between days and nights on each cycle. There is a crew leader on each shift who primarily works out of the control room.

The work requires moving between outdoor and indoor environments. Some of the indoor work involves exposure to raw or slightly processed sewage. There are certain areas where spaces are very confined and noise levels are high enough that hearing protection is required.

Activity Demand Variables

These variables are tasks that must be carried out by the employee and are implicitly or explicitly required as objectives of the job.

- Work in some confined spaces.
- Cover large distances on a daily basis.



- Work night shifts.
- Most work tasks are scheduled or responses to alarms.
- Walk over concrete and stairs.
- Climb up and down ladders.
- Carry out some tasks under unpredictable outdoor conditions that often include steady rainfall.
- Exposure to sewage.

Worker Decision Variables

These variables are the sub-routines and cognitive/physical decisions made by the worker in carrying out the objectives of the job.

- Choose postures for carrying out duties (e.g. lifting using hips and maintaining neutral spine, creative energy saving techniques).
- Some control over the order of tasks during the day.
- Choice of transportation method around the site (e.g., on foot, by cart or by bike).

Accommodative Considerations

1. Individuals with knee, hip or ankle difficulties may find they have difficulty with this job because of constant walking and stairclimbing.
2. Individuals who do not cope well with complex cognitive demands and high levels of responsibility should avoid this work.
3. Individuals recovering from systemic illness should be carefully screened before entering this activity because they must be able to work alone and can be exposed to bacteria.
4. Individuals who do not cope well in congested/confined or outdoor work environments would have difficulty with this position.
5. There is a significant learning curve associated with the tasks, boiler certification is required.

Prepared By: Greg Hart, Kinesiologist

June 6, 2001



Summary of Stresses

Metabolic Stresses

The aerobic energy system supplies the vast majority of energy required to complete the tasks in this position since the work is ongoing in nature. Capacity is more of an issue since the shifts are twelve hours and much of that time is spent on foot, walking, standing and climbing stairs. It is possible to walk 20 kilometres in a shift. The peak aerobic demand is about 8 METS (28 ml/kg/min) for stair climbing and ongoing it is about 5 METS (17.5 ml/kg/min). Since the shift is so long it is recommended that operators have a maximum aerobic power exceeding 10 METS (35 ml/kg/min) or more ideally exceeding 12 METS (42 ml/kg/min).

Structural Stresses

There is regular walking associated with this position, but there is enough variation in the work that there is little in the way of accumulated structural stresses. There is occasional lifting, pushing and pulling that has implications for the spine and for the shoulders and upper extremities, but that activity is more the exception than the rule.

As long as significant sitting is avoided, there is minimal associated structural stress to the operator. The crew leader may spend a considerable amount of time seated in the control room. Additionally, the layout of the work in the control room requires considerable shoulder elevation with any sustained computer activity.

INTERVENTIONS

Recommendations that could be implemented to increase productivity and lessen the risk of injury are listed below:

1. Encourage the workers to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, anaerobic power, muscular strength, muscular endurance and flexibility. Especially cardiovascular endurance.
2. Provide regular education in effective use of the body and neutral joint positions for this type of work.
3. Insure that sitting is never carried out for long durations (longer than 30 minutes at a time).
4. Plan the route when manually handling materials.



5. Take a moment to extend the spine and warm up the body when switching from sitting to strenuous activities.
6. Review footwear to insure that safety wear also is as light as possible with excellent heel and forefoot support.

Referral: Mike Arcand		Organization: GVRD						Title: Plant Operator - Annacis Island		
Dept.: WWTP		Division: Annacis Island						Contact: Mike Arcand		
PHYSICAL DEMANDS		REQD	SIDE	FREQUENCY*				Max. Weight (kg)	Usual Weight (kg)	COMMENTS
				Sel 1	Low 2	Mod 3	High 4			
S T R E N G T H	Lifting - Floor to Knuckle		B		X			20	5	Buckets of oil/condensate, sample rods, shovel
	Lifting - Knuckle to Waist		B		X			20	5	Buckets of oil/condensate, sample rods, shovel
	Lifting - Waist to Shoulder		B		X			20	5	Buckets of oil/condensate, sample rods
	Lifting - Over Head									
	Carrying - With Handles		B		X			20	10	Oil buckets for up to 50 metres
	Carrying - Without Handles		B		X			10	5	Sample jars, hoses and tools short distances
	Pushing - Upper Extremity				X			8	3	Open/close valve levers, buttons, rake bins
	Pushing - Hip/Leg Assist		B		X			30	5	Valve keys
	Pulling - Upper Extremity		B		X			20	5	Valves/buckets/hoses, blanket sample rod
	Pulling - Hip/Leg Assist		B		X			30	10	Opening valves with the key, hoses
	Reach - Shoulder or Above		B		X			10	3	Overhead wheel valves, rake bin
	Reach - Sho. or Above extnd		B	X				10	3	Overhead wheel valves, rake bin
	Reach - Below Shoulder		D			X		6	3	Switch on/off cart, take samples, access levers
	Reach - Bel. Shoulder extnd									
E N R G	Handling		B			X		20	10	A wide variety of tools, pumps, hoses, equip.
	Gripping		B			X		max	mod	Mouse, sample jars, hoses, rods, levers, ladders
	Fine Finger Movements		B		X			mod.	min.	Switches, computer keys, keys, buttons
P O S T U R E +	Aerobic (percent)						90	Most activities are walking, sitting and repeated stair climbing		
	Anaerobic (percent)				10			For occasional exertion in lifting or climbing a long flight of stairs		
	High Energy Expenditure					X		Sustained stair climbing and walking		
	Low Energy Expenditure					X		For almost all activities including sitting and light walking		
M O B I L I T Y	Neck - Static Flexion					X		Working on low level issues, checking samples/water		
	Neck - Static Neutral									
	Neck - Static Extension				X			Short duration to check overhead pipes, screens, run hoist		
	Neck - Rotation		B			X		Looking around obstacles, work at main control with computers		
	Throwing									
	Sitting				X			Monitoring plant functions and doing computer work		
	Standing					X		To carry out many duties on concrete		
	Walking					X		On concrete/metal/grass/asphalt, up to 20 km/shift		
	Running/Jumping			X				Possible in emergency situation		
	Climbing - Arms and Legs				X			Ladders in the plant (< 10 metres/time)		
B I L I T Y	Climbing - Legs Only				X			Stairs in the plant, less than two flights/time usually		
	Bending/Stooping				X			Carry out low level equipment checks,		
	Crouching				X			Carry out low level equipment checks, change chlorine/SO2 in summe		
	Kneeling			X				Carry out low level equipment checks		
	Crawling									
	Twisting				X			Work around railings, accessing controls in congested spaces		
	Balancing					X		On ladders, over railings, near access shafts		
G E N	Traveling					X		Around 300 acre plant on cart, bike or foot		
	Work Alone					X		Probable for some elements of the day, always radio contact		
	Interact with Public			X				Possible for tours		
	Operate Equip/Machinery					X		Valves, pumps, computer, cart, engines, specialized equipment		
	Irregular/Extended Hours			X				4 on/4 off shifts, 12 hour nights and days		

* Frequency Legend 1 = Seldom; Not Daily 2 = Low Daily Activity; < 1hr
 3 = Moderate Demand; Repetition 1 - 3 hrs daily 4 = High Frequency Demand; Repetition > 3 hrs daily
 The following shading denotes a HIGH RISK TASK: Modifications should be considered

REQD is marked if the particular demand or category is relevant to the purpose of the job.

SIDE refers to the side or limb required to execute a task. If it is marked **E**, it indicates either side, the most common choice is listed first. **D** refers to dominant and **B** to both sides.

Referral:		Organization:						Title: see 1st page header	
Dept.:		Division:						Contact:	
PHYSICAL DEMANDS		R E Q D	S I D E	FREQUENCY*				COMMENTS	
				1	2	3	4		
P E R C E P T I O N	Hearing - Conversations		B			X		Colleagues in person, via phone, via radio	
	Hearing - Other Sounds		B				X	Alarms, machinery noises	
	Vision - Far						X	Most activity, high degree of concentration usual	
	Vision - Near					X		Examine parts or gauges closely	
	Vision - Colour				X			Determine the quality of the product, some computer info	
	Vision - Depth				X			Distances have to be judged when raising and lowering objects	
	Perception - Spatial						X	Many tasks involve working around obstacles, driving	
	Perception - Form								
	Feeling (Tactile)				X			Impaired by gloves in most situations	
	Reading					X		Computer screens, gauges, instructions, correspondence	
W O R K E N V I R O N M E N T	Writing		D	X				Short notes/readings, lockout tags	
	Speech					X		Talking with colleagues in person and via radio	
	Inside Work					X		In buildings and galleries	
	Outside Work					X		On grounds, to include rain and wind (unlikely snow)	
	Hot Conditions >25 deg. C			X				During summer months, near engines	
	Cold Conditions <10 deg.C			X				Can be exposed (outside) briefly during the winter time	
	Humid					X		In some enclosed spaces with water, outdoors on some days	
	Dust				X			On windy days outside	
	Vapor Fumes					X		Sewage fumes	
	Hazardous Machines						X	A wide variety of equipment from screens to motors, fans etc.	
P S Y C H O L O G Y	Proximity to Moving Object						X	Forklift, carts, bikes	
	Noise		B			X		Some enclosed areas in the plant - very loud (>110 db) equipment	
	Electrical Hazard			X				Should always be locked out but possible	
	Sharp Tools			X				Possible with screwdrivers, etc.	
	Radiant/Thermal Energy					X		From engines and pumps in the buildings	
	Slippery Conditions						X	Around water constantly, especially on metal surfaces/steps	
	Vibration and Related				X			Jarring from cart, when close to the centrifuges	
	Chemical Irritants				X			Cleaning substances, testing substances	
	Organic Substances						X	Raw and partly processed sewage water and sludge	
	Medical Waste								
P S Y C H O L O G Y	Blood Products								
	Congested Worksite				X			Some areas that are highly populated with equipment	
	Lighting						X	Daylight, indoor fluorescent and incandescent	
	Lighting - Indirect					X		Reflected off of equipment, water and computer screens	
P S Y C H O L O G Y	Consequences of Error					X		High, ranging from noxious odour release to explosion/others	
	Competence Challenge					X		Sometimes in terms of time, always with complexity and reaction	
	Autonomy					X		More pronounced at night, much decision making latitude in job	
P S Y C H O L O G Y	Relatedness			X				Limited team work required, have to get along with co-workers	

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For detailed descriptions of each of the different categories, please refer to the reference guide or inquire with Human Effort at 1-888-4EFFORT