Contents

1 Summary

State the aims and objectives of the experiment.

Give a brief outline of the experiments you performed.

Summarise the most important results and major findings/trends, expressed quantitatively.

State the major conclusions which can be drawn from the results of the experiment

2 Introduction

Background information on the topic.

State the problem, vision and purpose

status quo, technical problem, competing solution

obstacle, prognosis

background knowledge

3 Procedure

1.

2.

3.

Variables

- Control:
  - Output voltage on function generator: 10V.
  - Probes 180º from each other. Sense leads 30º from the probe and 180º from each other. See Figure 3.1.
  - Gain $\frac{R_3}{R_2} = \frac{15k}{150} = 100$.
  - Liquid volume 250 ml, 60mm height measured from inside the cup.
- Independent: Frequency.
- Dependent: Voltage peak-to-peak

¡¡¡¡¡¡¡ HEAD:Engineering Challenge 2/files/Lab1.tex

Considerations Due to a limited power input into the amplifier, a gain ratio of 1000 led to *gain saturation*, where we no longer observed the expected amplification.

Although we define probe orientation, there are two factors we are disregarding: the cup is not perfectly cylindrical, and the leads are not straight – so the distance between electrodes is smaller than what the experimental setup implies.

With gain of 10, the maxima appeared in different frequencies as to those of 100 and 1000. Suspect to be related to the percentage error being too large.

3.1 Raw data

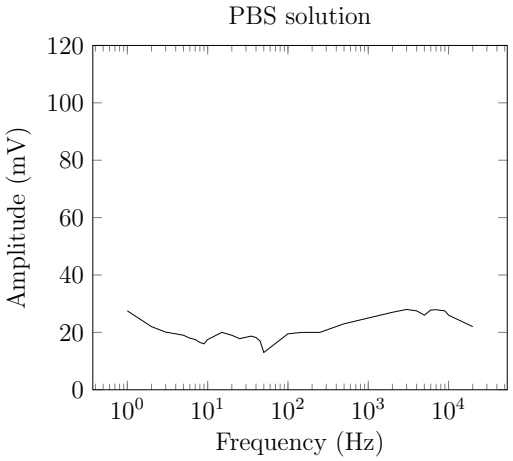

Figure 1: Amplitude based on frequency. Note the dip at 50 Hz due to the filter.

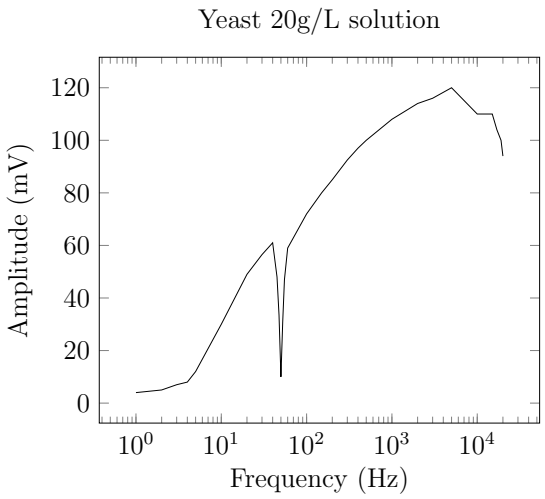

Figure 2:

======= ¿¿¿¿¿¿¿ 2544e85dfba9b8c2a4cb72a9d48d7796db5bc51d:Engineering Challenge 2/files/Procedure.tex

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Maximum amplitude for PBS around 3000hz, maximum amplitude for yeast at 5000hz. We pick 4000 Hz. There is no concern for cell disruption at the range of frequencies we are analysing (Yerworth, R., 2019 November 28)

Uncertainty of about +/- 2ml with our beakers. Relevant in the construction of the calibration curve.

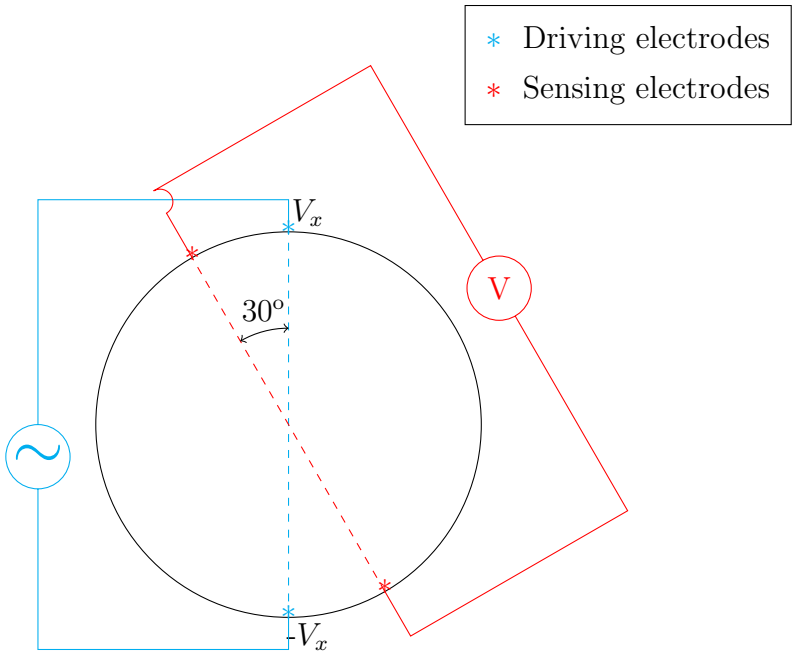


Figure 3: Orientation of electrodes

We are creating the calibration curve without the impeller. Because it's plastic, we assume very little effects in the condutance

The frequency we inputed was also observed in mydaq's oscilloscope.

4 Data

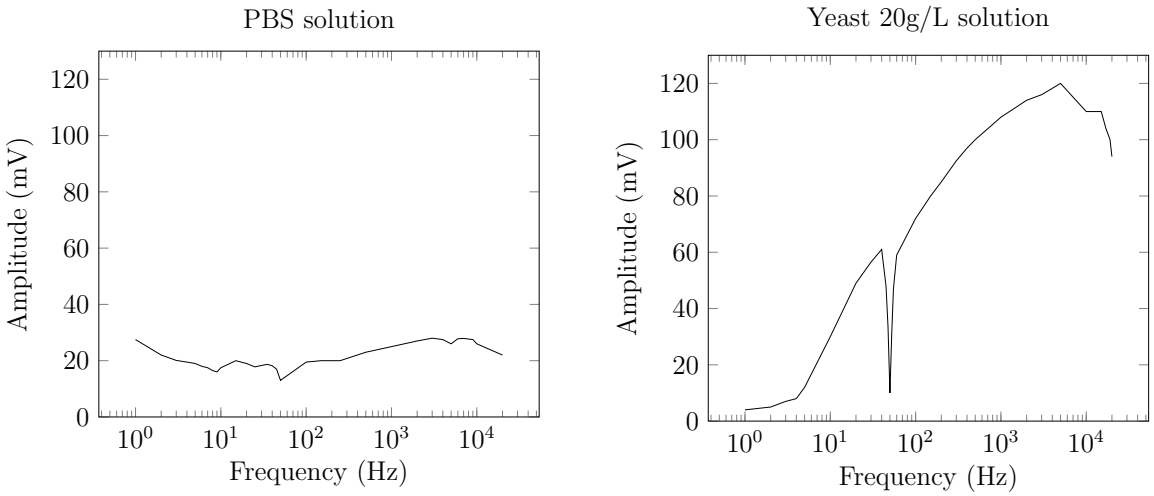


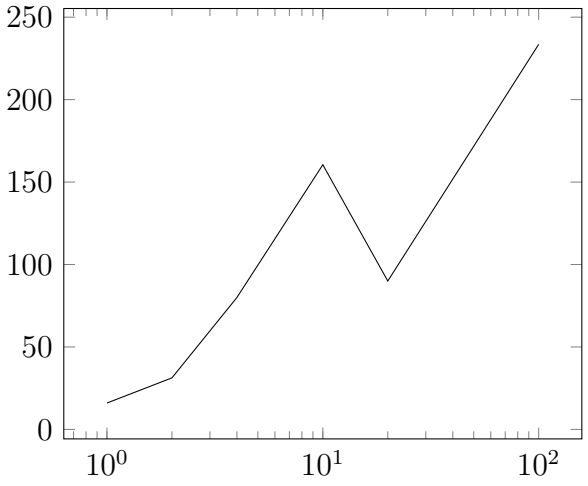
Figure 4: Amplitude based on frequency. Note the dip at 50 Hz due to the filter.

Assess performance of reactor prototype; cell density with final design

Uncertainties Consider trends vs values? Probably most important for the calibration curve.

important comments on results, relate to theory and knowledge

Limitations and improvements


250
200
150
100
50
0
10^0
10^1
10^2

5 Analysis

We would want to have more data points in our callibration curve.

We used 250ml to determine the frequency, and 300ml for the callibration curve. We don't expect The difference in ideal frequency per volume to be significant.

6 Conclusion