

Uthuli Endaweni yokusebenza



Incwadi yokuqeqesha abasebenzi

OKUPHAKATHI

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1

Isingeniso

ISINGENISO

- **Zazise**
- **Yamukela abaqeqeshwa**
- **Azisa isifundo**
- **Yenza abaqeqeshwa bakhululeke**
ngokubathembisa ukuthi ayikho into okumele
bayesabe mayelana nalesifundo, futhi uma
bengaqondisisi kumele bacele ukuba uchaze
- **Azisa iminingwane yokuphatha**
- **Cela abaqeqeshwa ukuba bazazise ngokwabo**
- **Buza ukuthi ikhona yini imibuzo noma izingxaki**

Nize kulezifundo namhlanje ukuze nifunde ngothuli endaweni enisebenza kuyo. Noma uthuli lujwayelekile empilweni yemihla ngemihla, kukhona izikhathi lapho luyingozi khona empilweni. Ezimayini sivame ukusebenza ezindaweni ezinothuli, kusemqoka ukuba sazi ukuthi kunini lapho uthuli luyingozi khona nokuthi singenzani ukwenza isimo salo sibengcono. Abantu abaningi abaqondisisi ngalokhu futhi abazi ukuthi kunezinto abasebenzi abangazenza ukwenza indawo yokusebenza ikhululeke othulini.

■ **Bonisa isichachiso/umfanekiso 1**

Abaphathi bemayini bafuna abasebenzi bonke bazi mayelana nezingozi zothuli endaweni yokusebenza kungakho beqale uhlelo lokuqaphela uthuli (Dust Watch programme) kulemayini. Loluhlelo luzokwenza abasebenzi bahlale bazi ngothuli endaweni yokusebenza nokuthi lunganqandwa kanjani.

■ **Bonisa umfanekiso 2**

Zintathu izizathu okumele nizazi mayelana nothuli:

1. Lubanga izifo
2. Lukhubaza ukuphepha
3. Lwehlisa izinga lomsebenzi kanye nomkhiqizo

Isifundo esimqoka enizosithola kulezifundo ukuthi kumele nenze ngakho konke okusemandleni enu ukwenza izinga lothuli endaweni yokusebenza libe phansi. Ngokwenza lokhu, nizokwehlisa ingozi yothuli empilweni yenu nasekuphepheni kwenu futhi umsebenzi wenu uzoba nempumelelo enkulu.

Lezifundo zinezinhloso ezimbalwa ekunifundiseni kabanzi ngothuli.

- **Bonisa umfanekiso 3**
- **Funda izinhloso zalezifundo**

Ekuqedeni kwalezifundo nizo kwazi lokhu:

1. Luyini uthuli.
2. Lunithikameza kanjani uthuli.
3. Siyini isifaniso sothuli futhi kungani kusemqoka ukuba senziwe.
4. Lungavinjelwa kanjani uthuli.
5. Lungadambiswa kanjani uthuli.

Lezizinhloso kuzokhulunywa ngazo ezigabeni ezahlukene.

- **Buza abaqeqeshwa:**

Ngaphambi kokuba siqhubeke, ikhona yini imibuzo eninayo?

- **Lindela abaqeqeshwa babuze imibuzo**
- **Chaza uma kudingekile**

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Isigaba 1: Isimo sothuli

ISIGABA 1: ISIMO SOTHULI

- **Bonisa umfanekiso 4**
- **Funda izinhloso zalesigaba**

Ekuqedeni kwalesigaba nizokwazi lokhu:

1. Luyini uthuli.
2. Yini eyenza uthuli lube yingozi.
3. Luvelaphi uthuli futhi lwenzeka kanjani.

Kulesigaba sizofunda ngesimo sothuli. Empeleni ngendlela ejwayelekile siyazi ukuthi uthuli luyini. Ezikhathini zonke siyalubona uthuli. Noma kunjalo, kulesigaba sifuna ukufunda ngothuli kabanzi. Ukuze siqonde ukuthi uthuli luyingozi kanjani empilweni nase kuphepheni kwethu nokuthi lwehlisa kanjani umkhiqizo, kumele siqonde ukuthi luyini. Uma sesiqonda lokhu sizokwazi ukuthi kungani luyingozi futhi kungani kufanele silungcine lusesimeni esiphansi endaweni esisebenza kuyo.

■ **Buza abaqeqeshwa:**

Yini uthuli?

■ **Linda baphendule**

Singasho ukuthi uthuli luyizinhlayiya ezincane eziphuke entweni enkulu njenge dwala noma ilahle. Singazibona lezinhlayiya zindiza emoyeni. Futhi singalubona uthuli uma luhlezi endaweni elibala njengempahla yasendlini.

OKUMELE KUQASHELWE NGUMQEQESHI:

- **Bonisa umfanekiso 5**
- **Nikeza lencaciso elandelayo yothuli kubaphathiswa noma abasebenzi be CMU:**

 Uthuli olubangwa ukuhlephuka kwezinto luyizinhlayiya eziqinile ezibuthelene ndawonye ezingaba sesimeni esilandelayo:
 1. Zingalenga noma zisaphazeke emoyeni
 2. Zingahlala zilenga emoyeni isikhathi eside, lokhu kuncike ebukhulwini bazo
- **Le ngqikithi elandelayo kumele inikezwe bonke abasebenzi.**
- **Buza abaqeqeshwa:**

Nicabanga ukuthi yini eyenza uthuli lube yingozi empilweni?

- **Linda baphendule**

OKUMELE KUQASHELWE NGUMQEQESHI:

**Ucwaningo olwenziwa kubasebenzi basemayini
lutshengisa ukuthi iningi labo kalikholwa ukuthi isifo
sephaphu (pneumoconiosis) sikhula ngokuhamba
kwesikhathi. Isizathu salokhu ukuthi abasebenzi kababoni
ukuthi baphefumula umoya onezinhlayiya ezincane zothuli.
Into yokuqala yokulungisa lesimo ukwenza bazi ukuthi
izinhlayiya zothuli zincane kakhulu ngobukhulu. Kumqoka
ukuba basiqondisise lesigaba sezifundo.**

Izinto ezimbili ezimqoka mayelana nothuli ezenza lube ingozi izinga lobukhulu balo kanye nohlobo lwalo. Sizobika ngobu khulu bothuli uma sesikhuluma ngendlela uthuli oluyingozi ngayo empilweni.

Ekuqaleni sithe uthuli lwenziwa izimvuthuluka zokuhlephuka kwento njenge dwala.

■ **Buza abaqeqeshwa:**

Kuliqiniso yini ukuthi kukhona izinto ezincane eduze kwethu esingeze sazibona ngamehlo enyama?

■ **Linda baphendule**

Yebo kuliqiniso ukuthi kukhona izinto ezincane eduze kwethu esingeze sazibona ngamehlo enyama. Udinga ukusebenzisa into enjenge ngilazi ekhulisayo (magnifying glass) noma imasikilopu (microscope) ukuze uzibone. Uthuli luyezinye zalezo zinto. Manje ungasho ukuthi ungalubona uthuli ngokweqiniso. Empeleni uma ubona uthuli usuke ubona ifu ezinkulungwane zemvuthuluka yothuli.

OKUMELE KUQASHELWE NGUMQEQESHI:

Bonisa leliphuzu ngokunikeza umqeqeshwa ngamunye izinto ezithambile ezifana nendwangu, iphepha elithambile noma uvalo. Bacele basule indawo eqinile efana njenge desiki noma phansi endlini. Kumele baqaphele ukuthi into abebesula ngayo ibihlanzekile kodwa manje isingcolile.

Ukungcola enikubonayo izinkulungwane eziningi zezinhlayiya zothuli. Ngesikhathi nibheka phezukweddesiki noma phansi endlini anikwazanga ukulubona uthuli. Manje okwenza ukuthi nikwazi ukulubona yingoba ngesikhathi nisula niyenaqoqela ndawonye izimvuthuluka zalo. Kanjalo nasemgodini uma nisebenza anikwazi ukulubona ngaphandle kokuthi nize nikhanyise bese niyalubona ekukhanyeni. Noma ukhanyisa ngelambu lusekhona uthuli ongakwazi ukulubona ngaphandle kokuthi usebenzise imasikilopu.

OKUMELE KUQASHELWE NGUMQEQESHI:

- **Bonisa umfanekiso 6**
- **Kubasebenzi abafundile tshengisa umfanekiso 6 ukubonisa umahluko phakathi kwezinhlayiya ezibonakalayo kanye nalezo ezingabonakali. Gcizelela ukuthi izinhlayiya ezincane zothuli lwamalahle esiziphefumulayo emaphashini ethu azibonakali ngeso lenyama.**

Akusho ukuthi into ayikho uma ungakwazi ukuyibona. Kungenzeka ukuthi ibe ncane kakhulu ukuyibona ngehlo lenyama. Ngendlela loluthuli luluncane ngakhona luhlala emoyeni isikhathi eside ngaphambi kokuba luwele emhlabathini. Lokhu kuyisifundo esimqoka ngenxa yokuthi yilo loluthuli esiluphefumulayo singaboni olwenza izifo zephaphu. Loluthuli lubizwa ngokuthi ngoluphefumukelayo ngoba luncane futhi luyakwazi ukungena emaphashini ethu. Loluthuli olusemoyeni luyingozi enkulu.

Uthuli olukhulu njengalolu olubambeka emakhaleni

nasemphinjeni alusiyona ingozi enkulu noma lungabanga izifo emapayipini okuphefumula. Loluthuli lubizwa ngokuthi uthuli oluyinhlupho ngoba lubanga ubunzima bokuphefumula.

■ **Bonisa umfanekiso 7**

Kumele sikhumbule ukuthi kunothuli esingalubona nothuli esingeke sikwazi ukulubona, ngaleyo ndlela kumele sihlale siqaphile. Inhlenganisela yothuli yenziwa wuthuli oluyinhlupho kanye nothuli oluphefumukelayo oluyingozi.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

OKUMELE KUQASHELWE NGUMQEQESHI:

Indikimba elandelayo kumele inikezwe kubo bonke abasebenzi.

Kuze kube manje sesifunde ngobukhulu bothuli. Manje sizobheka izinsusa zothuli emgodini.

■ **Buza abaqeqeshwa:**

Uthuli lwenzeka kuphi emgodini?

■ **Linda baphendule**

Uthuli lwenzeka uma ilahle lishayeka, lisikwa, licubuzeka noma likhuhluze. Uthuli oluningi lubangwa ngumshini osika ilahle njenge continuous miner noma i-roadheader. Luyenzeka futhi uma amalahle ethuthwa noma ethululwa. Uma into ihamba, kungaba abantu noma umshini, ibanga uthuli.

- **Buza abaqeqeshwa:**

Uthuli luvela kuphi ku-continuous miner?

- **Linda baphendule**

- **Bonisa umfanekiso 8**

Into ebanga uthuli lwamalahle ngamapiki uma esika ilahle. Uma sikhuluma ngothuli olwenziwa i-continuous miner sisuke futhi sikhuluma ngothuli olwenziwa i-roadheader ngoba kusebenza ngokufana. Uthuli oluningi luyenzeka uma amalahle ebuthwa izandla ze-continuous miner noma futhi elayishwa kuma shuttle cars. Ukuhamba kwama shuttle cars kungabanga uthuli futhi.

- **Bonisa umfanekiso 9**
- **Uma uxoxa ngamaphuzu amahlanu alandelayo bhekisa ezindaweni ezifanele emfanekisweni.**

Ekumbeni ngokuqhubeka (continuous mining) uthuli lwenzeka ezindaweni ezahlukene.
Lezindawo yilezi:

1. Isenzo sokulima sama bhora okusika (cutting bits)
2. Ukuwa kwelahle eliphukile
3. Ukubuthwa nokulayishwa kwamalahle okwenziwa continuous miner kanye nokuthuthwa kwamalahle shuttle car.
4. Ukuchithwa kwamalahle
5. Ukubhoboza uphahla.

Uthuli luyenzeka futhi uma i-continuous miner isika uphahla noma phansi. Ngezinye izikhathi kuyenzeka ukuthi uphahla noma indawo yaphansi kwakheke ngomhlabathi onamatshe, uthuli oluvelayo lapha uthuli lwamatshe. Lolu uthuli olunengozi enkulu olungabanga izifo zephaphu.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Bukeza isigaba

Akesibukeze esikufunde kulesigaba:

1. Kumele siqonde isimo sothuli ukuze sazi ubungozi balo empilweni yethu nasekuphepheni kwethu. Futhi, kumele siqonde ukuthi luwehlisa kanjani umkhiqizo.
2. Uma sesiqonda ngesimo sothuli, sizokwazi ukuthi kungani kufanele silugcine lusezingeni eliphansi endaweni yokusebenza.
3. Uthuli lwenziwa izinhlayiya ezincane kakhulu zezinto ezilenga emoyeni noma ezihlezi phansi.
4. Izinto ezimqoka ngothuli ubukhulu balo kanye nezinhlobo zalo.
5. Kunezinto ezincane kakhulu ongeke wazibona ngeso lenyama. Ukuze uzibone udinga ukusebenzisa ingilazi ekhulisayo noma imasikilopu. Uthuli luwolunye lwalezonto.
6. Izinhlayiya ezincane zothuli esiziphefumulayo ezenza izifo zephaphu.
7. Emgodini uthuli lubangwa ukuphuka kwelahle noma idwala ngenxa yokushayisana, ukufihliza, ukusika noma ukukhuhla. Futhi luyenzeka uma amalahle ethuthwa. Ukuthulula kanye nezithuthi nakho kuyalubanga uthuli.

8. Uthuli luvela ngezindlela eziningi ekumbeni ngokuqhubeka:
- (a) Isenzo sokulima samabhora okusika.
 - (b) Ukuwa kwelahle eliphukile.
 - (c) Ukubuthwa nokulayishwa kwamalahle okwenziwa i-continuous miner kanye nokuthuthwa kwamalahle i-shuttle car.
 - (d) Ukuchithwa kwamalahle.
 - (e) Ukubhoboza uphahla.
9. Uthuli luyenzeka futhi uma i-continuous miner isika uphahla noma phansi. Ngezinye izikhathi kuyenzeka ukuthi uphahla noma indawo yaphansi kwakheke ngomhlabathi onamatshe, uthuli oluvelayo lapha uthuli lwamatshe. Lolu uthuli olunengozi enkulu olungabanga izifo zephaphu.

3

Isigaba 2: Imiphumela yothuli

ISIGABA 2: IMIPHUMELA YOTHULI

- **Bonisa umfanekiso 10**
- **Funda izinhloso zalesigaba**

Ekuqedeni kwalesigaba nizokwazi lokhu:

1. Imiphumela yothuli empilweni yenu.
2. Imiphumela yothuli ekuphepheni kwemayini, ikakhulu mayelana nokubonakala kanye nokuqhuma.

Kulesigaba sizofunda ngemiphumela yothuli njengoba nibona kulezinhloso. Ngamanye amazwi sizothola ukuthi uthuli lwenzani empilweni yethu nokuthi lukubeka kanjani engozini ukuphepha kwethu.

Makesibheke inhloso yokuqala ethi uthuli luyithinta kanjani impilo yethu. Ukwenzeka kwezifo eziningi kuya ngobukhulu bothuli kanye nokuthi buluhlobo luni. Lezizifo zingenziwa ukuphefumula uthuli oluningi noma ukuphefumula uthuli isikhathi eside. Abanye abantu bacabanga ukuthi uma uthuli luzokugulisa, kumele ubonakale ugula esikhathini esiphakathi kwesonto noma amabili. Akulona iqiniso lelo.

Iqiniso ukuthi izifo ezibangwa luthuli zingathatha iminyaka ukukhula emaphashini. Ukuthi kuthatha isikhathi esingakanani kuya ngomuntu. Ukukhula kwesifo sephaphu kuthatha iminyaka eminingi. Into esemqoka okumele uyikhumbule ukuthi akumele ubeke impilo yakho ebucayini. Imiphumela yothuli ithatha isikhathi, kumele uhlale uqaphele ngazo zonke izinsuku. Abasebenzisi be-continuous miner kumele basebenzise izamfonyo nsukuzonke, ukungazisebenzisi usuku olulodwa nje kuyingozi enkulu.

OKUMELE KUQASHELWE NGUMQEQESHI:

Ucwaningo kubasebenzi basemayini lutshengisa ukuthi kunenkolelo ethi isifo sephaphu sithatha isikhathi esifushane ukuze sikhule (kungaba amasonto amabili). Kusemqoka ukuthi lenkolelo eyize ilungiswe ngesikhathi sokuqeqesha. Isizathu salokhu ukuthi kungenxa yalenkolelo eyenza abasebenzi abaningi emgodini bahluleke ukuthatha izinyathelo zokugwema uthuli. Bakholwa ukuthi uma bengaguli esikhathini esingaphansi kwamasonto ambalwa, abekho engozini futhi ngeke bagule.

Noma kunjalo, izifo ezinzima zephaphu, njenge sifo sokushisa kwephaphu (pneumoconiosis) zithatha isikhathi eside ukukhula ngenxa yokuba sendaweni enothuli. Ngenxa yalesimo salesisifo abasebenzi basemayini kungenzeka bangazi ngaso kuze konakale kakhulu. Ngakho kusemqoka ukuthi yonke imizamo yenziwe kuloluqeqesho ukuqiniseka ukuthi abasebenzi bayaqondisisa ngesimo sesifo sephaphu esikhathini

eside. Futhi kumele baqonde ngokubaluleka bokuthatha izinyathelo zokuvikela ukwenzeka kwalesifo.

Uma ubuza abaqeqeshwa ukuthi kungani becabanga ukuthi isifo sephaphu sithatha isikhathi eside ukukhula, ungasebenzisa lolulwazi olulandelayo ukubaphendula uma bengenayo impendulo ngokwabo. Impendulo ukuthi izinhlayiya ezincane zothuli ziyaphefumuleka bese zihlala othwethwesini lwephaphu. Ekuhambeni kwesikhathi lezinhlaliya zothuli zakhela emaphashini bese zenza ingxaki. Lokukwakhela kuthatha isikhathi okungaba iminyaka eminingi ngaphambi kokuba isifo sibe ingxaki kumuntu esimphephe.

■ **Buza abaqeqeshwa:**

Nicabanga ukuthi kungani uthuli luthatha iminyaka eminingi ukwenza isifo sephaphu?

- **Siza abaqeqeshwa ukuba bazicabangele ngokwabo impendulo.**
- **Uma sebenikezile impendulo noma bethi kabazi chaza usebenzisa ulwazi olunikezwe ngenhla kusaziso okufanele kuqashelwe ngumqeqeshi. Sebenzisa umfanekiso ongunxantathu wephaphu noma uqwembe olutshengisa iphaphu ukukusiza uma unikeza isihlaziyo.**

Manje siyazi ukuthi kungathatha iminyaka eminingi ukuthi isifo sephaphu sikhule. Lokuqhubeka kokwakheka kothuli emaphashini, nokuziphendulela kwamaphaphu othulini kubizwa ngokuthi isifo sokushisa kwephaphu. Ungasazi futhi isifo sokushisa kwephaphu (pneumoconiosis) ngegama laso elidala elithi 'phthisis'.

I-Pneumoconiosis yigama elejwayelekile elisho izinhlobonhlobo zezifo zephaphu. Uhlobo ngalunye lwesifo sephaphu lunegama eliqondene naso. Akengisebenzise isibonelo ukuchaza umahluko phakathi kwegama elejwayelekile negama elichaza ngqo. Igama imoto (car) liyisibonelo segama elejwayelekile elisho noma yiluphi uhlobo lwemoto ngaphandle kokwahlukanisa. Amagama 'Toyota', 'Ford', 'Mazda', kanye ne 'Volkswagen' ayizibonelo ezinhle ezichaza uhlobo lwemoto ngqo.

Ngendlela efanayo, igama 'pneumoconiosis' liyigama elijwayelekile njenge gama imoto (car). Amagama anjengo 'silicosis' igama elisho isifo esenziwa uthuli oluvela etsheni (silica), 'asbestosis', igama elisho isifo esenziwa i-asbestos akhomba isifo ngqo anjenge gama imoto (car) elingasho i 'Toyota' noma 'Ford'. I-Anthracosis noma iphaphu elimnyama igama elisho isifo sephaphu esenziwa uthuli lwamalahle.

Zonke lezizifo zenza umonakalo emaphashini. Uma lomonakalo wenzeka, izingxenye ezithile zephaphu ziyehluleka ukwenza umsebenzi wokuphefumula.

OKUFANELE KUQASHELWE NGUMQEQESHI:

Khombisa umqondo wokunwebeka ngokuba unwebe into enwebekayo noma injoloba. Chaza ukuthi amaphaphu ayanwebeka ngendlela efanayo njenge njoloba. Njengoba umoya ungena noma uphuma uma uphefumula, amaphaphu ayanwebeka futhi afinyele.

Uma amaphaphu onakele awanwebeki ngendlela ejwayelekile futhi awakwazi ukungenisa i-oxygen ngokufanelekile. Kuba ne oxygen encane okumele isetshenziswe umzimba. Ekuhambeni kweminyaka uma isifo siqhubeka siba sibi, ukuncipha kweoxygen emaphashini kwenza ukuphefumula kube nzima. Ekugcineni, umuntu uyehluleka ukusebenza ngoba engasakwazi ukungenisa i-oxygen eyanele ukuze athole amandla okwenza umsebenzi wakhe.

Ngaphambili sikhulume nge-silicosis njengesibonelo sohlobo lwesifo i-pneumoconiosis. I-Silicosis isifo sephaphu esibangwa ukuphefumula uthuli lwetshe (silica). Uthuli olwenzeka uma itshe lophahla lomgodi liphuka ngesikhathi kumbiwa lubizwa ngokuthi i-quartzite. uthuli i-quartzite ine silica (uthuli lwamatshe).

Kumele kugcizelelwe ukuthi uthuli lwetshe (silica) lunengozi enkulu ukwedlula uthuli lwamalahle. Uthuli lwetshe lubanga ukuphatheka kanzima othwethwesini lwamaphaphu. Eqinisweni lokhu akusho ukuthi kuphephile ukuphefumula uthuli oluningi lwamalahle. Noma kungathatha iminyaka eminingi ukungenwa isifo sephaphu esenziwe uthuli oluningi lwamalahle emaphashini slokhu kuseyingozi. Esikushoyo lapha ukuthi uthuli lwamatshe luyingozi enkulu empilweni nxa luqhathaniswa nalolo lwamalahle.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Manje singakhuluma ngenhloso yesibili ethi, imiphumela yothuli ekuphepheni kwemayini. Imiphumela emikhulu isekuqhumeni nase kwazini ukubona okwenzayo.

Akukuhle ukusebenza endaweni enothuli oluningi, futhi kuyingozi.

- **Buza abaqeqeshwa:**

Uma kunothuli oluningi endaweni yokusebenza nicabanga ukuthi kungaba namphumela muni ekuphepheni kwemayini?

- **Linda baphendule**

Nicabanga ukuthi kungani kuyingozi?

■ **Linda baphendule**

Kuyingozi uma kunothuli oluningi endaweni yokusebenza ngoba ungeke ubone kahle. Ngamanye amazwi kunokubonakala okungacacile. Uma ungaboni kahle, kunengozi yokuthi ungenza amaphutha noma ungeke wakwazi ukubona isimo esinengozi. Kungakho uthuli oluningi luyingozi ekuphepheni kwemayini. Lungabanga izingozi ezinzima ezingenza kufe noma kulimale abanye abasebenzi.

■ **Buza abaqeqeshwa:**

Ingabe ukhona yini umthetho eniwaziyo mayelana nokubonakala kahle endaweni yokusebenza?

- **Linda baphendule**

Chaza imithetho noma imigomo esebenza emayini yakho.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Esinye isikhathi lapho uthuli lunomphumela othile ekuphepheni kwemayini ilapho kuba khona ukuqhuma othulini lwamalahle. Kunamathuba amaningi okuqhuma kothuli lwamalahle uma kunothuli oluningi lwamalahle emayini. Ukuqhuma kwenzeka uma ifu lothuli lwamalahle emoyeni lokheleka. Uthuli lwamalahle oluqhumayo lwakhiwa izinhlayiya ezincane kakhulu eziphephukela phezulu emoyeni.

Ukuqhuma kothuli lwamalahle kwenzeka kanje: okokuqala igesi i-methane iyaqhuma. Lokuqhuma kwegesi i-methane kususa uthuli lwamalahle emoyeni bese luyokheleka. Ukusuka lapho kuba nokuqhuma emuva kokunye, kuqhubeke njalo uma kusenothuli lwamalahle emoyeni.

Ukuqhuma kothuli lwamalahle kuyingozi enkulu, ikakhulu ekuphepheni kwemayini nasezimpilweni zabasebenzi bemayini.

Kunezinto ezimbili ezingenziwa ukunqanda ukuqhuma kothuli lwamalahle.

Okokuqala, ungavimbela igesi i-methane nezinye izinhlobo ezokhelekayo ngoba yizo lezinto ezokhelekayo eziqala ukuqhuma kothuli lwamalahle.

Okwesibili, uthuli olungashi lungandlalwa phansi, ophahleni nasemaceleni omgodi.

Loluthuli olungashi i-limestone, abantu balifinqile leligama bathi i-"stonedust". Noma lubizwa "stonedust", lwahlukile othulini oluvela etsheni uma kumbiwa. Loluthuli ludinga ukwendlalwa ngokwanele ukuqinisekisa ukuthi inoma iliphi ifu lothuli lwamalahle elingakhuphuka emoyeni angeke laqhuma.

Khumbulani ukuthi uthuli oluvela etsheni olwenzeka uma kumbiwa lubizwa i-quartzite futhi lune "silica", kanti "stonedust" engavuthi endlalwa phansi nasemaceleni emgodini ukuvimbela ukuqhuma kothuli lwamalahle ibizwa limestone. Le limestone ivumelana nemithetho eqinile ukuqiniseka ukuthi ayinangozi empilweni yenu.

Imayini isebenzisa i-limestone ukuvimbela kanye nokuqiniseka ukuthi akunankinga empilweni yabasebenzi.

- Buza ukuthi ikhona yini imibuzo
- Chaza uma kudingeka

Bukeza isigaba

Akesibukeze esikufunde kulesigaba:

1. Izifo ezibangwa luthuli zingathatha iminyaka ukukhula.
2. Ukuqhubeka kokwakhela kothuli emaphashini ethu kanye nokuphatheka kwawo luthuli kubizwa pneumoconiosis.
3. I-pneumoconiosis igama elejwayelekile elisho izinhlobo eziningi zezifo zephaphu. Yilolo nalelo hlobo lwesifo sephaphu lunegama laso eliqonde ngqo.
4. I-silicosis igama eliqonde ngqo lohlobo lwesifo sephaphu esibangwa ukuphefumula uhlobo lwensimbi etholakala ematsheni (silica).
5. I-'silica' iyatholakala othulini lwamatshe (quartzite dust) oluvela uma kumbiwa. Loluthuli luvela uma kuphuka amatshe ophahleni. I-'silica' iyingozi enkulu kunothuli lwamalahle. Kodwa kumele nikhumbule ukuthi akusho ukuthi kuphephile ukuphefumula uthuli oluningi lwamalahle. Nalo uthuli lwamalahle luyingozi.
6. Kumqoka ukuqonda ukuthi izinhlayiya ezincane ze 'silica' ezingena emaphashini zibanga isifo sephaphu (silicosis).

7. Uthuli oluningi lungenza indawo yokusebenza ibe ingozi ngoba lungabanga ukungabonakali kahle. Ngenxa yokungabonakali kahle okwenziwa uthuli oluningi ungenza amaphutha noma uhluleke ukubona isimo esingaphephanga. Lokhu kungabanga izingozi ezingabulala noma zilimaze abanye abasebenzi.
8. Kunengozi enkulu yokuqhuma kothuli lwamalahle uma kunothuli oluningi lwamalahle emayini. Ukuqhuma kungenzeka uma ifu lothuli lwamalahle lukhuphukela emoyeni lokheleka.
9. Kunezinto ezimbili ezingenziwa ukuvimbela ukuqhuma kothuli lwamalahle. Okokuqala ungavimbela igesi methane nezinye izinhlobo ezokhelekayo ngoba yizo lezinto ezokhelekayo eziqala ukuqhuma kothuli lwamalahle. Okwesibili, uthuli olungashi lungandlalwaphansi, ophahleni nasemaceleni emgodini.
10. Loluthuli olungashi i-limestone, abantu balifinqile leligama bathi i-'stonedust'. Noma lubizwa i-'stonedust', lwahlukile othulini oluvela etsheni uma kumbiwa. Loluthuli i-'limestone' luvezwa ngaphansi komthetho oqinile wokulinganisa futhi alunangozi empilweni yenu. Uthuli oluvela etsheni uma kumbiwa lubizwa i-'quartzite' kanti lune 'silica'.

4

**Isigaba 3:
Ukufanekiswa
(sampling) kothuli**

ISIGABA 3: UKUFANEKISWA (SAMPLING) KOTHULI

- **Bonisa umfanekiso 11**
- **Funda izinhloso zalesigaba**

Ekuqedeni kwalesigaba nizokwazi lokhu:

1. Izizathu zokufaniswa kothuli
2. Okusetshenziswa ukufanisa uthuli
3. Lufaniswa kanjani uthuli

Kuze kube manje kuloluhle lwezifundo sifunde ngesimo sothuli kanye nemiphumela yothuli empilweni yethu nase kuphepheni kwemayini. Siyazi ukuthi izinhlayiya ezincane zothuli zingangena emaphashini ethu zibange izifo zephaphu ezinzima. Lezizifo zingenzeka emuva kwesikhathi eside sisebenza endaweni enothuli oluningi.

Ngokubheka njalo izinga lothuli endaweni yokusebenza, imayini ingasiza ekunivikeleni ezifeni ezibangwa luthuli. Ngenxa yokuthi amazinga othuli abhekwa njalo emayini, izindawo zokusebenza ezingaba nothuli oluyingozi empilweni zingaphawulwa.

OKUMELE KUQASHELWE NGUMQEQESHI:

- **Kubaphathiswa noma abasebenzi be CMU kanye nabasebenzi abafundile bonisa izizathu zokufaniswa kothuli ku-projector noma oqwembeni.**
- **Bonisa umfanekiso 12**

Ukufaniswa noma ukusampulwa kothuli kwenzelwa:

1. Ukuthola ukuthi yini ebanga amazinga amakhulu othuli endaweni yokusebenza.
2. Ukubona ukuthi kungenziwani ukwehlisa izinga lothuli.
3. Ukuthola ukuthi izindlela noma imishini kusebenza kahle kangakanani ukwehlisa amazinga othuli.
4. Ukuhlola ukuthi amazinga othuli aphansi ngokwanele yini emva kokuba izinyathelo sezithathiwe zokwehlisa amazinga othuli.
5. Ukugcina amalekhodi amazinga othuli, ukuze imifanekiso yamazinga othuli ezindaweni ezahlukeni zemayini iphawulwe.
6. Ukulandela imithetho.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

- **Bonisa abaqeqeshwa i-dust pump**

Manje sizofunda nge dust pump. Isetshenziselwa ukusampula uthuli. Noma kunjalo, ngaphambi kokuba sifunde nge dust pump akesiqiniseke ukuthi siyazi ukuthi kushoni ukusampula noma ukufanisa uthuli.

- **Buza abaqeqeshwa:**

Uma sikhuluma ngokusampulwa kothuli, kusho ukuthini ukusampula?

- **Linda baphendule**

OKUMELE KUQASHELWE NGUMQEQESHI:

Uma beyazi incazelo yokusampulwa kothuli, yeka lencazelo elandelayo. (Abaphathiswa noma abasebenzi be CMU kumele bazi ngaleligama).

Akesikhulume ngokuthi igama ukusampula noma ukufanisa lisho ukuthini. Lisho ukuthatha noma ukuhlola izincezu ezincane zento ukubona ukuthi into yonke iphelele injani.

Umpheki ekhishini lehositela usampula ukudla akuphekayo. Uzwa ukudlana okuncane (sample) ukubona ukuthi kuphekeke ngendlela efanele nokuthi kuzwakala kamnandi. Uma kukuhle uyazi ukuthi sekulungele ukuphakwa. Akakudli konke ukudla ukubona ukuthi kuphekeke kahle.

Nokusampulwa kothuli kufana kanjalo. Uthuli oluncane luthathwa endaweni yokusebenza ukubona ukuthi lungakanani uthuli olukhona. Ngendlela efanayo yompheki, akudingekanga ukuthatha lonke uthuli endaweni yokusebenza ukubona ukuthi lungakanani. Ngokuthatha uthuli oluncane kulula ukubona ukuthi lungakanani uthuli olukhona endaweni yokusebenza. Ngendlela efanayo, lokhu kuliqiniso nasekusampuleni abantu. Ngokubona ukuthi kwenzekani esampuleni yabantu kulula ukubona ukuthi bonke abantu bathinteka kanjani.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

- **Lenqikithi elandelayo kumele inikezwe bonke abasebenzi.**

I-dust pump umshini osetshenziselwa ukusampula uthuli. Umshini othatha uthuli oluncane, isampula, emoyeni endaweni yokusebenza.

OKUMELE KUQASHELWE NGUMQEQESHI:

**Bonisa i-dust pump noma umfanekiso noma uqwembe
olubonisa i-dust pump isesikhwameni sayo.**

I-dust pump umshini omncane ofana nalona otshengiswe lapha.
Njengoba nibona ifakwe esikhwameni sayo esimnyama sesikhumba.

OKUMELE KUQASHELWE NGUMQEQESHI:

**Bonisa i-dust pump noma umfanekiso noma uqwembe
olubonisa i-dust pump ikhishiwe esikhwameni sayo.**

I-dust pump injena uma ikhishiwe esikhwameni sayo. Isikhathi lapho i-dust pump ikhishwa khona esikhwameni sayo ilapho uma yenziwa ukuthi isebenze noma yenziwa ukuba ingasebenzi. Le dust pump

isetshenziswa njalo ukuhlola amazinga othuli emayini. Kusho ukuthi, isetshenziswa ukuqapha amazinga othuli.

OKUMELE KUQASHELWE NGUMQEQESHI:

Qiniseka ukuthi abaqeqeshwa bayaqonda ukuthi ukuqapha amazinga othuli kusho into efanayo nokuhlola njalo amazinga othuli.

Ukusampula uthuli kwenziwa ngokuqapha amazinga othuli emayini. Izimayini eziningi zisebenzisa izindlela ezimbili zokusampula uthuli. Enye ibizwa "spot sampling" kanti enye ibizwa "personal gravimetric sampling".

■ **Bonisa umshini we spot sampling**

Ilokhu okusetshenziswayo ukwenza i-'spot sampling'. I-'spot sampling' isinikeza imiphumela masinyane ukuze sikwazi ukuthatha izinyathelo

uma kunengxaki. I-'personal gravimetric sampling' ithatha isikhathi ukunikeza imiphumela, futhi lemiphumela ithunyelwa kunjiniyela wezimayini wombuso. Umshini osetshenziselwa ukusampula ngendlela ye 'personal gravimetric' ubizwa i-'dust pump'.

I-dust pump ikala ubuningi bothuli endaweni yomsebenzi. Ikwenza lokhu ngokufaka uthuli kuphampu ngembobo encane eseshubhini eliseceleni kwayo. Lonke uthuli oluqoqiwe ngeshifu lugcinwa ephampini. I-dust pump iqoqela ndawonye uthuli kuphela hayi enye into.

OKUMELE KUQASHELWE NGUMQEQESHI:

Nikeza lolulwazi olulandelayo kubaphathiswa noma abasebenzi be CMU: I-dust pump eyaziwa futhi ngokuthi i-'personal gravimetric sampler', isetshenziswa ukulinganisa uthuli oluphefumulekayo endaweni yokuphefumula yomsebenzi. Umoya ozosampulwa udonswa ngomshini onesisefo. Uthuli olukhona emoyeni lubekelela esisefeni bese luyakalwa ukuze kucatshangwe ubuningi bothuli olukhona emoyeni. Ezinye zezisefo ziyahlaziywa ukulinganisa ukuthi kunothuli olungakanani lwamatshe (silica).

- **Lenqikithi elandelayo kumele inikezwe bonke abasebenzi.**

I-dust pump igqokwa emzimbeni iboshwe ngamabhande. Abanye abasebenzi i-dust pump bayigqoka emahlombe abo ukwenza kubelula ukuba benze umsebenzi wabo. Ekugcineni kwe shifu, i-dust pump ithunyelwa endaweni lapho ihlolwa khona. Uma sekwenziwe konke lokhu, imiphumela ithunyelwa kunjiniyela yezimayini yombuso ukuze isetshenziswe i-Risk Committee ukubala ukuba ingozi kwemayini. Lokhu kulinganisa kusetshenziselwa ukubona ukuthi imayini kumele ikhokhe kangakanani esikhwameni sokunxephezela ngokuya komthetho we Occupational Diseasesku Mines and Works Act. Inani imayini elikhokhayo esikhwameni liya ngokuthi amazinga othuli angakanani emayini. Uma amazinga emakhulu nentela ibankulu.

Amazinga othuli okucatshangwa ukuthi awanangozi anikiwe ngokomthetho. Uma imiphumela yokusampulwa kothuli itshengisa ukuthi amazinga othuli makhulu, imayini kumele ithathe izinyathelo ukwehlisa lamazinga.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Manje sizofunda ngokuthi uthuli lusampulwa kanjani endaweni yokusebenza. Amazinga othuli endaweni yokusebenza ayafana kuwe nakumhlobo wakho osebenza naye emsebenzini ofanayo. Ngalendlela, akudingekanga ukuthi wonke umsebenzi afake i-dust pump.

Ngesikhathi esiyizinyanga eziyisithupha, abasebenzi abahlanu ekhulwini, ohlobeni ngalunye lomsebenzi, bakhethwa ukuba bafake i-dust pump. Labasebenzi bagqoka ama-dust pump ishifu eyodwa. Uma kunabasebenzi abangaphansi kwekhulu ohlobeni oluthile lomsebenzi emayini, kudingeka kuthathwe amasampula amahlanu. Ngakhoke, abasebenzi abahlanu bakhethwa ukufaka ama-dust pump noma uma abasebenzi bengaphansi kwekhulu kufanele bawagqoke kaningi ukwenza inani lamasampula amahlanu.

Ngenxa yokuthi kuthathwa inani lamasampula elincane, kungenzeka ukuthi ungakhethwa ukuba ugqoke i-dust pump isikhathi eside. Futhi, uma kwenzeka uyigqoke, akuvamile ukuthi kudingeke uyigqoke isikhathi eside. Kuya ngokuthi bangaki abasebenzi ohlobeni oluthize lomsebenzi.

OKUMELE KUQASHELWE NGUMQEQESHI:

Abasebenzi kumale batshelwe ukuthi ubani ozobanika ama-dust pump nokuthi ubani ozowalayida nokuwacima. Isibonelo esilandelayo sibhekise kophethe isimo okusetshenzwa kuso. Bheka ukuthi ubani onelungelo lalomsebenzi emayini asebenza kuyo bese umenza athathe indawo yomphathi wesimo okusetshenzwa kuso kulesibonelo.

Uma kumele ufake i-dust pump, umphathi wesimo okusetshenzwa kuso uzokwazisa ngaphambi kosuku okuzokwenzeka ngalo.

Ekuqaleni kweshifu elandelayo ophethe isimo okusetshenzwa kuso uzobophela i-dust pump emzimbeni wakho, bese eyilayida.

Ekupheleni kweshifu uzoyikhumula futhi.

Uma i-dust pump isifakiwe, iqala ukuqapha kuze kufike ekupheleni kweshifu lapho umphathi wesimo okusetshenzwa kuso eyicima khona.

Akumelanga uyikhumule i-dust pump ngesikhathi seshifu. Ngesikhathi ufake i-dust pump kusemqoka ukuthi imbobo efaka isampula yothuli ingavalwa. Uma imbobo ivaliwe, isampula ngeke ibe lusizo, kumele ilahlwe.

Umthetho wazisa imayini ngenani lamasampula okumele athathwe. Uma amasampula engabuyiselwa emuva noma engasetshenziwa ngenxa yokonakala, kumele athathwe kabusha. Lokhu kusho ukuthi kumele i-dust pump uyifake kwenye ishifu. Lokhu kungenzeka futhi uma i-dust pump ingasiwa kumphathi wesimo okusetshenzwa kuso ekupheleni kweshifu. Kusemqoka ukukhumbula ukuthi ukusetshenziwa kwe dust pump kwenceke ekuthembekeni komsebenzi oyigqokile. Uma i-dust pump iphazanyiswa noma ikhishwa endleleni efakwe ngayo, izonikeza imiphumela emibi.

Khumbula, i-dust pump ilinganisa kuphela uthuli endaweni osebenza kuyo. Uyacelwa ukuthi uyinakekele futhi uyigqoke kahle. Ikhona ukusiza imayini ukwenza indawo osebenza kuyo iphephe.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Bukeza isigaba

Akesibukeze esikufunde kulesigaba:

1. Ngokuhlola njalo amazinga othuli emayini, imayini inceda ukuvikela wena ezifeni zephaphu ezibangwa luthuli.
2. Inhloso enkulu yokuhlola amazinga othuli njalo emayini ukuphawula izindawo zokusebenza lapho isimo sothuli singesihle. Ezinye zezizathu ezenza ukuthi kuhlolwe njalo amazinga othuli emayini ilezi:
 - (a) Ukuthola ukuthi yini ebangela amazinga othuli aphezulu endaweni yokusebenza.
 - (b) Ukubona ukuthi yini engenziwa ukwehlisa izinga lothuli.
 - (c) Ukuthola ukuthi zisebenza kahle kanjani izindlela noma izimpahla zokusebenza ezisetshenziselwa ukwehlisa izinga lothuli.
 - (d) Ukuhlola ukuthi amazinga othuli aphansi ngokwanele yini emva kokuthi izinyathelo zokwehlisa uthuli sezithathiwe.
 - (e) Ukugcina amalekhodi amazinga othuli ukuze imifanekiso yamazinga othuli ezindaweni ezahlukeni zemayini iphawulwe.
 - (f) Ukulandela imithetho.

3. Izimayini eziningi zisebenzisa izindlela ezimbili zokusampula uthuli. Enye ibizwa i-'spot sampling', futhi inikeza imiphumela ngokushesha. Eyesibili ibizwa i-'personal gravimetric sampling' kanti isebenzisa umshini obizwa ngokuthi i-dust pump.
4. Isampula ingxenye encane ethathwe entweni. Ngakhoke, ukusampula uthuli kusho ukuthatha ingxenye encane yothuli emoyeni ukuze kubonakale ukuthi lungakanani uthuli olukhona.
5. Ngokuthatha isampula nje yothuli, kulula ukuthola ukuthi lungakanani uthuli endaweni yokusebenza. Lokhu kuliqiniso ngokusampula abantu.
6. I-dust pump umshini osetshenziselwa ukusampula. Ikwenza lokhu ngokuthatha uthuli oluncane emoyeni endaweni yokusebenza.
7. I-dust pump ifakwa esikhwameni sesikhumba esimnyama sokuyivikela. Isikhathi lapho i-dust pump ikhishwa khona esikhwameni ilapho ilayidwa khona noma icinywa.
8. Ukusampula uthuli kwenziwa ngokuqapha amazinga othuli emayini kusetshenziswa idust pump. Lokhu kwenziwa ngokufaka uthuli ephampini ngembobo encane eseshubhini eceleni. Lonke uthuli olubuthwe ngesikhathi seshifu lusephampini.
9. I-dust pump igqokwa emzimbeni iboshwe ngebhande.
10. Ekupheleni kweshifu i-dust pump ithunyelwa lapho uthuli luhlolwa khona. Imiphumela ithunyelwa kunjiniyela wezimayini wombuso bese isetshenziswa I Risk Committee ukuhlola ukuthi imayini iyingozi kangakanani. Ukulinganisa kusetshenziselwa ukubona ukuthi imayini kumele ikhokhe kangakanani esikhwameni sokunxephezela. Uma amazinga othuli emakhulu nomnikelo okhishwa imayini mkhulu.

11. Amazinga othuli okucatshangwa ukuthi awanangozi anikiwe ngokomthetho. Uma imiphumela yokusampulwa kothuli ibonisa ukuthi amazinga othuli makhulu, imayini kumele ithathe izinyathelo ukuwehlisa.
12. Izinga lothuli endaweni osebenza kuyo liyafana kuwe kanye nakubasebenzi osebenza nabo. Ngenxa yalokhu akudingekanga ukuthi bonke abasebenzi bafake i-dust pump.
13. Ngesikhathi esiyizinyanga eziyisithupha, abasebenzi abahlanu ekhulwini, ohlobeni ngalunye lomsebenzi bakhethwa ukuba ba gqoke i-dust pump. Labasebenzi bagqoka ama-dust pump ishifu eyodwa.
14. Uma kumele ufake i-dust pump, ekuqaleni kweshifu umphathi wesimo okusetshenzwa kuso uzobophela dust pump emzimbeni wakho, bese eyilayida. Akumelanga uyikhumule i-dust pump ngesikhathi seshifu. Kusemqoka ukuqiniseka ukuthi imbobo efaka isampula yothuli ayivalwanga.
15. Uma i-dust pump iphazanyiswa noma ikhishwa endleleni efakwe ngayo noma ingasiwa kumphathi wesimo sezokusebenza ekupheleni kweshifu, izonikeza imiphumela emibi okudinga ilahlwe. Uma eyodwa yalezinto ingenzeka, kudingeka uphinde ufake i-dust pump ngeshifu elandelayo.
16. Ubukhona be dust pump ukusiza imayini ukwenza indawo osebenza kuyo iphephe.

5

Isigaba 4: Ukuncishiswa kothuli olwenzekayo

ISIGABA 4: UKUNCISHISWA KOTHULI OLWENZEKAYO

- **Bonisa umfanekiso 13**
- **Funda izinhloso zesigaba**

Ekuqedeni kwalesigaba nizokwazi lokhu:

1. Okudingekayo ukunciphisa ubuningi bothuli olwenzekayo.

- **Buza abaqeqeshwa:**

Kusho ukuthini ukwenzeka kothuli?

- **Linda baphendule**

Ukwenza kusho ukuveza noma ukuqala. Ngakhoke, ukwenza uthuli ukuqala uthuli.

Lesigaba simayelana nokunciphisa ukwenzeka kothuli. Ngamanye amazwi, simayelana nokwenza uthuli oluncane. Siyazi ukuthi uma sisika izinto, njengetshe elinomhlabathi (sandstone) noma ilahle, uthuli lukhululeka emoyeni. Ngenxa yokuthi izinhlayiya ezincane zothuli ezisemoyeni zinengozi empilweni yethu, futhi ziphazamisa ukuphepha kwemayini, kumele senze konke okusemandleni ethu ukugcina ubuningi bothuli olwenzekayo lusezingeni eliphansi.

Wonke umuntu angathatha izinyathelo ukwehlisa amazinga othuli ngesikhathi kusetshenzwa. Ulwazi olukulesigaba lumqoka kubasebenzisi be "continuous miner", kubabheki babo kanye naku "section fitter". Bonke labantu bangaba nosizo olukhulu ekwehliseni ubuningi bothuli olwenzekayo.

Isisusa esikhulu sothuli olwenzekayo ipiki eligugile noma elibuthuntu. Isizathu salokhu ukuthi amapiki agugile adinga amandla amakhulu ukuze asike ilahle. Ipiki eligugile alikwazi ukusika ilahle lijule njengepiki elibukhali. Ngakhoke, ukuthola amalahle ngokusebenzisa ipiki eligugile kudinga ukusika ngamandla. Lomsebenzi ongezelelwe wenza uthuli oluningi.

- **Tshengisa abaqeqeshwa ipiki eligugile nepiki elibukhali ukuze babone umehluko.**

Akenginikeze isibonelo ukubonisa ukuthi ipiki eligugile lenza uthuli oluningi. Ipiki eligugile lifana nembazo egugile. Uma ukabha ukhuni ngembazo egugile kudingeka ukabhe kaningi ngaphambi kokuba ukhuni lukabheke. Ekuhambeni, kwenzeka amagxolo amaningi okhuni. Kodwa uma kusetshenziswa imbazo ebukhali, ukhuni alukabheki nje kalula kodwa kuba namagxolo amancane okhuni. Kunjalo-ke nangepiki. Ipiki eligugile lenza uthuli oluningi ngendlela efanayo njengembazo egugile eyenza amagxolo amaningi okhuni. Amapiki acijile enza uthuli oluncane.

Isizathu esenza ukuthi ipiki eligugile lenze uthuli oluningi ukuthi libanga ukugudla okuningi kunokusika. Ngenxa yokuthi ipiki eligugile lenza ukugudla okuningi, amathuba maningi okwenzeka kwezinhansi.

Ngakho kunezizathu ezintathu ezinhle zokushintsha amapiki agugile. Okokuqala, ngokushintsha amapiki masinyane uma ubona ukuthi ababuthuntu wehlisa ubuningi bokwenzeka kothuli. Okwesibili, uma amapiki agugile engashintshwa, kungaba nokulahleka komkhiqizo

ngoba awakwazi ukusika ilahle masinyane noma ngokwanele njenge piki elibukhali. Okwesithathu, amapiki agugile andisa amathuba okwenzeka kwezinhansi ezandisa amathuba engozi yokuqhuma kwe-'methane'.

Ukuhlola ukuthi amapiki agugile kungu msebenzi womsebenzisi we-'continuous miner'. Uma amapiki ebuthuntu kumele ashintshwe.

Enye indlela umkhiqizo ongalahleka ngayo ilapho osebenzisa umshini engakwazi ukubona lapho esika khona. Lokhu kwehlisa umkhiqizo ngoba osikayo engasiki lonke ilahle. Futhi, uma engaboni lapho esikakhona, umshini ungaphuma lapho usika khona kudaleke ukwehla komkhiqizo.

Uma osebenzisa umshini engakwazi ukubona kahle uphahla lomgodi, kune thuba elikhulu lokuthi angagudluza indawo lapho ilahle lihlalanga khona ne 'sandstone'. Lokhu kungenza uthuli oluningi lwe-'silica'.

Naphansi ngokunjalo, uma osebenzisa umshini engaboni lapho esika khona ngokulinganisa. Ibala elingalingani lingehlisa ukusebenza kanye nomkhiqizo wabashayeli be 'shuttle car'.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Bukeza isigaba

Akesibukeze esikufunde kulesigaba:

1. Ukwenza uthuli ukugala uthuli. Ngakhoke, ukunciphisa kokwenzeka kothuli kusho ukwenza uthuli oluncane.
2. Uma sikhuluma ngokwenzeka kothuli sigonde ukuthi uthuli lukhululeka emoyeni ngesikhathi sisika ilahle noma itshenhlabathi (sandstone). Izinhlayi ezincane zothuli ezisemoyeni ziyingozi empilweni yenu nasekuphepheni kwemayini. Ngakhoke kumele kwenziwe konke okusemandleni ukunciphisa uthuli.
3. Isisusa esikhulu sokwenzeka kothuli ipiki eligugile.
4. Ipiki eligugile alikwazi ukusika ilahle ngokujula njenge piki elicijile. Ngakhoke, ukuthola ilahle kudinga ukusikisisa. Lomsebenzi ongezelelwe wenza uthuli oluningi.
5. Ngenxa yokuthi ipiki eligugile lenza ukugudla okuningi, amathuba maningi okwenzeka kwezinhansi.
6. Kunezizathu ezinhle ezintathu zokushintsha amapiki agugile.
 - (a) Ngokushintsha amapiki masinyane uma ubona ukuthi ababuthuntu wehlisa ubuningi bokwenzeka kothuli.
 - (b) Uma amapiki agugile engashintshwa, kungaba nokulahleka komkhqizo ngenxa yokuthi awakwazi ukusika ilahle njengamapiki acijile.

- (c) Amapiki agugile andisa amathuba okwenzeka kwezinhlanga ezandisa amathuba engozi yokuqhuma kwe 'methane'.
7. Ukuhlola ukuthi amapiki agugile kungumsebenzi womsebenzisi we-'continuous miner'. Uma amapiki ebuthuntu kumele ashintshwe.
8. Umkhiqizo ungalahleka futhi uma osebenzisa umshini engaboni lapho esika khona. Futhi, uma osebenzisa umshini engakwazi ukubona kahle uphahla lomgodi kune ngozi yokuthi angashayisa i-'sandstone' engenza uthuli lwamatshe (silica).

6

**Isigaba 5:
Ukuthuliswa kanye
nokuvinjelwa kothuli**

ISIGABA 5: UKUTHULISWA KANYE NOKUVINJELWA KOTHULI

- **Bonisa umfanekiso 14**
- **Funda izinhloso zesigaba**

Ekuqedeni kwalesigaba nizokwazi lokhu:

1. Ukuthi izifafazo zamanzi nezindlela zokukolobha ziluthulisa noma ziluvimbela kanjani uthuli.
2. Izidingo zokuqiniseka ukuthi izimpahla zokuthulisa uthuli zihlala zisesimeni esikahle.

Esigabeni esedlule sifunde ngokuthi lungancishiswa kanjani uthuli olwenzekayo. Noma singalwehlisa uthuli masisebenza, kodwa luzohlala lukhona. Sidinga ukuba nento esiyenzayo ngaloluthuli olusalayo.

Lokhu sikubiza ngokuthi ukulwa nothuli. Ngalokhu siqonde ukuthuliswa kanye nokuvinjelwa kothuli. Izindlela ezisemqoka ekulweni nothuli ukusebenzisa amanzi afafazwayo nokukolobha kanye nokusebenzisa umoya ngendlela efaneleyo.

Ukufafaza amanzi kwehlisa uthuli ngezindlela ezimbili. Okokuqala, kumanzisa ubuso belahle ukuze uthuli lubambeke lungandizi emoyeni. Okwesibili, amaconsi amanzi amanzisa izinhlayiya zothuli emoyeni. Ngenxa yokuthi amaconsi amanzi ayasinda kunezinhlayiyo zothuli, uma ethintana nothuli konke kuwela phansi. Ngalendlela uthuli luyasuka emoyeni.

Kunezinhlalo eziningi ezahlukene zezifafazo. Noma kunjalo, zonke lezifafazo zinento eyodwa emqoka eziyenzayo, zilwa nothuli. Ngenxa yalokhu kusemqoka ukuthi zihlale zisesimeni esikahle sokusebenza.

■ **Bonisa umfanekiso 15**

Izifafazo zamanzi zisetshenziswa ezindaweni eziningana.

Zonke izifafazo kumele zihlolwe njalo ukuqiniseka ukuthi zisebenza ngokufanele.

OKUMELE KUQASHELWE NGUMQEQESHI

Ngenxa yokwahluka kwemilayo ebekiwe ezimayini, kusemqoka ukuthi usebenzise ulwazi oluqondene nemayini yakho ngesikhathi ufundisa ngalesigaba. Izindawo zolwazi okumele zithintwe yilezi:

- 1. Izinyathelo okumele zithathwe mayelana nezifafazo zamanzi ezivalekile.**
- 2. Ofanele amelane nalezinyathelo**

Ingxaki enkulu mayelana nokusetshenziswa kwezifafazo zamanzi ekuvimbeni uthuli, ukuvaleka kwemitshumo yazo. Izinto ezivala imitshumo yezifafazo kuvame ukuba izinto ezisemanzini amapayipi noma amalahle amancane noma amadwala amancane. Umtshumo ovalekile awunalo usizo. Nomtshumo ovaleke kancane awunalo usizo ngoba awufafazi yonke indawo futhi ungahluleka ukwenza amanzi athintane nothuli. Ngakho-ke kubalulekile ukuthatha izinyathelo masinyane ngesikhathi kubonakala ukuthi izifafazo zivalekile noma azisebenzi ngendlela efanele. Ukuqiniseka ukuthi izifafazo zisebenza ngendlela efanele kumele zihlolwe ekuqaleni kweshifu.

- **Bonisa umfanekiso 16**

Ku-'continuous miner', izifafazo kumele zihlolwe ngezikhathi zokuma nalapho futhi kuqala ishifu. Abasebenzisa i-'continuous miner' kanye ne-'fitter' yibo okumele bahlole izifafazo. Uma isifafazo singasebenzi kumele sikhishwe kufakwe umtshumo omusha wesifafazo. Ungalingi uzame ukuvula umtshumo wesifafazo ngokufaka ucingo kuwo, lokhu kungalimaza umtshumo.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

- **Bonisa umfanekiso 17**

Manje sizobheka ukusetshenziswa kwezindlela zokukolobha ekususeni nasekuvimbeni uthuli. Izimayini eziningi zisebenzisa izindlela zokukolobha ekuhlanzeni umoya onothuli. Ukuhlanza umoya kubizwa ukukolobha (scrubbing).

■ **Bonisa umfanekiso 18**

Lomfanekiso utshengisa indlela yokukolobha esetshenziswa ku-'continuous miner'. Izigudli zenziwa ngamaphedi ensimbi esasisefo. Kulezisefo umoya onothuli ungena khona. Kunezifafazo zamanzi ezimanzisa izingcingwana. Amathonsi amanzi kulezingcingwana abamba izinhlayiya zothuli. Amathonsi amanzi anezinhlayiya zothuli ashayisana nepuleti le-'demister' bese eyakazeka angene esigujini (sump). Isifafazo samanzi siyakaza izinhlayiya zothuli olubambekile.

Kumele kugcizelelwe ukuthi izifafazo zamanzi zingamalunga amqoka omshini wokukolobha (scrubber system). Uma lezifafazo zingasebenzi, isikolobhi (scrubber) angeke sisuse uthuli emoyeni. Ucingo sisefo esikolobhini kumele luhlanzeke ngazo zonke izikhathi ngoba lugezwa ngamanzi aphuma ezifafazweni. Uma isisefo singahlanzekile, kusho ukuthi izifafazo azisebenzi kahle. Ngamanye amazwi, imitshumo

yezifafazo evalekile kumele ihlanzwe.

OKUMELE KUQASHELWE NGUMQEQESHI:

Lolulwazi olulandelayo kumele lunikezwe kubaphathiswa noma abasebenzi be CMU:

Umoya onothuli udonseka ngembotshana yesikolobhi okumele ibe seduze nobuso bendawo okusetshenzwa kuyo. Lokhu kuya ngohlobo lomshini osetshenziswayo.

Isibutho sesikolobhi sisembhojaneni ngemuva kwembotshana. Isibutho sinentuba yompheme wesikolobhi. Lesibutho singashintshwa masinyane uma kunesidingo. Ngenhla kompheme wesikolobhi kunepayipi elinezimbotshana ezimbalwa (manifold), eziletha amanzi okuhambisa uthuli.

Uma umoya usudlulile esibuthweni sompheme wesikolobhi, ungema ku 'demister housing'. Amathonsi amanzi emoyeni alahlekelwa umfutho bese ewela kusampu ehlanganiswe emshinini ngedileni ku-'demister housing', umoya owomile nohlanzekile ungena efenini bese ukhishwa.

- **Lenqikithi elandelayo kumele inikezwe kubo bonke abasebenzi.**
- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Ukugcina imishini yokuthulisa nokuvimbela uthuli isesimeni esihle sokusebenza kusemqoka. Ukugcina imishini kahle kumqoka ekugcineni amazinga othuli ephansi.

Umsebenzi wasemayini kumele kube ngumsebenzi wakhe ukulwa nothuli endaweni yakhe. Noma kunjalo, bonke abasebenzi kumele babambisane ngoba kuthinteka impilo yabo. Isibonelo, umsebenzisi we-'continuous miner' kanye ne 'section fitter' kungumsebenzi wabo ukugcina impahla yokunqanda uthuli ku-'continuous miner' isesimeni esikahle sokusebenza. Nikhumbule ukuthi uthuli aluyona ingozi nje empilweni yenu, kodwa lenza umkhiqizo ube mubi. Ngakho-ke ukuvimbela uthuli kanye nokugcina izinto zokuvimbela uthuli zisesimeni esihle sokusebenza, kumqoka kakhulu.

Kunezinto ezimbalwa okumele zenziwe ukuqiniseka ukuthi izimpahla zokuvimbela uthuli zibhekeke kahle njalo.

OKUMELE KUQASHELWE NGUMQEQESHI:

**Kubasebenzi abafundile tshengisa amagama amqoka
alokhu okulandelayo kuprojekta.**

■ **Bonisa umfanekiso 19**

Njengoba senibonile, izifafazo zamanzi zidlala indima emqoka ekulweni nothuli. Izinto ezimqoka ezidinga ukunakekelwa kuzifafazi zamanzi imitshumo. Uma ubona ukuthi umtshumo uvalekile, ulungise masinyane. Lmitshumo engakasetshenziswa kumele ihlale ikhona ukuze ifakwe esikhundleni semitshumo eyonakele noma egugile.

Ukuvimbela izifafazo zamanzi ekuvalweni ukungcola, izisefo kumele zifakwe kwimithombo eletha amanzi. Izisefo kumele zihlanzwe noma kanye ngosuku. Ukufaka izisefo ezizihambisela ngokwazo amanzi kwenza ukuhlanza kube lula. Emva kokuba amabhande eseluliwe, amapayipi kumele avulelwe amanzi ukususa ukungcola ngaphambi kokuthi ahlanganiswe futhi.

Ukuvuza kwamapayipi kungenza ukuhamba kwamanzi kube kuncane, okungenza impumelelo yezifafazo ibe ncane. Ngenxa yalesizathu, kumele ukuvuza kulungiswe masinyane.

Izokolobho zingavalwa ukungcola okungenza ukuhamba kwamanzi nomoya kwehle. Lokungcola kumele kuhlazwe njalo ngesikhathi seshifu.

Izisefo ezisetshenziswa kwimishini yokukolobha ukubamba uthuli kumele zihlanzwe noma kanye ngeshifu. Uma zingcolile noma zivalekile, isikolobho asikwazi ukususa uthuli emoyeni, ngakhoke asinalo usizo.

Izifafazo ezisezikolobheni kumele zihlolwe ngesikhathi sokubheka ukuthi yonke into isemi ngomumo yini. Lokhu kumele kwenziwe njalo ngeshifu ukuqiniseka ukuthi zisesimeni esihle. Ukungenisa umoya kumele kuqiniseke ngokugcina i'brattice cloth' kuze kufinyelele emhumeni wokugcina.

Ngesikhathi kusetshenziswa isincedisi sokungenisa umoya, imibhobho engenisa umoya kumele igcinwe iseduze nobuso bomgodi. Imibhobho engenisa umoya kumele ihlale isesimeni esikahle ngazo zonke izikhathi. Imibhobho edlikizekile noma evuzayo kumele ikhishwe kufakwe emisha. Amafeni kumele aqhutshelwe phambili njalo ukuvimbela ukwehla komfutho ngenxa yobude bombhobho.

OKUMELE KUQASHELWE NGUMQEQESHI:

Lolulwazi olulandelayo lubhekene nezindlela okumele zisetshenziswe umsebenzisi we-'continuous miner'. Ngakhoke lolulwazi lusemqoka kubasebenzisi be-'continuous miner' kanye nakubahloli (supervisors). Umsebenzisi we-'continuous miner' ubhekene nomsebenzi wokusebenzisa izindlela ezithize. Lezindlela kumele zenziwe ekuqaleni kweshifu nangezinye izikhathi uma kunesidingo.

Umsebenzisi we-'continuous miner' kumele ahlole isimo samapiki. Amapiki abuthuntu kumele, ashintshwe.

Futhi, kumele ahlole isimo sezifafazo zamanzi. Imitshumo yezifafazo zamanzi evalekile kumele ilungiswe kanti nezifafazo ezingekho kumele zifakwe.

Makuhlolwa imibhobho yomoya, kumele aqiniseke ukuthi imbotshana engenela embhobheni ilungile. Izinto ezifana namalahle amancane ezitholakala embhobheni zisuswe.

Isisefo sesikolobho kumele sihlanzeke.

Izifafazo manzi zesikolobho kumele zibe sesimeni esihle sokusebenza. Izifafazo ezivalekile kumele zihlanzwe kanti nezifafazo ezingekho kumele zibuyiselwe.

Isisefo samanzi kumele sihlanzwe.

Uma umsebenzisi we-'continuous miner' ethola ubunzima ekuqhubeni lezindlela, kumele atshele i-'section fitter' okumele inikeze usizo.

- **Lengqikithi elandelayo kumele inikezwe bonke abasebenzi.**

Indlela yokufaka umoya (ventilation system) iyinxenye yenqubo yonke eyenzelwe ukuthulisa nokuvimbela uthuli. Lendlela isemqoka ekufakeni umoya opholile lapho kusetshenzwa khona ngomshini. Lendlela futhi iyadingeka ekuchitheni nasekuhlambululeni amagesi nothuli.

- **Buza ukuthi ikhona yini imibuzo**
- **Chaza uma kudingeka**

Bukeza isigaba

Makesibukeze esikufunde kulesigaba:

1. Ukulwa nothuli, sikhuluma ngokuthulisa kanye nokuvinjelwa kothuli.
2. Izindlela ezimqoka ekuthuliseni nasekuvimbeleni uthuli ukusebenzisa izifafazo zamanzi kanye nokukolobha.
3. Ukufafaza amanzi kwehlisa uthuli ngezindlela ezimbili:
 - (a) Kumanzisa ubuso belahle ukuze uthuli lubambeke lungandizi emoyeni.
 - (b) Amathonsana amanzi amanzisa izinhlayiya zothuli emoyeni. Ngalendlela ziwela phansi kanye namathonsana amanzi. Ngalendlela uthuli luyasuka emoyeni.
4. Imitshumo yezifafazo ivame ukuvaleka ngenxa yokungcola okusemapayipini amanzi, emalahleni noma ezinhlayiyeni zedwala. Imitshumo evalekile noma evaleke kancane ayinasizo. Kungumsebenzi womsebenzisi we-'continuous miner' kanye ne-'section fitter' ukuhlola izifafazo zamanzi. Uma isifafazo singasebenzi kumele sikhishwe kufakwe esisha.
5. Izikolobho zisetshenziswa ukukolobha kanye nokuhlanza umoya onothuli.
6. Izigudli zinephedi lensimbi esasisefo. Umoya onothuli ungena kulezisefo. Amathonsana amanzi ezingcingwaneni abamba izinhlayiya zothuli.

7. Izifafazo zamanzi ziyinxenye esemqoka yesikolobho.
8. Ukuhlala isimo sezinto ziseqophelweni elihle lokusebenza kusemqoka ekuvimbeni nase kuthuliseni uthuli. Lokhu kudingekile ekugcineni isimo sisebenza kahle.
9. Umsebenzi wasemayini kungumsebenzi wakhe ukulwa nothuli endaweni yakhe, kodwa bonke abasebenzi kumele kube ngumsebenzi wabo ngenxa yempilo yabo. Umsebenzisi we-'continuous miner' kanye ne-'section fitter' kungumsebenzi wabo ukugcina impahla yokunqanda uthuli ku-'continuous miner' isesimeni esihle sokusebenza.
10. Into emqoka edinga ukunakekelwa ezifafazeni zamanzi imitshumo. Uma ubona ukuthi umtshumo uvalekile, ulungise masinyane. Imitshumo egugile noma eyonakele kumele ishintshwe kufakwe emisha.
11. Ukuvimbela izifafazo zamanzi ekuvalweni ukungcola, izisefo kumele zifakwe kwimithombo eletha amanzi.
12. Izisefo kumele zihlanzwe okungenani kanye ngosuku.
13. Ukuvuza kwamapayipi kumele kulungiswe masinyane.
14. Ukungcola ezimbotsheni zesikolobho kumele kuhlanzwe njalo kanye ngeshifu.
15. Izisefo zemishini yokukolobha kumele zihlanzwe okungenani kanye ngeshifu.
16. Ngesikhathi sokubheka ukusebenza kahle kwesimo sezinto, kumele izifafazo ezisezikolobheni zihlolwe.
17. Ukungeniswa komoya kumele kuqiniseke ngokugcina 'brattice cloth' kuze kufike emhumeni wokugcina.

18. Imibhobho engenisa umoya kumele ihlale isesimeni esihle ngazo zonke izikhathi. Imibhobho edlikizekile noma evuzayo kumele ikhishwe kufakwe emisha.
19. Ukufaka umoya ngeventiletha kusemqoka ngoba kwenza umoya opholile lapho kusetshenzwa khona ngomshini. Indlela yeventiletha iyinxenye yenqubo yonke yokulwa nothuli.

- **Tshela abaqeqeshwa ukuthi sebefike esiphethweni sohde lwezifundo. Babuze ukuthi banayo yini imibuzo bese uchaza uma kudingeka.**
- **Phetha izifundo ngokubabonga ekubeni nothando kanye nokuhlanganyela.**