



Modiul 9 – Lenas Wakabuk

Pico-Haedro insaed lo komiuniti

PIJIN LANGUAGE - SOLOMON ISLANDS

Slen fo fanding hem kam from:

KOICA
Korea International
Cooperation Agency

An Patna Wetem:



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Pico-Haedro komiuniti training modul hem introdaksin go long fundamentol blong Haedro paoa sistem. Taem yu komplitem kos ya, bae yu save long olketa samting ya:

- Deskraebem Haedro Eneji.
- Luksave long olketa difren pat fo yiusim long haedro paoa sistem.
- Eksplenem olketa waka blong olketa difren pat long haedro paoa sistem.
- Diskraebem olketa difren taep long haedro sistem.
- Luksave long olketa beisik tes ikuipmen an demonstreitem korekt an seif yiuseij.
- Diskasem olketa ki fakta fo konsidarem taem baem nao haedropaoa sistem.
- Diskraebem impotens blong mentenens blong haedro paoa sistem.

PLANIM LESON

TEBOL 2: Leson Plan

Olketa Sapta insaed Wakabuk ia	Olketa Leson insaed wakabuk ia
1. Aes break- introdaksin	Leson Topik an Aktiviti 1
2. Wanem nao Haedro Eneji ?	Leson Topik
	Aktiviti 2
	Aktiviti 3
3. Beisiks blo Elektrisiti	Leson Topik
	Aktiviti 4
4. Oketa pats blo Haedro paoa sistims	Leson Topik
	Aktiviti 5
5. Taeps and Saez blo Haedro paoa Sistims	Leson Topik
	Aktiviti 6
6. Seifti lo Haedro paoa sistims	Leson Topik
7. Baem na Haedro Paoa Sistims	Leson Topik
	Aktiviti 7
8. Meintenans blo Hom Haedro sistims	Leson Topik
	Aktiviti 8
	Aktiviti 9

Disfala Lenas Wakabuk (LW) hemi teken aot from Treinas Gaed (TG) wea kam wetem. Olketa infomesin insaet long disfala LW olketa bin mekem isi an sot. Olketa raetim daon noma olketa mein aedias noma a wea olketa fokas na long olketa piksas, daegrams an olketa aktivitis blong hem wea alaom na lenas fo engeij wetem olketa trenas taem blong training. If yu laekem eni adisinol infomeisin long eni seksin insaed, yu save luk go nao long Trenas Gaed (TG) blong Lenas Wakabuk (LW) ia.

Foto long Buk Kava: Pico-Haedro Sistem taem hem waka (opereisin).

Sos: Paowerspouts NewZealand.

Stetment fo diklearem no eni responsibiliti: Global Green Growth Institute hem no promesem, long toktok o mining, o hem no gareni ligol laeabiliti o responsibiliti long hao stret, kompli o hao eni nara mek tri pati hem iusim, o risalt blong olketa iusim, eni infomeison, tul, prodakt, o proses wea hemi stap insaed long infomison long disfala dokument o hem representim dat eni yus bae hem no brekem lo blong olketa praevet ona raet.

MINING BLONG OLKETA WODS INSIDE LONG WAKABUK IA

AC Karent: Olterneting karent hemi wan taep blo elektrisiti wea hemi sens olowe noma, hem prodius bae oketa invetas, jeneretas an bigfala paoa sitims.

Ah: hemi Amp-aoa , Hem minim wan ampia blo karent save flou fo wan aoa

Kemikol eneji: insaet long olketa batri, olketa kemikol ya yius nao fo storem eneji mekem yu save yiusim fo onim nao redio, sajem fon o olketa laet long naet.

Karent: (A) – hemi flo blo elektrisiti saj insaed lo seket waeas

DC karent: hemi karent flow lo wan daereksin an /o garem na volteij wetem constant polarity

Eneji: Hemi paoa wea hemi teken from making yus lo fisikol o kemikol risosis, espeseli fo provaedim na laet an hit (hot) o fo wakem na masins. Hemi simpli ability fo duim waka

Hanes (as PPE): Hemi fom blo pesonol protektiv ekwipmen (PPE) wea hem disaen fo kajim na man inkeis em foldaon from hae ples taem hem waka

Hit Eneji: hem tu temol eneji, hemi eneji wea wanfala objek garem bikos lo muvment blo molekuls blo hem. Hae tempreja or eneji from hit

Hed: Vetikol distans from point wea wata enta an intek go lo point wea wata livim na haedro paoa divaes. Hemi jenroli mesad lo fit o mitas

Haedro eneji: hem paoa wea hem kam from eneji from wata wea hem ran fast an save putum fo samfala yiusful rison. Haedro eneji hem wanfala riniuabol eneji.)

Haedro - Paoa: Paoa wea foling wata na prodiusim

Mekanikol eneji: diswan hem eneji wea ejin long bout hem givim fo roteitem nao propel fo muvum nao bout. Hem semsem olsem ejin blong ka or tarake wea mekem olketa taea fo muv.)

Megawat: wan million wats

Nem Plet: Saen wea hem pas lo samting an wea hem talem na nem blo ona, okupaea, meka, o oketa nara ditaels.

Radiasin: Eneji wea travol bae weivs o patikols, in patikula na elektromagnetik radiasin osem hit ox-reis

Temol Eneji: hemi eneji objek garem biko lo muvmen blo molikuls blo hem

Volteij: Hemi presa from wan elektrikol seket paoa sos wea pusim na sajd elektrons (karent) fo go pas na lo kondakting lup, eneibolim na oketa fo duim na waka osem laetim ap na lae.

Wat: Reit wea waka hem dan lo elektrikol seket. Hemi wan juls o waka dan lo wan sekon

Wh: hemi Wat-aoa wij mins dat wan watpaoa hem save flo fo wan aoa

1

Introdaksin

AKTIVITI 1

Introdusim yuseleva. Also talem wat nao yu save duim long taem olsem. Yu garem eni eksperiens wetem haedro paoa? Wanem nao olketa tingting blong yu long haedro paoa?



2

Wanem nao
Haedro Eneji

2.1 Wanem nao eneji?

Eneji hem abiliti fo duim waka. Eneji save sensis from wan fom go long narawan an den bae save yusim fo waka. Samfala fom long eneji nao:

- **Hit eneji:** Traem tingim baek taem yu statem faea fo boelem wata.

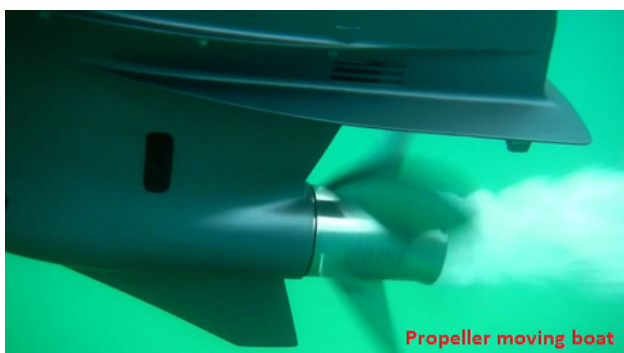
FIGA 1: Hao hit eneji boelim wata¹



The burning wood gives out heat energy and heats the pot. This heat helps to boil the water. The heat energy gets transferred to water. We all know how hot boiled water is.

- **Mekanikol eneji:** diswan hem eneji wea ejin long bout hem givim fo roteitem nao propel fo muvum nao bout. Hem semsem olsem ejin blong ka or tarake wea mekem olketa taea fo muv.

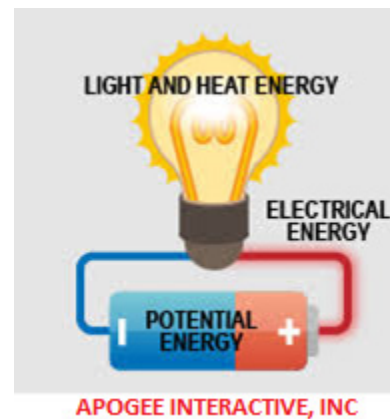
FIGA 2: Mekanikol Eneji from propel²



Propeller moving boat

- **Kemikol eneji:** insaet long olketa batri, olketa kemikol ya yius nao fo storem eneji mekem yu save yiusim fo onim nao redio, sajem fon o olketa laet long naet.
- **Elektrikol eneji:** diswan hem eneji wea muv insaet long olketa waea fo givim paoa long olketa samting wea save yiusim paoa.

FIGA 3: Elektrikol Eneji³



APOGEE INTERACTIVE, INC

2.2 Wanem nao Haedro Eneji?

Haedro eneji hem paoa wea hem kam from eneji from wata wea hem ran fast an save putum fo samfala yiusful rison. Haedro eneji hem wanfala riniuabol eneji.

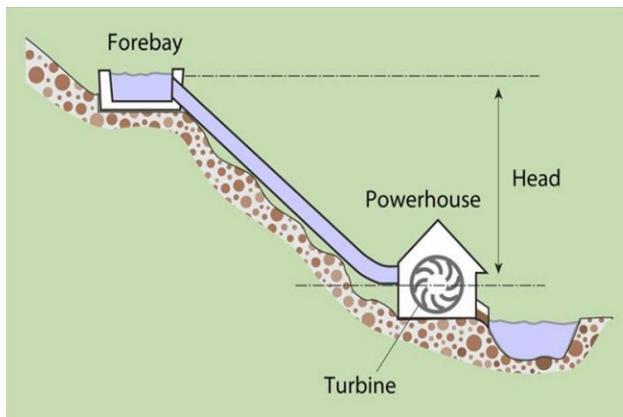
Ples for Storem wata - yiusim dam o resevo fo storem nao wata wea hem flou from blong riva bifo hem rilis go long tebaen fo mekem nao paoa fo yiusim. Diswan hem letem nao fo ren wea hem save stap an save yiusim taem tuweit an drae sison insaet long yia.)

Ran-blong riva skim-diswan taem daevetem nao lelebet long flou blong riva wea ran go long paep o sanol go long tebaen fo mekem nao paoa. Diswan hem isi nomoa fo bildim an save duim yiusim lokol matiriol wea hem sip nomoa an bae no spoelem tumas envaeronmen taem flad olsem.

1 Source: Pikrepo, <https://p0.pikrepo.com/preview/673/890/black-cooking-pot-on-fire.jpg>, accessed on 16 June 2021.

2 Source: Wonderful engineering, <https://wonderfulengineering.com/wp-content/uploads/2017/02/wby-boats-have-propellers-at-the-back-1024x576.jpg>, accessed 16 June 2021.

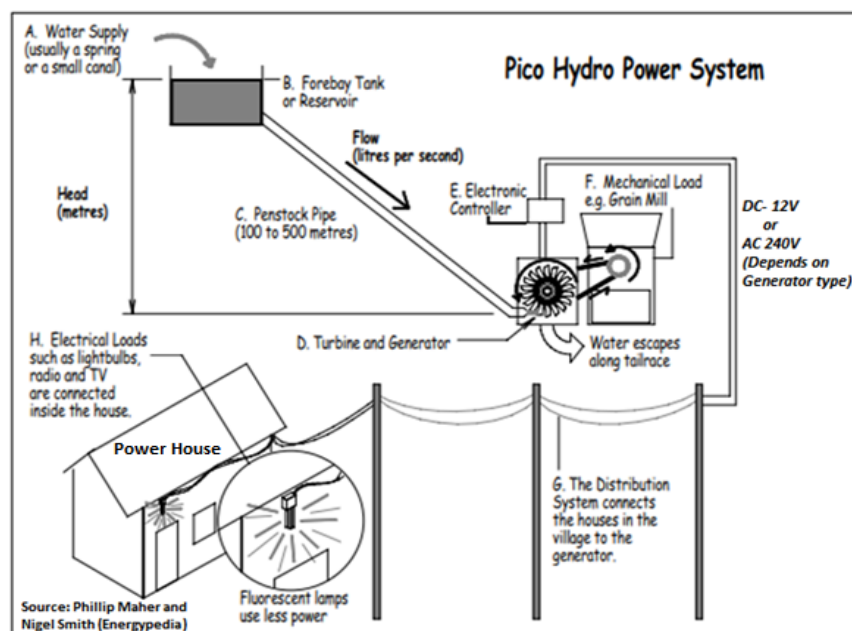
3 Source: APOGEE, <https://www.apogee.net/>, accessed 16 June 2021

FIGA 4: Beisik Haedro Paoa setup⁴

2.3 Wanem nao Piko haedropaoa?

Pico-haedropaoa hem olsem haedropaoa bat long smol skel. Smol Pico-haedro hem kolsap sem long Sola PV sistem wea hem save stanap selewa wea enoji wea hem genereited hem stap insaet batri an save yusim taem laek yusim. Pico-haedro sistem hem mek yus nao long potensol enoji long wata wea hem flou fo roteitem tebaen an kinetic paoa hem konvet go nao long elektrisiti taem yusim nao elektrik jenereita.

- Diswan hem wanfala smol dam wea olketa save kolem olsem Weir wea hem yius nao fo daarektem wata sos go nao long Forebay tank
- Resevo hem save holem nao samfala wata fo daarektem nao wata go long penstock
- Penstok karem flou blong wata go long tebaen
- Tebaen Wetem potensol enoji blong wata, rebaen hem roteit wea hem konekt go long jenereita wea mekem paoa o save konekt go long eni mekanikol lod (olsem hao hem sou long)
- Save yusim kontrola fo control/regiuleit aotput blong paoa
- Transmison laen karem paoa go long olketa haos.
- Paoa wea hem jenereited hem save DC-12V o AC-240V. Diswan hem dipen nao long taep long jenereita yu yusim an paoa yu ekspekt fo produsim.)
- Haos bae givim samfala ikiupmen. Sapos DC paoa hem transmit, batri, saj kontrola, inveta an lod bae mas yusim. Sapos AC paoa nao hem transmit den bae AC lod nomoa bae yusim.
- Presa wea hem kam tru long drop long altitud bituin forebay an paoahaos(haoshol) olketa kolem long Hed.

FIGA 5: Tipikol setup blong wanfala pico-haedro sitem⁵

⁴ Source: U.S Department of Energy, "Planning a Micro Hydropower System", <https://www.energy.gov/energysaver/planning-microhydropower-system>

⁵ Adapted from the International Journal of Research in Engineering and Technology, "Design and Development of Pico Micro Hydro System by Using House Hold Water Supply", <https://citeserx.ist.psu.edu/viewdoc/download?doi=10.1.1.672.5203&rep=rep1&type=pdf>
rinnoveshme.html

FIGA 6: Skimatic an Piksas blo tipikol Piko-Haedro Sistim⁶



Raetem not long hia:

6 Source: News Sewa, June 2021, <http://www.newssewa.com> and DocPlayer, Manual for Renewable Energy Source, <https://docplayer.net/45114164-Manual-per-burimet-e-energi-ve-te-rinovueshme.html>

AKTIVITI 2

1. Waswe yu ting dat taem yiusim haedro dam hem daonem polusin?

2. Olketa wanem kaen enoji nao haedro enoji sistem save prodiusim?

3. Waswe olketa haedro dam save spoelem nasrol wael laef

AKTIVITI 3

1. Diskas long klas sapos yu lukim finis wanfala haedropaoa sistem? Searem ekspierens blong yu.

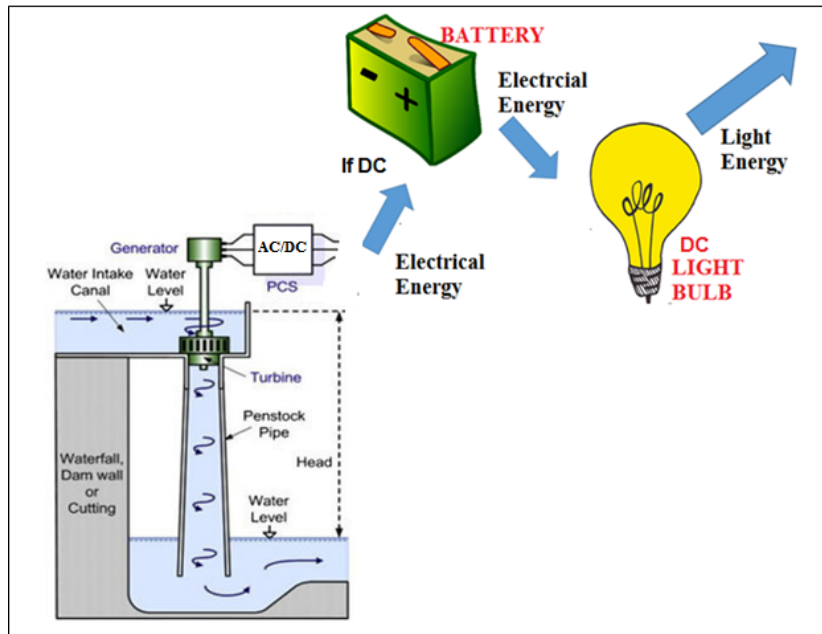
3

Beisik long
Elektrisiti

3.1 Elektrikol Eneji

Elektrikol eneji hem olsem narafala fom long eneji. Long daegram ya, yu save lukim hao diswan hem hapen

FIGA 7: Hao Haedro eneji senses foms of eneji fo givim na laet⁷



Figa 7 som hao nao haedro eneji hem sens go long elektrikol eneji taem yusim haedro tebaen/jenereita.

3.2 Eneji insaet batri

Eneji wea hem stap insaet batri hem yusim kemikol. Wanfala komon risajabol teknologi hem led asid batri (olsem batri blong tarake) no mata lithium-ion batri hem kolsap olsem olketa wea yumi yusim long mobael fon an laptop nao hem stat fo kam ap bat hem dia.

FIGA 8: Led Asid Rijajabol Batri⁸



Seifti Tip: Eneji blong eni fom wea hem elektrikol eneji from jenereita o from batri hem denjaras tumas ya an hem save kosem karakil sapos yumi no keaful. Olowe folom olketa sefti rui taem waka wetem eneji.

⁷ Source: TDM Electricity, <http://www.tdmelec.fr/wp-content/uploads/uploadpeel/minikaplan4.jpg>, accessed 21 June 2021

⁸ Source: JICA

3.3 Paoa

Long simpol tem, yumi difaenem paoa olsem enoji wea hem yius long taem blong hem. Yunit blong paoa hem Wats (W). 1000 wats hem semsem olsem 1kilowat (kw).

FIGA 9: 4 W Laet Balb⁹

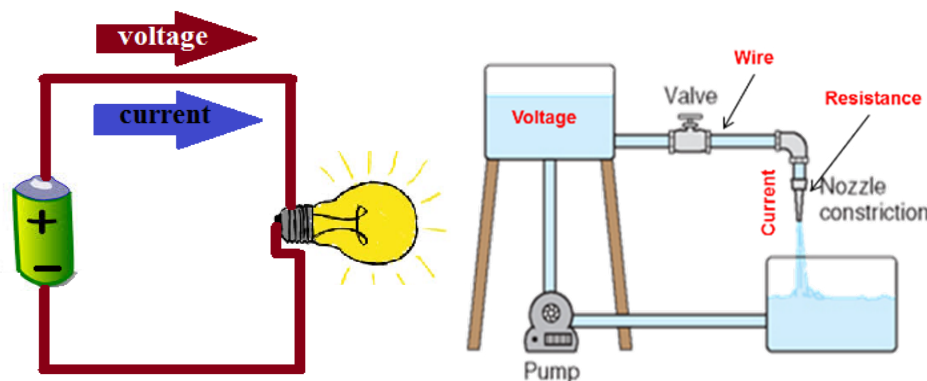


3.4 Volteij an Karent

Volteij hem elektrikol potensol o presa wea muvum electron insaet long waea (kondakta) an save kompearem go long presa insaet wata paep.

Karent hem koleksin blong flou blong olketa electron. Olsem nomoa wata wea flou from hae ples go long lou ples long fos blong graveti, karent hem flou tru long olketa waea yusim nao fos blong volteij.

FIGA 10: Volteij an karent mekao paoa volteij hem osem na presa insaed wata tank¹⁰



Volteij hem mesa nao long yunit volt an karent hem mesa olsem Amperes or Amps. Yumi olowe laek fo save hao mas karent an volteij nao hem stap long olketa waea ya. Yumi save se dat volteij hem olsem nao dip blong strim an karent hem strong blong strim. No mata strim hem no dip-sapos fos long wata hem strong tumas, hem save mekem yumi draon. Hem sem nomoa long lou volteij-sapos karent hem hae hem save fit fo man dae long hem.

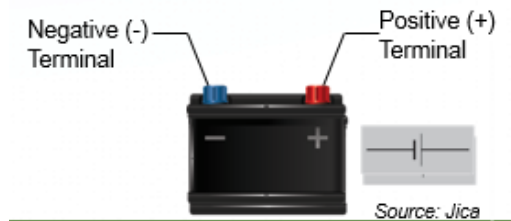
3.5 AC an DC system

Karent wea yumi tekem from batri hem daerekt karent o DC bikos hem no sens. Long DC or daerekt karent, karent hem flou daerekt from positive go long negative teminol an garem wan valiu nomoa. Long olketa bik divaes, yumi garem AC karent o narafala karent wea karent ya olsem wev. Long AC sistem, yumi garem laev, niutrol an graon.

9 Source: Shopee.com, Philips Led Lights 4 Watt Yellow and White Colour, <https://shopee.com.my/PHILIPS-4-WATT-LED-LIGHT-yellow-and-white-i.267756065.3536838685>

10 Adapted from the Electricity Basics, Arizona State University (VOCTEC), <http://votcec.asu.edu>

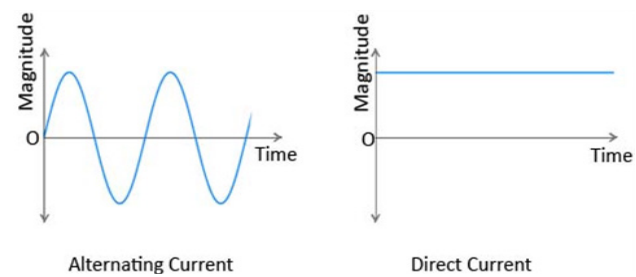
FIGA 11: Polariti blo Batri¹¹



Seifti Tip: Hae karent an volteij sav kosem sirias karakil an save dae sapos hem pas tru bodi blong yu. Olowe mas avoidem nekekt waea an mek sua no waka long olketa laev seket. Olowe praktisim sefti o tekem elektrisian wea garem pepa.



FIGA 12: AC an DC garem na difren volteij an Karen magnitude ova taem¹²



Olketa AC volteij save hae lelebet an staka long olketa grid sistem ya yusim nao AC fo transfa paoa go long olketa haos. Yu mas ridim nao baek blong olketa samting wea yiusim paoa fo save sapos hem AC o DC. Leibol lo baek ya o nem plet blong aplaens ya garem tu infomeisin long volteij an karent wea hem nidim.

Lo hia hem wanfala sampol blo nem plet blo wanfala AC paoad sest friza

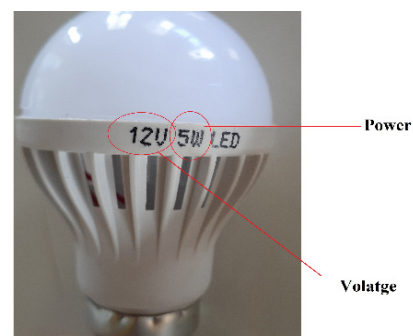
FIGA 13: Sampol Nem plet leibol blo sest Friza¹³

Haier					
Deep Freezer					
Model:	DW-25L92	Refrigerant:	R600a: 52g		
Inner Temperature:	-10℃ - -25℃	Anti-shock Safety Classification:	I		
Effective Volume:	92L	Power Connection Type:	Y		
Rate Voltage:	220-240V~	Foaming Cabinet:	CP/IP		
Rate Frequency:	50Hz	Manufacture Date and No.:	in the Barcode		
Power Input	77W	Power Usage			
Rate Current:	0.35A				
Climate Class:	4				
Weight:	46kg	Current Usage			
Haier Medical and Laboratory Products Co.,Ltd.					
Haier Industrial Park,Economic Technology Development Zone, Qingdao 266510,P.R.China					

Yu save faendem paoa taem yu taemsim nao volteij an karent tuggeda. Long keis blong Figure 13, yumi lukim 220V den taemsim wetem 0.35. Reiting blong karent bae hem givim yumi paoa wea hem barava 77W an hem stap nao long Paoa input leibol. Diswan hem save yiusful sapos paoa hem no daerekt, yumi save yiusim volteij an karent fo kalkiuleitem.

Hem ia na wanfala sampol blo DC laet nem plet o lebol.

FIGA 14: DC Balb Lebol Ditel¹⁴



11 Source: JICA

12 Adapted from System Components: Charge Controllers & Inverters, Arizona State University (VOCTEC), <http://vottec.asu.edu>

13 Source: DocPlayer, "Deep Freezer-upright: HMRS Haier Medical & Laboratory Products Co., Ltd

14 Source: Amazon.com, "Led bulbs", https://m.media-amazon.com/images/I/31kJoFKty+L_AC_SY100.jpg, accessed 21 June, 2021

Raetem not blong yiu long hia

AKTIVITI 4

Treina bae givim tufala AC aplaens nemplet olsem AC laet balb an AC fan. Bae hem givim tu 2 DC aplaens nemplet olsem DC balb an DC aesboks. Insaet long tim, olketa mas duim nao diswan?

- Luksave watkaen divaes nao hem AC an watkaen wan nao DC.
- Luksave volteij an karent wea nidim fo ranem olketa divaes ya.
- Talem hao mas paoa nao wanwan long evri divaes ya save yiusim.

FIGA 15: AC Bulb 220 – 240 V, 3 W, 0.01A¹⁵



FIGA 16: AC Fan, 220V, 55W, 0.25A¹⁶



¹⁵ Amazon.com, "Led bulbs", https://m.media-amazon.com/images/I/31kJoFKty+L.AC_SY100.jpg, accessed 21 June, 2021

¹⁶ Source: Khind.com, <https://www.khind.com.my/index.php?route=product/search&search=AC%20Fan%2C%20220V%2C%2055W%2C%200.25A%20>, accessed 25 June 2021.

FIGA 17: DC Light 12V, 6W, 0.5A¹⁷



FIGA18: DC Freezer, 12V/24V, 55W, 4.58 A/ 2.29A¹⁸



1. Wanem nao waka blong olketa inveta?

2. Wae nao yumi nidim olketa batri?

Seifti Tip: Eneji blong eni fom wea hem elektrikol eneji from jenereita o from batri hem denjaras tumas ya an hem save kosem karakil sapos yumi no keaful. Olowe folom olketa sefti rul taem waka wetem eneji.



¹⁷ Source: AliExpress.com, <https://www.aliexpress.com/item/1316122622.html>, accessed 25 June 2021.

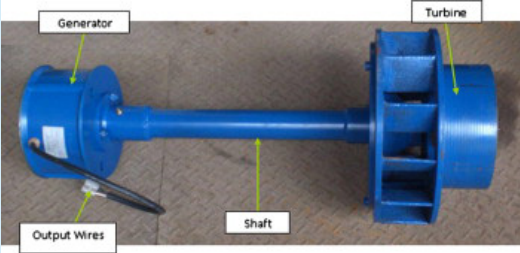
¹⁸ Source: Made in China.com, "Solar Freezer", <https://m.made-in-china.com/company-commercial-energy/>, accessed 25 June 2021.

4

Olketa pat blong Pico
Haedro paoa sistem

Haedro paoa sistem hem garem olketa difren pat wea save yiusim fo disaen an instolem nao haedropaoa sistem. Olketa sistem ya save stan seleva an save haebrid sistem, wetem sola sistem. Olketa mein pat blong haedropaoa sistem an waka blong olketa nao bae yu lukim long teibol ya.

AKTIVITI 5

 Tebaen Jenerol Asembli¹⁹	Tebaen hem divaes wea hem yiusim eneki blong wata an konvert hem eneki ya go long mekanikol eneki (roteisin) an disfala tebaen hem konekt go nao long jenereita wea hem produsim paoa.
 Penstok (PVC pipe)²⁰	PVC paep save yiusim fo sanolem wata from resevo (dam) go long tebaen.
 Batri²¹	Batri hem divaes wea save storem elektrikol eneki go long fom blong kemikol eneki an konvet hem eneki ya go long paoa. Olketa batri save diliverem paoa olsem daerekt karent (DC). Olketa komon batri nao save produsim 12V. Batri konekt go to saj kontrola.
 Saj Kontrola²²	Saj kontrola hem waka fo control an regiuleite nao sajing blong batri from jenereita. Hem save limitim tu reit wea elektrik karent hem ad kam o tekem from batri. Hem stopem ova sajing an ova disajing an save protect aegensim ovavolteij o adavolteij wea save sloum nao waka blong batri, laefspan blong hem an hem save givim seifti risk tu.

19 Source: Researchgate.net, "Typical low head Pico hydro turbine", https://www.researchgate.net/figure/Typical-low-head-pico-hydro-turbine-courtesy-of-Hydropotec-Vietnam_fig1_257414899, accessed 25 June 2021.

20 Source: Creative Commons, adapted from Energypedia, https://energypedia.info/wiki/File:Penstock_La_Laguna.JPG

21 Source: JICA

22 Source: Solar4rvs.com, "Victron Smart Solar MPPT Charge controller", <https://www.solar4rvs.com.au/assets/full/VIC-SCC110020160R.jpg?20210204030925>, accessed 25 June 2021.

Inveta²³

Inveta hem elektronik divaes o seketri wea save sensim darekt karent (DC) go long narafala difren karent (AC).

Wanfala paoa inveta divaes o seket hem rikuaem DC paoa sos wea hem steibol (12V, 24V) an hem save saplaem inaf karent fo paoa wea sistem ya laekem.

AC aotput volteij blong paoa inveta hem waka semsem olsem grid laen volteij, olsem olketa 240VAC, 50 Hz

Kebol²⁴

Elektrikol keibol save yiusim fo konektem tu o moa divaes wea hem alaom transfa blong elektrikol signal o paoa from wan divaes go long narawan. Long Pico-haedro sistem, olketa keibol konekt from jenereita go long batri, batri go long inveta, inveta go long olketa paoa aotlet, saj kontrola go long batri an DC paoa lod.

Breka /Aesoleta²⁵

Seket breka hem otomatik elektrikol suis wea hem disaen fo protektem elektrikol seket fo no spoel sapos karent hem strong tumas from ovalod or sot seket. Waka blong hem fo brekem karent flou taem wanfala folt hem long dea.

Aesoleita hem divaes wea hem yius fo aesoleitem nao seket o ikuipmen from sos blong paoa. Aesoleita hem mekanikol divaes fo suis wea long open posison hem allow fo aesoleisin blong input an aotput blong divaes.

Elektrikol Paoa Aotlet²⁶

Paoa aotlet hem konektem elektrik ikuipmen go long narafala karent (AC) paoa saplae insaet long bilding.

23 MorningStar, May 2021, <https://www.morningstarcorp.com/products/suresine/>

24 Source: Global Market, http://newimg.globalmarket.com/PicLib/group0/5e/73/c477defc613ecc9a0e47b82452f4_1.jpg

25 Source: Wave inverter.co, <https://waveinverter.co.nz/shop/solar/solar-connectors/py-dc-isolator-switch-mc4/> and POSO.com, <http://poso.com.vn/wp-content/uploads/2020/04/1-2.png>

26 Source: Eurotech NZ, "PDL 600 Series Power Points", <https://www.kiwisparks.co.nz/collections/pdl-600-series-power-points/products/pdl-691>, accessed 25 June 2021.

5

Difren taep
haedro sistem

5.1 Olketa taep blong klasifikeisin blong haedropaoa

Save klasifaem haedro paoa sistem olsem lou, midiam an hae hed haedro.) Diswan hem minim nao hed, haet wea wata drop long hem.

TEBOL 3: Klasifikeisin folom “Hed “

klasifikeisin	Hed
Lou	1-30m
Midiam	30-100m
Hae	100m an go ap

5.2 Olketa saes blong Haedropaoa

Hem garem 6 taep long haedro sistem. Evri sistem ya garem semsem konsept bat paoa aotput hem dipen nao long hao mas wata flou yu garem an haet distens (vetikol distens) bituin resevo (dam) an tebaen.

TEBOL 4: Haedro Sistim Taeps

Klasifikeisin	Plan aotput (Kapasiti)
Pico haedro	Lou den 10 KW
Macro-haedro	10kW-100kW
Mini-haedro	100kW – 1 MW
Smol-haedro	1MW – 10MW
Midiam-haedro	10MW –100MW
Laj- haedro	Haeya den 100 MW

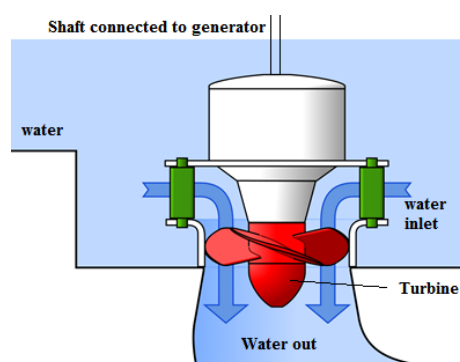
5.3 Piko- Haedro

Piko-haedro sistem hem wanfala smol sistem (les den 5kW). Hem no nidim bik wata flou an vetikol distens. Olketa diswan ya save yiusim nao long olketa smol komiuniti.

FIGA 19: Piko-haedro sistim



27



28

5.4 Maekro-Haedro

Maekro-haedro (5-100kW) sistem hem semsem olsem Piko bat difrens nao hem saes blong tebaen wea save yiusim, a jenereita kapasiti hem bik tu.

FIGA 20: Maekro-Haedro Sistim²⁹



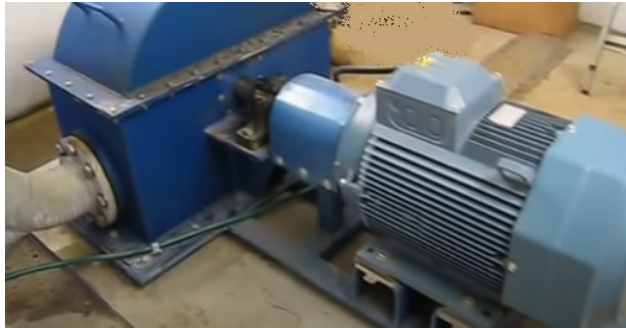
27 Source: Baylor University, adapted from Wikipedia, "Pico Hydro", https://en.wikipedia.org/wiki/Pico_hydro

28 Source: Mechanical E- Notes, <https://mechanicalnotes.com/wp-content/uploads/2019/08/kaplan-turbine-diagram-1000x550.png>, accessed 16 June 2021.

29 SUNECHO Hydro Turbines, June 2021, <https://www.micro-hydro-power.com/>

5.5 Mini-Haedro

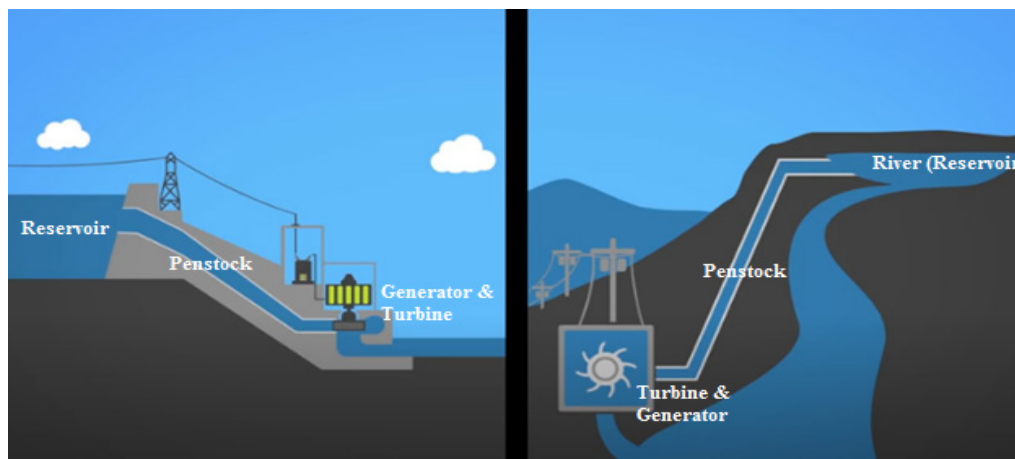
FIGA 21: Maekro-Haedro Sistim³⁰



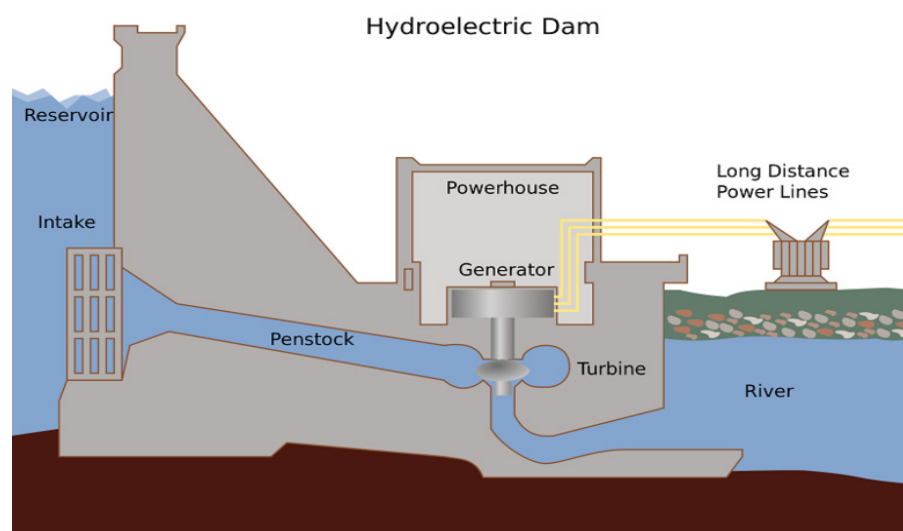
5.6 Mini go long Bik Haedro Sistem

Mini go long bik haedro sistem hem yusim sem prinsapol. Bat save klasifaem go moa go long 2 difren sistem. (Long piksa wan long raet ya hem ran-of-riva aplikeisin an wan long left ya hem haedro dam apkliekeisin)

FIGA 22: Lefsaed – haedro dams an Raetsaed – Ran of Riva³¹



FIGA 23: Wanfala Tipikol laj haedro paoa sistim³²



³⁰ Source: Pinterest.com, "Mini hydroelectric Pelton Turbine, <https://www.pinterest.com/pin/431340470538243882/>

³¹ Earth & Science Space, "Hydroelectric power generation, <https://grade8science.com/7-3-1-what-existing-technologies-could-solve-the-problem-of-global-warming/> or watch YouTube video: Student Energy, "Hydropower 101", 18 May 2015, <https://www.youtube.com/watch?v=q8HmRLCgDAI>

³² Source: Wikimedia Commons, Hydroelectric Plant, September 2015, https://upload.wikimedia.org/wikipedia/commons/thumb/5/57/Hydroelectric_dam.svg/2000px-Hydroelectric_dam.svg.png

5.7 Olketa difren taep tebaen

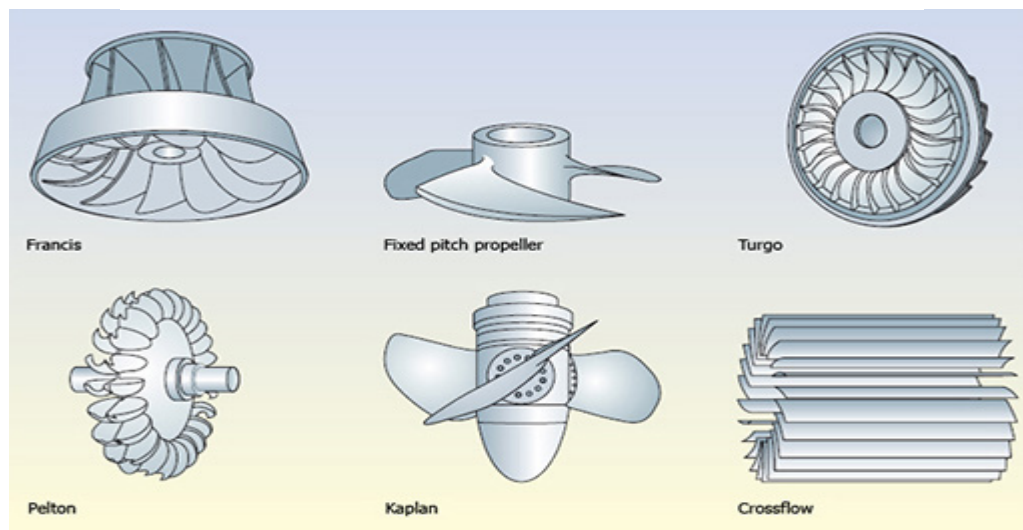
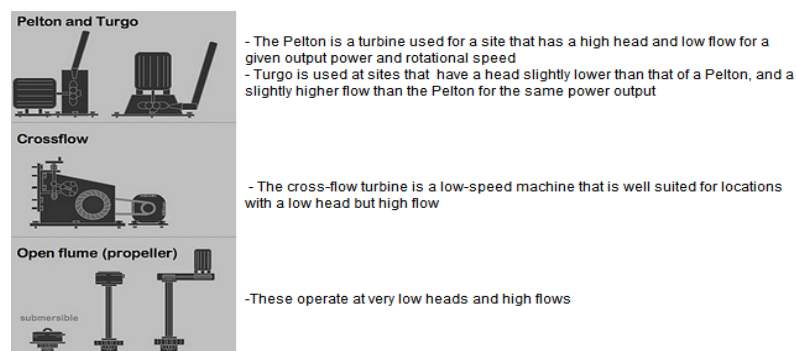
Tebaen hem konvetem nao potensol eneji insaet long wata go long kinetic eneji olsem roteisin eneji. Hem dipen long hed an flou (amaont long wata) long watkaen tebaen fo yusim.

Olketa tebaen hem insaet long tufala katagri wea hem impals an riaksin tebaen.

TEBOL 5: Tebaen taeps wea save yusim lo difren wata karektaristiks

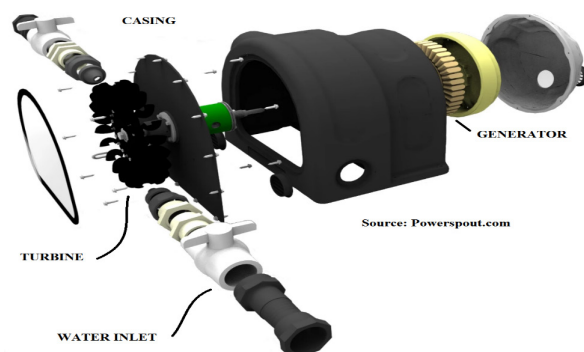
Tebaen Taeps	Wata Hed (m)	Wata Flou (litas/sek)
Propela taeps	1 - 5	14 - 55
Tago Taeps	2 - 30	8 - 16
Pelton Taeps	3 - 130	0.5 - 8

FIGA 24: Tebaen Taeps³³

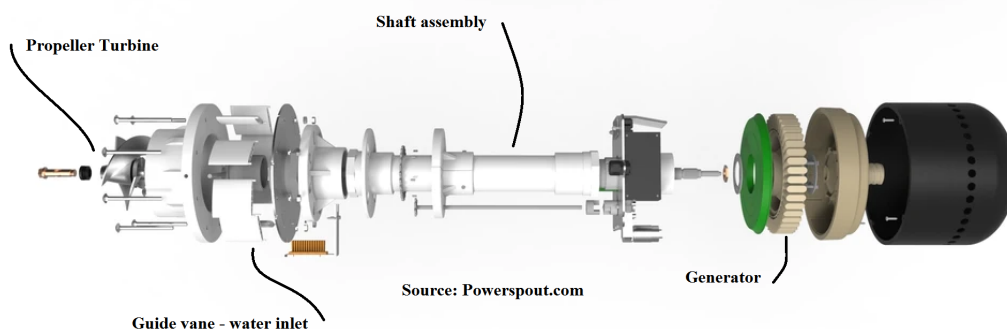


33 Source: Public Research Institute, June 2021, <http://www.publicresearchinstitute.org/Pages/hydrroturbines/images/TypesOfHydroTurbines.jpg>

FIGA 25: Propela Tebaen³⁴



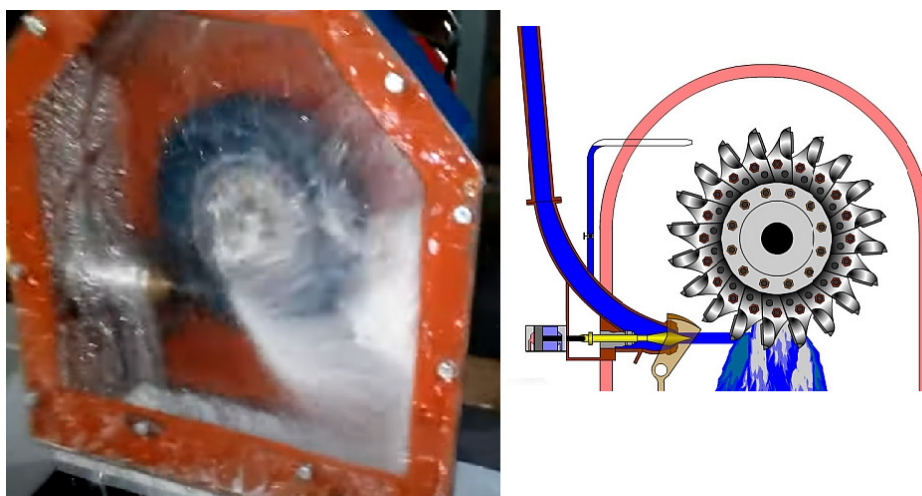
FIGA 26: Propela Jenereita (Eksploded viu)



5.7.1 Aksin blong wata long tebaen

Insaet long haedro sistem wata garem potensol enejji (taem hem stap hae) hem konvet go nao long mekanikol enejji, taem wata jet hem hitim tebaen hem fosim nao tebaen fo roteit olsem bae yu lukim long piksa long daon. Fo save gud lukim piksa.

FIGA 27: Wata fosim na Tebaen fo Roteit³⁵



³⁴ Source: Powerspout.com, accessed 16 June 2021.

³⁵ Source: www.mekanizmalar.com also see YouTube video: mekanizmalar, "Pelton turbine", 12 October, 2013, https://www.youtube.com/watch?v=gbyl-6q7_4

Raetem not blong yiu long hia:

AKTIVITI 6

1. Tingim wanfala wata sos (krik, strim, watafol an samfala moa) long ples blong yu. Drou wetem aedia yu garem abaotem Pico-haedro sistem, hao nao bae yu yiusim disfala wata ya fo mekem elektrisiti. Raetem fo soum olketa bik setap komponen.

2. nsaet long haedro sistem, soum samfala hasad wea yu mas lukluk long hem.

3. Wanem nao trifala klasifikeisin blong haedro paoa sistem?

4. Talem nem blong trifala difren taep long tebaen wea bae save yiusim insaet long pico-haedro sistem.

6

Seifti insaet
haedro sistem

Long hia garem samfala impoten seifti tip fo folom fo stap seif an fo kipim olketa narawan seif tu taem dil wetem haedro sistem.

1. Evritaem mas ofum paoa bifo mekem eni konekisin o ajasmen. No waka long seket wea paoa stap on long hem yiet.

FIGA 28: Woning Saens³⁶



2. Evritaem mas tekem wanfala elektrisian fo duim nao waering blong haos. Yu no traem fo duim waering seleva.

FIGA 29: Werem Insuleited Glav³⁷



3. Evritaem mas werem PPE olsem olketa glav, ae gogols an shu fo seifti.
4. Yu no traem fo ripearem olketa batri wea hem no waka gud. Olketa batri garem poisin wea save kosim bik ham/karakil.

FIGA 30: Asid Woning³⁸



5. No storem olketa batri kolsap faea o insaet living rum-samfala batri save givim olketa poisin gas no mata yumi no save lukim.

FIGA 31: Fiums Woning³⁹



6. No storem olketa batri long olketa speis wea hem smol o kosap ples fiul bikos hem save statem faea. Evritaem putum olketa batri long ples wea hem kol an ea hem staka long hem. Olketa led asid batri save givim aot nao olketa smol kuantati blong haedrojin gas so putum long rum wea hem ea hem ran gud.

Figa 32: Batri Woning⁴⁰



36 Source: AviationPros, <https://www.aviationpros.com/tools-equipment/safety-equipment/article/11148860/ground-handling-safety-signs>

37 Source: Safetyworkblog.com, <https://safetyworkblog.com/assets/understanding-the-2015-edition-of-nfpa-70e-the-arc-flash-hazard.jpg>

38 MSDS online, <https://www.msdsdsonline.com/2014/07/22/sulfuric-acid-safety-tips-sulfuric-acid-msds-information/>

39 Source: National Safety Signs, <https://nationalsafetysigns.com.au/wp-content/uploads/2020/02/D10332-Toxic-Fumes-sign.png>

40 We Need Signs.com, "Ansi Battery Charging Safety Signs", <http://www.weneedsigns.com/home.php?cat=403>

7

Baem na Pico-Haedro
Sistim

7.1 Hao fo baem nao hom haedropaoa system

Hydropaoa sistem hem lelebet had fo minim anles yu aedentifaem nao wat kaen saes nao yu laekem.

7.2 Samfala kuestin fo askem nao sela

1. Waswe prodakt ya garem waranti tu? Waranti hem fo eni folt insaet long taem wea sela save sensim fo yu. Sapos waranti hem fo long taem hem bae gud.

FIGA 33: Waranti Simbol⁴¹



2. Wat kaen taep tebaen nao long system? Wanem nao paoa aotput blong jenereita? Sistem ya hem DC or AC? Sapos hem AC was otomatik volteij regiuleita hem kam wetem tu?

FIGA 34: Tebaen Taeps⁴²



FIGA 35: Jenrol Karektaristiks⁴³



GENERAL CHARACTERISTICS	
Certifications:	2006\42\CE (Machinery Directive); 2014\35\UE (LVD); 2014\30\UE (EMC)
Power range:	3 – 750 kW
Head range:	30-550m
Flow range:	2-400 l/s
Number of nozzles:	6
Flow regulation:	on/off valves by electrical drive for flow regulation
Generator:	asynchronous squirrel-cage motors, high efficiency
Generator class	
insulation/temp. rise:	F/B
Bearings of generator:	lifetime lubricated / with grease-gun
Temperature sensor	
generator windings:	N°3 PTC in series
Frequency:	50-60 Hz
Voltage:	230/400V - 277/480V, three-phase
Protection grade:	IP23 (protection grade of generator IP55)
Rotational speed sensor:	proximity 1 signal/revolution
The mechanical components in contact with water are in stainless steel	

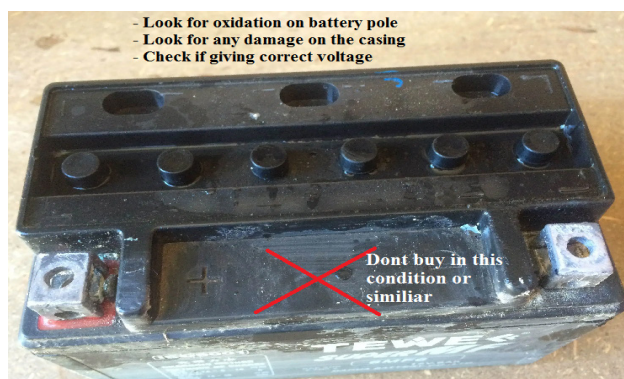
41 Source: PNGWING, <https://www.pngwing.com/en/free-png-kfvtb>

42 Source: Power Spout, June 2021, www.powerspout.com

43 Source: Direct Industry.com, "Hydraulic turbine", <https://www.directindustry.com/prod/irem-spa/product-16995-2302864.html>, accessed 25 June 2021.

3. Yu mas sek long eni ples hem nogud. No baem prodakt wea hem nogud. Mas askem sela fo soum long yu sapos prodakt ya waka. Sapos olketa pat long prodakt ya hem krak, deti o spoel no baem. Sapos batri hem lik o osem hem boela no baem prodak ia.

FIGA 36: Sekemap fo eni dameij⁴⁴



1. Fo olketa batro yu save askem sela fo soum yu nao batri voltej taem hem mesam.

2. Roteitem tebaen fo lukim fri muvment blong hem. Askem sapos saplaea save soum dat jenereita hem produsim paoa (sapos hem save duim tes ran.)

FIGA 37: Sikim asistans from sela⁴⁵



1. Luk fo olketa prodakt wea hem bran wan- faendem olketa prodakt wetem propa bran an logo an garem instraksin manuel. No baem prodakt wea no garem bran, raeting no klia gud o wea instraksin manuel hem mis,

2. Taem yu selektem inveta, askem sela sapos aotput blong inveta hem pua saen wev.

FIGA 38: Paoa Inveta⁴⁶



1. Lukluk gud long olketa nem plet.

FIGA 39: Paoa Inveta⁴⁷

3000W INVERTER						
						
Model	YX-3000W-S					
Continuous Power	3000W					
Peak Power	6000W					
DC Voltage	DC12V	DC24V	DC48V	DC12V	DC24V	DC48V
AC Voltage	100VAC or 110VAC or 120VAC $\pm 5\%$			220VAC or 230VAC or 240VAC $\pm 5\%$		
No Load Current Draws	1.4A	0.7A	0.3A	1.4A	0.7A	0.3A
Frequency	50HZ $\pm 0.5\text{HZ}$ or 60HZ $\pm 0.5\text{HZ}$					
Output Waveform	Pure Sine Wave					
AC Regulation	THD<3% (Linear load)					
Output Efficiency	up to 92%					
DC Voltage Range	10-15.5V	20-31V	40-62V	10-15.5V	20-31V	40-62V
Low Voltage Alarm	10.5V $\pm 0.5\text{V}$	21.5V $\pm 0.5\text{V}$	43V $\pm 1\text{V}$	10.5V $\pm 0.5\text{V}$	21.5V $\pm 0.5\text{V}$	43V $\pm 1\text{V}$
Low Voltage Shut Down	10V $\pm 0.5\text{V}$	20.5V $\pm 0.5\text{V}$	40V $\pm 1\text{V}$	10V $\pm 0.5\text{V}$	20.5V $\pm 0.5\text{V}$	40V $\pm 1\text{V}$
Over Voltage Shut Down	15.5V $\pm 0.5\text{V}$	31.5V $\pm 0.5\text{V}$	62V $\pm 1\text{V}$	15.5V $\pm 0.5\text{V}$	31.5V $\pm 0.5\text{V}$	62V $\pm 1\text{V}$
Low Voltage Recovery	12.7V $\pm 0.5\text{V}$	25V $\pm 0.5\text{V}$	49V $\pm 1\text{V}$	12.7V $\pm 0.5\text{V}$	25V $\pm 0.5\text{V}$	49V $\pm 1\text{V}$
Over Voltage Recovery	14.7V $\pm 0.5\text{V}$	29.5V $\pm 0.5\text{V}$	59V $\pm 1\text{V}$	14.7V $\pm 0.5\text{V}$	29.5V $\pm 0.5\text{V}$	59V $\pm 1\text{V}$
Protection Function	Low voltage shutdown	Buzzer sounds 3 times interruptedly and fault light turns red				
	Over input voltage protection	Buzzer sounds 4 times interruptedly and fault light turns red				
	Over temperature protection	Buzzer sounds 5 times interruptedly and fault light turns red				
	Over load protection	Buzzer sounds 3 times interruptedly and fault light turns red				
	Short circuit protection	Recover automatically				
Reverse polarity protection		Built-in fuse or Built-out fuse				
Working Temperature	-10°C~+50°C		Production Size	12V: 465x220x80mm; 24V: 445x220x80mm		
Storage Temperature	-30°C~+70°C		Packing Size	45x28x14.3cm		
Warranty	12 months		N.W. / G.W. (KG)	12V: 7.3KG/9.0KG; 24V: 6.9KG/8.0KG		
Start	Bipolar soft-start		Quantity / Carton	2pcs		
Cooling Way	Intelligent cooling fan		Carton Size	56.5x28.5x32.5CM		
Certification	CE		Carton Weight	12V: 18KG; 24V: 17KG		

1. Yu mas mek sua olketa prodakt ya hem seif fo yusim. No baem sapos yu lukim olketa waea ya hem sou aot o prodakt ya hem no luk gud bikos hem save kosem karikil wea yu no ting bae hapen.

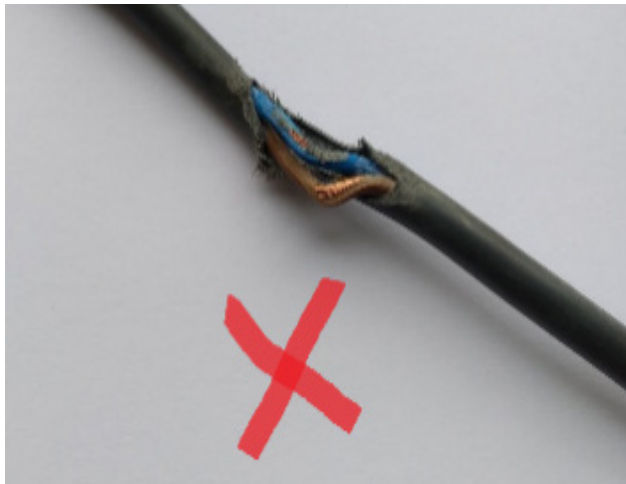
⁴⁴ Source: The DIY Life, Tech & Electronics, <https://www.the-diy-life.com/wp-content/uploads/2016/05/battery-opened.jpg>, accessed 25 June 2021.

⁴⁵ Amazon.com, "Electric Measuring instrument", <https://www.amazon.com/Electric-Measuring-Instrument/s?k=Electric+Measuring+Instrument>, accessed 25 June 2021.

⁴⁶ Source: COCOON ecolima, "HIP-300-12 Inverter 12V-230V 300W", https://cocoona.gr/wp-content/uploads/2020/04/HIP_300_12V-scaled.jpg

⁴⁷ Source: Goteborgsaventyr, <https://goteborgsaventyrcenter.se/product/z59qeznno47/mexxsun-3000-watt-12-v-24-v-220-v-pure-sine-wave-inverter>

FIGA 40: Olketa waeas wea eksposd⁴⁸



1. Taem go fo pei olsem, go araon long olketa stoa an kompearem praes, kualati, waranti, olketa saes, if hem bran, seifti an samfala samting moa blong prodakt wea yu laek baem.

2. Askem sela abaotem olketa kost wea hem kam wetem diswan sapos yu tekem wanfala profesonol fo kam duim waka fo instolem.

Raetem not blong yiu long hia:

48 Source: IOL, "How to fix frayed cables", <https://www.iol.co.za/technology/how-to-fix-frayed-cables-49412981>

AKTIVITI 7

Mekem olketa grup. Displeim nao tebaen/jenereita, batru, inveta, saj kontrola an olketa laet from kit wea hem aveilabol ya. Go long desk wea evri prodakt ya hem stap long hem. Yu imagenim nao treina ya hem sela an yu nao baea, yiusim olketa tip wea yu garem long antap ya an askem treina samfala infomeisin moa abaotem prodakt.

Samafala impoten kuestin wea mas askem nao:

8

Mentenens blong Hom
Haedropaoa sistem

Evri haedro paoa sistem hem rikuarem samfala regiula mentenens fo mek sua hem seif an dat hem waka gud an fo mek yius

8.1 Wae olketa haedropaoa sistem hem feil?

Hem garem staka wei hao haedropaoa sistem hem givim problem. Yumi maet notisim diswan bat no tingting strong abaotem tumas antil hem no waka nao.

8.1.1 Mentenens blong Tebaen

- Mas sekem olketa skrin long inlet fo meksua tebaen hem klia.
- Luk fo rabis insaet tebaen
- Sekem dat evri drein insaet long tebaen asembli olketa klia.
- Mek sua olketa bearing hem gris an no wonaot.

FIGA 41: Rabis⁴⁹



8.1.2 Metenens blong Jenereita

- Kipim klin an ea pasej mas klia. Yiusim bloua fo tekemaot dast from insaet jenereita.
- Meksua wata hem go kolsap jenereita
- No dismantelim jenereita fo klinim dast.
- Go sekem teminol

FIGA 42: Teminol Koneksin⁵⁰



Seifti Tip: NO TASIM ENI TEMINOL AN KOMPONEN WEA HEN MUV TAEM JENEREITA HEM RAN

49 Source: Walczak, N. (2018). Operational Evaluation of a Small Hydropower Plant in the Context of Sustainable Development. Pages 7-8, <https://www.mdpi.com/2073-4441/10/9/1114/html>

50 Source: EC&M, <https://www.ecmweb.com/maintenance-repair-operations/article/20890352/the-basics-of-electrical-overheating>

Long piksa antap ya, wan teminol hem ova hit an sens kala, taem yu lukim sens long hem, yu mas sekem fo stretem. Sapos yu taetem nat ya hem bae no help ya. Hem maet nesesari fo yu katemaot nao nogud pat blong keibol an duim baek nao koneksin.

- Sekem olketa bearing-ofum jenereita o disengeijim from tebaen an roteitem wetem han fo herem eni nois olsem taem hem rabrab. Sapos nois ya yu herem den yu nid fo sensim bearing.
- Ridim nao jenereita manuel an folom olketa mentenens instraksin ya

8.1.3 Mentenens blong Penstok an sanol

- Mas sekem nao penstock paep nogud hem lik an mas repearem baek.
- Mas meksua patwei blong wata hem mas klia

FIGA 43: Meksua Saedwoks no brek⁵¹



Mek sua yu garem gud flou blong wata go long tebaen
Afta hem renren, mas go karem aot inspeksin
Mas meksua olketa gras wea hem grou bik mas kliarem

8.1.4 Mentenens blong Batri

Mentenens long batri hem dipen long taep long batri an rekuamens blong kampani wea wakem an diswan hem inkludem:

Inspektem an klinim olketa batri rek, keis trei an temineisin

Yu mesarem batri volteij sapos yu garem malti mita o ridim nomoa from batri volteij from saj kontrola. Eksampol nao 12V batri mas no go daon bilou 12V fo long taem. Sapos hem olsem, den laef blong hem kolsap en naya.

Samfa saj kontrola garem nao displei skrin bat olketa simpol wan save soum nomoa amaont blong saj levlo blong batri taem red laet on.

FIGA 44: LED laets hem somaot na batri saj levlo⁵²



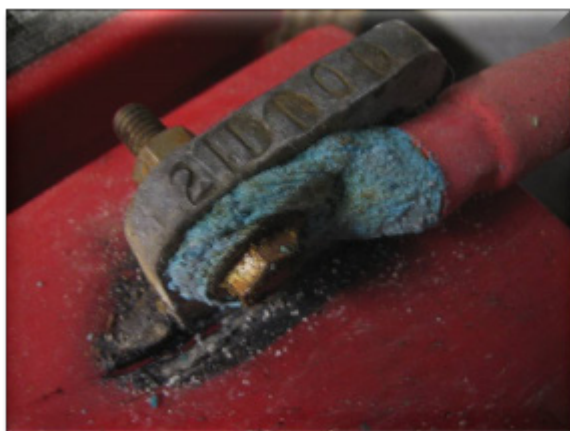
- Samfala saj kontrola save displeim nao batri volteij an olketa nara mesamen an olketa narafala mesamen long displei skrin. Yu bae nid fo ridim nao manuel blong olketa kontrola fo lukim hao nao olketa difren mesamen save sou.

51 Source: Wisions of Sustainability, "Demonstration of Sustainable Low Head Pico-Hydro to Deliver Enhanced Rural Energy Services to the Terai Region Of Nepal", <https://www.wisions.net/projects/demonstration-of-sustainable-low-head-pico-hydro-to-deliver-enhanced-rural>

52 Source: Sundaya Apple, "Sundaya Apple Regulator, Quick Start Manual", https://assets.website-files.com/5a2fb65f5701c800018e826f/603e4f42254a71b39b6e33a9_Sundaya%20apple%20-%20English.pdf

FIGA 45: Saj kontrola wetem batri volteij displei⁵³

- Pirioidik batri mantenens mas inkludem nao evri teminol fo rast an propa taetening blong teminol. Sekem tu wata blong batri an ripleisim wetem distil wata fo tuweit ledasid batri sapos levol hem lou. Trae fo duim diswan evri 2-4 wik.
- Yusim stil bras fo klinim oksaed long olketa koneksin. Mas werem insuleisin glav Olowe.
- Ripearem long semtaem tu olketa waea wea hem nogud

Figa 46: Klinim na teminol korosin⁵⁴

Hem yiusful fo krietem seklis fo helpem yu karem aot nao rutin mantenens long sistem blong yi. Sapos yu faendem eni folt-kontaktem elektrisian semtaem. Wanfala simpol seklis nao long hia, yu save kipim fo yu save yiusim.

Seifti Tip: Yiusim seifti glas an raba glav taem sevesim olketa batri. Werem olketa ol kaleko bikos asid from tuweit batri save kasem yu.

Kipim open boks blong beiking soda an plastik konteina long wata taem yu sevesim nao olketa batri-inkeis hem poa, yu save putum nao beiking soda long wata, stearem an yiusim nao miksa fo kuiktaem niutrolaesem eni asid wea hem poa.

Lou volteij (12V0 hem no sok hasad bat hae karent ya. Wrens wea hem drop akros long teminol save kuiktaem bonem han blong yu an batri save bosta long hem.



⁵³ Source: Amazon, "iSunergy MPPT Solar Charge Controller", <https://www.amazon.com/iSunergy-Controller-Intelligent-Regulator-Batteries/dp/B081GSFDKC>, accessed 25 June 2021.

⁵⁴ Source: Jim Dunlop Solar

8.1.5 Beisik Mentenens Sekaplis

TEBOL 6: Beisik Haedro Mentanens Wikli-Mantli Seklis

Aetem	Wikli Sekaplist -Beisik	Duim (tickim)
1	Sekem wata sanol	
2	Sekem dat no eni rabis stap mekem tebaen hem roteit fri	
3	Klinim tebaen an jenereita	
4	Sekem olketa teminol an olketa waea	
5	Sekem maotening sistem, taetem sapos hem nid fo olsem	
6	Sekem batri volteij insaet saj batri-sapos hem hem posibol	
7	Sekem an klinim batri teminol korouson	
8	Sekem an taetem olketa eni lus teminol koneksin	
9	Sekem batri wata insaet olketa tuweit batri an filim wetem distil wata.	
10	Sekem batri storeij eria hem kol an ea hem sekiuleit gud.	
11	Sekem dat evri laet an olketa aplaens blong sistem hem waka.)	

Raetem not blong yiu long hia:

AKTIVITI 8 - MENTENENS SEKAPLIS

Krietem mentenens sekaplis long evri rutin waka wea nid fo duim fo ekstedem nao laef blong piko-haedro sistem. Trae fo ting hao bae yu duim olketa sek.

AKTIVITI 9

Rison (Pepos) blong eksasaes ya hem fo getem evri memba blong komiuniti fo apresietem nao ki rol olketa woman pleim long taem wakem disison, long manejmen an yius long teknologi. Ridim disfala keis stadi an ansarem olketa kuestin.

Hao olketa woman tekem kam sens

Salo an hasban blong hem Mario stap long Afio long Malaika wetem trifala pikinini blong tufala. Olketa no garem eni paoa long vilij. Mario hem vilij hed an hem fisaman an mas go aot long si bifo san hem raes fo tekem olketa gud fis an dilivarem long fising steisin wea wanfala aes rum long aelan. Samtaem Mario save tekem kam olketa smol fis fo kukim. Tufala garem trifala pikinini, Lili hem 9, Timoci hem 10 an Salote hem 13 an olketa go long skul wea hem 4 km from haos blong olketa. From haos go long skul hem olsem wan aoa. Olketa garem bik gaden long hom. Olketa garem staka poteito, yam, kabis an olketa tomato fo deili nid blong olketa. Olketa parens blong Mario stap wetem olketa tu. Mario waka had an staka taem hem garem staka samtung fo duim olsem ripaerem bout tekem aes, tekem olketa pasenja go long olketa nara aelan insaet bout blong hem long olketa ivining. Sala hem save bisi tu lukaftarem parens blong Mario, lukafta haos, lukafterm pikinini an olketa obligeisin blong komiuniti.

Wanfala ivining, 13 yia ol dota blong tufala Salote hem stadi yiusim kerosin laet. Smel blong kerosin ful insaet haos taem olketa laetem trifala laet. Mario no kam baek yiet from neiba blong olketa wea hem go fo dring kava lelebet. 9 yia ol Lili hem komplein dat smel blong kerosin hem mekem hem sik. Tufala pikinini ya raoa tufala evriwan laek yiusim laet. Lili no min fo tekem nao laet an ranran wetem an laek plei wetem. Taem tufala ranran insaet haos, den nomoa laet ya foldaon from han blong hem, lan long map an faea stat nao. Salote saot fo help an olketa neiba ran kam fo aotem faea bat staka buk blong salote hem bone na. Lili hem fraet tumas fo yiusim nao kerosin laet. Long naet Sala talem Mario abaotem wanfala aedia.

Mario: Rilaks no eniwan hem bone, Bae mi tekem olketa niu buk long en long wik. Wae nao yu wari tumas?

Sala: Mi ting hem taem yumi stop fo yiusim olketa kerosin laet insaet haos blong yumi.

Mario: Wanem? Yu karange ya-wanem nao bae yumi yiusim?

Sala: Mi herem dat yumi save yiusim gud wata wea hem ran o strim fo jenereitem nao paoa. Yumi garem strim kolsap, yu save tok wetem olketa narawan long vilij olsem hed long vilij an diskasem sapos olketa inters fo garem elektrik laet long olketa haos. Vilij blong mam blong garem pico-haedro an olketa pikinini long vilij olketa do gud long skul bikos olketa stadi long gud laet.

Mario: Wow, Yu dimand tumas. Yu fala olketa woman olowe, (Sala stopem hem toktok)

Sala: Wanem nao yu minim taem yu se 'yufala olketa woman'.

Mario: Umm

Sala: Mifala olketa woman mas draevem nao kerosin bikos mifala fil olsem laef hem laek taem no eni paoa. Mi hav to wekap eli taem hem dak yiet an laetem nao smel kerosin laet den kukim kaikai. Mi have to duim ekstra fo stoarem nao kaikai an fis mekem hem nogud an yumi sik long hem. Mi meksua tu dat olketa pikinini duim homwok taem long lelebet laet. Mi mas sevim slen fo no spen tumas long kerosin.

Mario: Ok, mi agri yumi nidim paoa. Bae mi laekem tu frij fo putum fis. Bat Jone talem mi dat pico-haedro sistem hem baem an hem putum bat hem no waka fo wan wik moa. Waswe sapos hem go nogud o hem no waka? An sistem ya bae hem kostem slen? Waswe sapos olketa long vilij no agri?

Sala: Oh my god. Yumi traem. Diskas wetem olketa long vilij an sapos olketa agri yumi save sevim lelebet slen wea yu save tekem from fis taem yu selem evri wik an sapos yumi seiv kasem Krismas bae yumi save baem sistem. Yumi save stori wetem olketa long dipatmen long enaji fo helpem yumi. No wari abaotem mentenens, yumi save tekem help from olketa wea save long sistem ya. Mi save bae olketa lokol atoroti bae help tu. Mi save go fo samfala treining. Oh my god!

Mario: Datwan barava gud aedia. Mi hapi intala agri long diswan an mi hapi fo help lukafterm pikinini an parens blong mi taem yu go treining long pico-haedro sistem. Bae mi stori wetem olketa long vilij tumoro.

En blong Plei

Help ansarem tufala kuestin

- Wat kaen tings nao Sala, Mario an olketa long vilij mas luk fo taem baem nao wanfala pico-haedro sistem?
- Hao nao bae Sala an olketa woman bae tek kea long pico-haedro sistem?

9

Estimeiting potensol saes
blong haedro sistem

Yumi lanem dat olketa aplaens nomata hem laet balb, frisa, televisin an samfala moa yiusim nao spesifik amaont long paoa (Wats). Adem evriting ya bae givim yu aedia long hao mas paoa yu nidim.

Pico-haedropaoa sistem hem smol ya an hem save paoarem nao olketa aplaens an hem impoten dat olketa yiusa adastanem nao limit long sistem ya.

Amaont long paoa wea haedro sistem save jenereitem hem dipen long olketa samting ya

1. Hed-olsem yumi save diswan hem hao hae wata drop an hem save mesarem long mita (M)
2. Flou- diswan hem volium blong wata wea save putum long tebaen an save mesarem long kiubik mita pa sekond.
3. 1 kiubik mita/sekond hem ikol long 1000 lita botol blong wata pas insaet wan sekond.
4. Graveti-diswan hem konstan (stei sem) an hem 9.81m/s (mita.sekond)
5. Ifisiensi blong tebaen an elektrikol ekuipmen. Ovarol ifisiensi blong sistem blong 50% bae hem risnabol asamson (0.50).

Hem posibol fo estimateit saes blong pico-haedropaoa sistem beis nao long olketa fakta ya an diswan save duim wetem lokol komiuniti wetem asistens. Simpol fomiula fo yiusim nao long daon:

$$\text{Electrical Power Output (kW)} = \text{Head (m)} \times \text{Flow (m}^3/\text{s)} \times \text{Gravity(m/s)} \times \text{Efficiency}$$

Save mesam hed taem duim saet savei. Diswan save duim wetem teip mesa an spirit level.

Flou blong riva o strim bae dipen nao long sison an taem long dei. Fo garem gud aedia hem gud fo mesarem diswan ovam olketa difren taem long yia bat fo tekem mesamen long barava lou level vae givim aedia long miniman flou an lou amaont posibol fo jenereitem.

Riva strim flou reit save mesarem nao long namba long olketa wei an hem inkludem nao saet mesamen olsem baket an olketa paep, kros seksin/velositi an flou blong solt. Diswan hem aotsaed skop long disfala woksop bat hem impoten fo adastanem an lokol komiuniti save help fo tekem asistens from lokol gavman blong Eneji o Envaeroment Dipatmen.

Eksasaes

Kuestin: Saet hem garem hed wea hem 2m an strim hem garem reit blong 51/s insaet sekond (sem olsem filim baket

Ansa:

flou hemi lo litas sekond an nid fo konvetim go lo kiubik mitas lo wan sekond, so bae divaedim bae a 1000. i.e., $5/1000=0.005\text{m}^3/\text{s}$

$$\text{Elektrikol Paoa (KW)} = \text{Hed (2m)} \times \text{Flow (0.005 m}^3/\text{s)} \times 9.81 \text{ m/s} \times 0.5$$

$$\text{Elektrikol Paoa (Kilowats)} = 0.04905 \text{ kW}$$

$$\text{Elektrikol Paoa (Wats)} = 0.04905\text{kW} \times 1000 = 49 \text{ Wats}$$

Kuestin: Hao mas fala laet balb na diswan save laetim ap lo 5 wats ij ?

$$\text{Ansa} = 49 / 5 = 9.8 \text{ so } 9 \text{ balbs}$$

If hed hem dabold i.e., 4 mitas, wanem nao bae saez blo Haedro Sistim lo wats?

$$\text{Elektrikol Paoa (KW)} = \text{Hed (4m)} \times \text{Flow (0.005 m}^3/\text{s)} \times 9.81 \text{ m/s} \times 0.5$$

$$\text{Elektrikol Paoa (Kilowats)} = 0.0981 \text{ kW}$$

$$\text{Elektrikol Paoa (Wats)} = 0.0981\text{kW} \times 1000 = 98 \text{ Wats}$$

Hemi impotent fo som nao dat yu nidim na constant laj flou an gudfala hed fo save instolim na bikfala sistim.



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