

# Multiflexmeter

Design report

Group 8

T3TG & V3TK

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Waterschap **Scheldestromen**

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## Summary

The project started with motive of making a cheaper and more effective way of measuring different things in ditches. They wanted a device that can replace any device which was used to measure the circumstances in ditches such as the water height and the salinity of the water. First of all we started doing some research. After that we designed an Arduino which can measure the silt level. Our conclusion was that you can measure the silt level the best with a LDR sensor, because it shows you when it gets dark in front of the sensor and it is strong enough to survive under a thick layer of silt.

## Preface

The client used to measure the height of the water, slip and the amount of salt in the water by hand. He wanted a device that could measure this so he wouldn't have to do it their self. We had to make it so that it would sent the information to him and so that it would be cheaper than €150,-.

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## 1. introduction

The client had a problem with measuring the water levels, the height of the slip and the amount of salt in the water. It had to be a device who's able to do all of that. It had to have a strong battery that could load itself, the results must be presented with a working prototype. We are first going to talk about the programme of requirements, then we talk about how we designed the device. The fourth chapter is about the conclusion where we answer the question of the client. The last chapter is about our recommendation, where we explain what can be improved.

## 2. programme of requirements

- A strong battery that charges itself
- A salinity sensor
- A siltation sensor
- Water height sensor
- Rainfall sensor
- A strong, waterproof shell
- It should be programmable
- It must contain a good SD card
- It must be able to send the data to the office of the Waterschap

## 3. designing proces

We had the idea to make a full working Arduino including all features the client mentioned to be in the full working Multiflexmeter. At consultations between our group and the client, the client informed us about the fact that it is way more efficient to focus on one particular idea of a sensor. Since the client was most impressed by the idea of using a LDR-sensor (Light Dependent Resistor).



LDR:

It works like this: One sets the complete siltation meter on the maximum height where silt can come. Then when the silt reaches the sensor, the sensor indicates no light around itself anymore, thus the value is low. With this value a signal should be send to the waterschap who must come to dredge the ditch.

### The values of the LDR sensor in different situations:

Night (normal)	Around 300	Day (normal)	Around 840
Night (turbid)	Around 155	Day (turbid)	Around 240
Night (silt)	Around 120	Day (silt)	Around 130

At first we thought that we had to design the whole multiflexmeter, but then we got the advice to just give some ideas for different parts of the multiflexmeter and then we submitted those ideas to the client at the middle consultations. The client wanted us to do further research on the idea of the LDR.

Another ideas we submitted to the client were an Ultra Soon sensor for measuring the water height. It works like this: The sensor sends a noise with an extremely high frequency with its speaker, when it reaches an object it is being reflected to the sensor, the reflected noise is registered with its microphone. The sensor measures the distance between himself and the object by registering the time between when the noise is send off and when it is received back. (The values are given in Arduino in cm)

## 4. conclusion

The client wanted us to make some improvements at the multiflexmeter. We showed him our ideas at the middle consultations between us and the client, and he told us that we should design the LDR further. So we did that. We kept us on the musts of the client. We had two

prototypes. And we found a kind of solar panel: The solar cells in a monocrystalline solar panel consist of a single crystal. The surface of monocrystalline solar cells has ordered electrodes and is uniformly black. These solar panels have the highest returns. Monocrystalline solar panels have a few percentage points more yield than polycrystalline. These panels are more expensive, but have a higher return per surface. The best choice for those who want to get the maximum return with limited space.

## 5. recommendation

We maintain that further research could be done on the way in which the LDR-sensors are placed in the tube. Because we think that they are vulnerable as they are now. We also think that it would be compulsory to have a light bar next to the LDR-sensors, because then the values are always better readable (the values at night are really close to each other). The light bar should be attached to the siltation meter, because when there is a measurement done the light bar has to be turned on simultaneously. The light bar also has to be set straight by tightening it to the ground perpendicularly.

## Epilogue

We think this is a nice project because we were able to do our thing and design it our way. We think that the trip to waterschap was unnecessary like we just went there to do a quiz and the water pumping station wasn't useable in the project. So our conclusion is that the kick-off wasn't useable but the project itself was very nice.

## Sources

<https://nl.wikipedia.org/wiki/LDR> : Tuesday 17 january

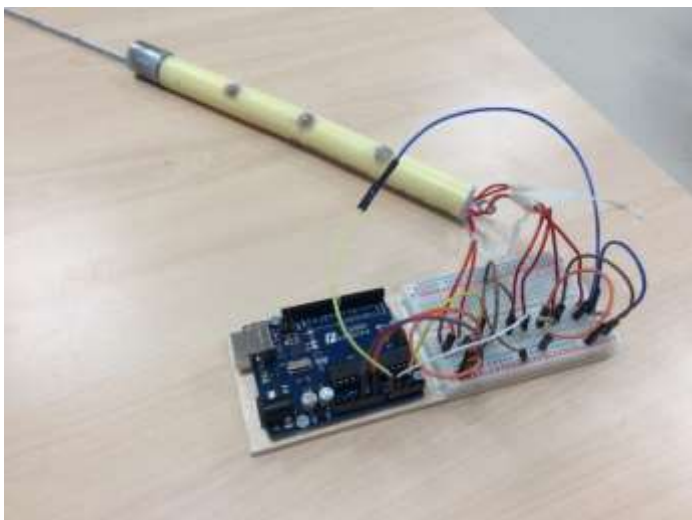
<http://pgmcg.nl/wat-is-hennep-begrijp-het-verschil-tussen-hennep-en-cannabis/> : Thursday 26 january

<http://www.multiflexmeter.nl/forum/> : used several times

<https://scheldestromen.nl/> : Tuesday 31 January

<https://nl.wikipedia.org/wiki/Hennep> : Thursday 26 january

## Attachments



## Here is the code of it:

```
int ldr1 = 0;           //analog pin to which LDR is connected
int ldr1_value = 0;     //variable to store LDR values
int ldr2 = 1;
int ldr2_value = 0;
int ldr3 = 2;
int ldr3_value = 0;

void setup()
{
  Serial.begin(9600); //start te serial monitor
}

void loop()
{
  ldr1_value = analogRead(ldr1);    //reads the LDR values
  Serial.print("diepste: ");
  Serial.println(ldr1_value);        //prints the LDR values to serial monitor
  delay(2000);                       //wait

  ldr2_value = analogRead(ldr2);    //reads the LDR values
  Serial.print("middelste: ");
  Serial.println(ldr2_value);        //prints the LDR values to serial monitor
  delay(2000);                       //wait

  ldr3_value = analogRead(ldr3);    //reads the LDR values
  Serial.print("hoogste: ");
  Serial.println(ldr3_value);        //prints the LDR values to serial monitor
  delay(2000);                       //wait
}
```