



HYDRAULIC EXCAVATOR OPERATOR TRAINING II

REPORT

MUFULIRA CENTRAL TRAINING CENTRE
24th April, 2023 to 28th, April 2023



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1. LIST OF ACRONYMS

ADT:	Articulated Dump Truck
HCM:	Hitachi Construction Machinery
HEO:	Heavy Equipment Operator
HEPA:	High Efficiency Particular Air
KVTC:	Kitwe Vocational Training Centre
MCM:	Mopani Copper Mines
PPDP:	Public-Private Development Partnership
SLAM:	Stop, Look, Assess the risk and manage
TOT:	Training of Trainers
TVET:	Technical and Vocational Education and Training
UNIDO:	United Nations Industrial Development Organization

2. INTRODUCTION

In order to equip Kitwe Vocational Training Centre (KVTC) trainers with the technical skills required to train students (beneficiaries) in the Heavy Equipment Operator (HEO) Training Courses at KVTC, KVTC trainers participated in the 4th Training of Trainers (TOT) in Hydraulic Excavator Operator Training II facilitated by Mopani Central Training Centre (MCTC) in Mufulira, Zambia, from April 24th to April 28th, 2023.

3. PURPOSE OF TRAINING

The following were the objectives of the training:

- i. Introduction to Excavator operations
- ii. Safety induction
- iii. Excavator component identification
- iv. Pre-start and after-start inspections
- v. Excavator operations and demonstrations

4. PARTICIPANT NAMES

The training was hosted by MCTC Trainer: Mr. Kennedy Chipunza and the following were the KVTC trainers who participated;

No.	Name
1	Osward Kabwela
2	Bernard Simumba
3	Harry Sianziba
4	Freddie Mulenga
5	Henry Sakala

5. INDUCTIONS AND SITE SEEING

Mopani management welcomed the team, and after the briefing the team were taken to the training wing where we were inducted online.



KVTC Team in the boardroom awaiting inductions

The team was assessed based on the online induction, and later taken on a tour of the training school. The team visited the Automotive Section, Metal Fabrication wing and the Rigging and Heavy Equipment section. Thereafter, the team went to the Simulator Lab and had visual briefing and induction of an Articulated Dump Truck (ADT) simulator, since there was no simulator for an excavator. The lessons included the following; Start up, emergency stop due to fire on a machine, slippery terrain, tire blow out, Fog, rain, poor visibility etc. The team was also shown how to change simulations according to desired test conditions.

6. THE DOVER TEST

Afterward, the team proceeded to the Dover test room. Prior to anyone being eligible to operate heavy equipment or undergo training as an operator, it is a pre-requisite for them to successfully pass a "Dover test". This test evaluates the coordination of cognitive processes and the limbs such as hands, eyes and legs.

7. THE DREYFUS MODEL

The team also had a pedagogical induction with Mr. Chileya Alfred, the training superintendent. He talked about various levels of Risk assessment, procedures, analysis and how these are regulated by the Laws of Zambia. He explained on various levels of courts of Law and the Acts involved in Zambia such as the Mining Act. He used the Dreyfus Model to explain why the risk behavior of humans' changes over time in what is known as the "Rule Governed Behavior".

The Dreyfus Model assumes that the longer one practices, the more competent he or she becomes at a job or task. Regardless of the job or task, it is important for every learner to follow direct rules and guidelines to learn a task.

The Dreyfus model has five stages in which one who practices a job or task will go through:

- i. **Novice:** At this stage the learner follows direct orders from the instructor until they understand what to do in every situation.
- ii. **Advanced beginner:** At this stage the learner is well grounded in the task or job but does not yet know how to prioritize tasks.
- iii. **Competent:** At this stage the learner is quite competent and can avoid certain bottle necks which can delay and jeopardize the execution of the task/job.
- iv. **Proficient:** At this stage the learner is proficient in the job, but before a final decision is made, they have to consult with the expert, who is referred to as the expert.
- v. **Expert:** At this stage the learner is now an expert and carrying out tasks/jobs based on knowledgeable experience and can deal with unexpected events.

The Dreyfus model of skill acquisition is useful to understand the level of development of any individual in any job. It is for this reason that this model is used to assess an individual's performance and how it correlates with the required skills and competences of a job or task. More information on this model can be found on the following websites:

- a. Zeeman, A. (2019). Dreyfus Model of Skill Acquisition. Retrieved 28/04/2023.
<https://www.toolshero.com/human-resources/Dreyfus-model-of-skill-acquisition/>
- b. Dreyfus, S.E., & Dreyfus, H.L. (1980). *A five – stage model of the mental activities involved in directed skill acquisition (No. ORC-80-2)*. California Univ. Berkeley Operations Research Center.

8. RISK MANAGEMENT

Mr. Chileya also explained some of the policies used by Mopani Copper Mines, an example was the SLAM policy meaning Stop, Look, Assess the risk and Manage it. Before embarking on an assignment, one must assess the risks involved, if they are manageable then they can proceed to execute the task. If not competent enough to manage the risk or risks involved, they must convey the information to the immediate supervisor who must advise the next course of action. This is one of the ways in which accidents can be prevented and managed before they can happen in a work place.

9. MACHINE INSPECTION AND IDENTIFICATION

Following the completion of the pedagogical training, the team proceeded to the actual work site to conduct inspections on a Hyundai Excavator (non-runner). One of the objectives was that when teaching a student to identify the components of the upper carriage of a machine such as an excavator, they must be taught in the following sequence:

- i. Mention the name or parts of the components
- ii. Outline what function/s it performs
- iii. How the parts or components look when worn out

The components covered were the digging bucket which has the following parts:

- i. Shacks (teeth for engaging the ground)
- i. Cutting edges for cutting excess material when scooping up
- ii. Bucket Linings which protect the bucket
- iii. The stick and the adjoining parts such as the pins and collets which must be greased using the greasing nipple by the operator on a daily basis
- iv. The hydraulic cylinder which must be checked for leakages and tightness of bolts and nuts, cleanliness of the piston pin etc.
- v. Hydraulic hoses serving the bucket cylinder which must be checked for possible cracks, leaks and damage
- vi. The boom which must be checked for any physical damage, tightness of hose and pipe clamps and leakages on its lift cylinders.

The inspection then shifted to the lower carriage; the following should be checked:

- i. The tightness of the track chain. Here you can use a visual check to determine whether the Track is sagging and can tension it by pumping grease into the tensioning device. The manual must be consulted and only qualified technicians can do this adjustment and not an operator.
- ii. The wear pattern of the rollers and the truck chain, if the rollers are worn out, the truck chain would come out during movement.
- iii. The sprocket teeth must also be inspected for wear.
- iv. The swinging device must be checked on the bolts if they are all available and tight, the greasing nipples must be checked for functionality in order to grease the swinging device.

The team then proceeded to conduct an inspection of the engine compartment; the following inspections should be carried out.

- i. Check the engine oil
- ii. Check hydraulic oil in the main hydraulic oil tank and on the swing motor (the area must be clean and free of any dirt and debris). This oil must be checked twice (before start up and after start up) the reason for this is that after start up, much of the oil will be pumped into the system, so the second check is to ensure that there is still sufficient volume of oil in the system.
- iii. Check the coolant on the expansion tank and not on the radiator cap. Operators are discouraged from touching coolant containers (such as Radiators) and passages because of the danger of being burnt by a hot coolant.

During mounting and disembarking the engine compartment, emphasis must be on maintaining the three-point contact while facing the machine always.

The next set of inspections shifted to the cabin of the machine. Here there was identification of the components and their functions. The following were identified:

- i. The travel pedals/handles
- ii. The Joy sticks for the boom/stick and swinging functions
- iii. The interface and gauges
- iv. The working mode selector (Hammer, Bucket and grabber/cutter) and
- v. The most important was the Hydraulic Lock-Up Lever which locks out the working devices when in the locked position. This is a safety feature to prevent unintentional movements of the machine and boom.

10. MANEUVERING AN EXCAVATOR

On the training site the team met Mr. Chipunza who serves as the Training Coordinator. As a safety measure within the plant, the team received dust masks with HEPA Filters, Goggles and Ear plugs. After the necessary security inspections were completed, the team was guided into the plant area. Prior to engaging in any activities within the plant, inductions are conducted as per Mining Regulations. During this phase, the safety officer gave safety instructions to the team and a few other visitors. The team proceeded to the training site, where we had the opportunity to meet Mr. Kunda, an expert specialist in excavator operations.

Mr. Kunda initiated the practical training session by demonstrating how to maneuver the excavator when going forward, reverse, sideways etc. He called each team member individually to operate the excavator, allowing everyone to practice the operations learnt.



Mr. Kennedy Chipunza, left, debriefing the KVTC trainers on the activities for the following day.

The team asked the excavator trainer for certain special maneuvers to be demonstrated to the team, such as:

- i. How to cross obstacles like drainages
- ii. How to climb ramps
- iii. How to ascend and descend a steep incline/decline
- iv. How to work and park on uneven surface.

The team at the practice area observed the excavator trainer operate and maneuver the Excavator, we witnessed him skillfully gather, clear, and load mineral materials. This provided the team with a valuable opportunity to witness the effectiveness of the Excavator in Action. Mr. Kunda and his team were clearing materials to pave way for the newly extracted and smelted materials.

11. ASSESSMENTS

On the final day the team was assessed. The assessments covered the following categories:

11.1. LOWER STRUCTURE

- i. Pre-start inspections (identifying, Inspecting the working implements and explaining their functions and what could happen if they were to worn out).
- ii. Checking the undercarriage for condition, Track Tension, missing fasteners and wear on rollers and grousers, checking condition of boom cylinders and hydraulic hoses and pipes.
- iii. Checking missing fasteners, condition of swinging device greasing points.

11.2. UPPER STRUCTURE

- i. Checking engine oil level, Hydraulic oil level, Coolant level from expansion tank level indicator, swinging device pump oil level (Checking twice before and after start-up).
- ii. Fuel in the tank.
- iii. Check that there is no dirt and debris in the area housing the swinging device pump
- iv. Check the stick and the bucket cylinders for leakages and missing fasteners and any strange condition.

11.3. OPERATOR CABIN

Identifying the cabin controls and explaining their functions:

- i. Travel Pedals for left and right turns, reversing motion
- ii. Boom and Bucket Joy stick, Stick and swing Joy stick
- iii. Interface functions, self-check functionality when switched on, working mode selector (Drill, Hammer Cutter and bucket), engine revolutions counter, Ignition switch, hydraulic lock lever and its functions.

11.4. MINING REGULATIONS

- i. Authority and permits to operate Machine
- ii. Instances when to hoot
- iii. Applying the rule of Stop Look Assess and Manage (SLAM) to identify risks and fatal dangers
- iv. What to do with a machine during an emergency such as a fire on the engine or any other part of a machine.

12. CHALLENGES

During the training at MCTC the following challenge was highlighted:

- i. Being inducted on a Dump Truck Simulator instead of an Excavator Simulator.

13. RECOMMENDATIONS

In order to overcome the challenge that we faced during the training at MCTC, the following measures should be taken into consideration:

- i. More training is required on an Excavator Simulator actual machine.
- ii. Organize for a practical only based training.
- iii. Consider adopting the Dover test at KVTC.

14. OUTCOMES

- i. The team got to operate an excavator.
- ii. The team was given safety inductions and also learnt the importance of risk assessment, whether to proceed, eliminate or ignore the risk (something that poses a threat).
- iii. The team learnt about the various mining regulations being observed in the mines.
- iv. Learnt how to conduct Pre-start and after-start inspections and identification of components.

15. CONCLUSION

In conclusion this training was beneficial, we operated the Excavator machine and observed how to operate a simulator for the Dump truck machine. We were also exposed to health standards, such as having safety inductions before entering the plant. The SLAM theory is of importance because risk assessment help prevent most fatalities or accidents. Acquisition of knowledge on how to check the engine oil, stick and back cylinders. Apart from that we got an opportunity to learn about the components of an Excavator from a scrapped excavator, identifying its upper and lower parts.