

# BioRhythm

## Recycling Without Doubt



**Engineering for Social Innovation**  
*Team 42: BioRhythm White Paper 2020*

# TABLE OF CONTENTS



**Page 3**  
An Overview



**Page 4**  
Using the Scanner



**Page 5**  
BioRhythm Technology



**Page 6**  
Meet the Team



**Page 7**  
Conclusion

# An Overview



**35 Million Tons**

of plastic are thrown away every year in the US according to the EPA



**Only 10%**

of consumer plastic is recycled every year in the US



**25%**

of waste sent to be recycled is not recyclable and contaminates recycling stream purity

Even those of us with the best of intentions attempt to recycle items which cannot be recycled at our local facilities. There are many reasons for this, including the recycling codes themselves. The plastic types which can be recycled change from city to city all over America. Further, there are items that people are not sure if they can recycle but throw in the recycling anyways. The problem is all of these items contaminate recycling streams and make it very difficult for recycled material to be reused effectively in the market.

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## Target Market

Although poor recycling habits are a problem in many areas of the United States, one of the places with the most need for effective recycling programs are entertainment and events venues. People often travel out of their neighborhoods to attend these events where the recycling codes are likely to be different. Further, most items used here are single use items and the amount of waste generated is high. For this reason, BioRhythm has chosen the events and entertainment industry as the entry market.



**10 Tons**

of waste are produced at an average University of Missouri College Football game



**53,000 Tons**

of waste are generated every year at American music festivals

# Using the Scanner



1

Scan your plastic using BioRhythm



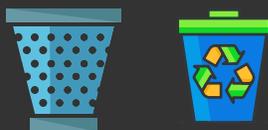
2

Read the lighted section



3

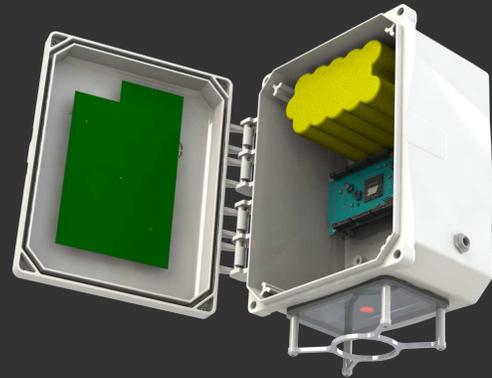
Dispose of your plastic with confidence



# BioRhythm Technology

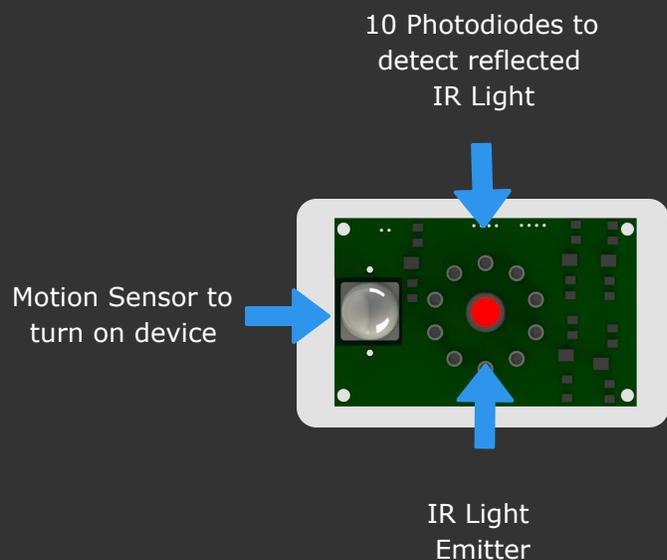
## IR Sensing Technology

There has been extensive research into the spectral response of different plastics in the waste management industry using Infrared (IR)/Near-Infrared(NIR) components that shine on plastic materials. In our device, plastics will be illuminated and reflect energy within the spectral range. NIR supports plastic identification based on color, shape, and absorption. BioRhythm utilizes the ability to detect absorption rates of different plastic structures. Unique spectral responses give confidence that NIR can be used in the application of proper plastic identification, which leads to proper disposal.



## A Deeper Look

The team has designed several PCBs that allow for sending IR light to a plastic in range, recording relevant reflectance data, and comparing the gathered data to a library of stored values. The team has developed this library by scanning sample plastics and generalizing the IR reflectance data so that it can be compared to the new plastic being scanned. BioRhythm can be set up for each individual venue so that only those material types which can be properly recycled or composted in that area are reported as "Recycle" or "Compost." This increases purity of the streams of plastic going into waste management facilities.



# Meet the Team



**Avi Elkin**

Manufacturing Engineer  
B.S. Mechanical Engineering

With a background in woodworking and furniture design, I am passionate about combining the science of engineering with the art of design.



**Photios Kyriazi**

Logistics Manager  
B.S. Mechanical Engineering  
Leadership Studies Minor

I aim to complete college with skills in engineering, leadership, and being that will propel me into discovering a lifestyle with which I can contribute positively to the world.



**Sam Nesmith**

CAD Engineer  
B.S. Mechanical Engineering

I am an aspiring product designer. I hope to design mass produced consumer products that improve people's lives with creative mechanisms.



**Zayna Pieper**

Project Manager  
B.S. Mechanical Engineering Plus  
Engineering Management Minor  
Engineering Entrepreneurship Minor

I am dedicated to working in teams of people who are motivated to create products and services which enhance a culture of genuine human experience and development in local and global communities.



**Blayne Robinson**

Financial Manager  
B.S. Mechanical Engineering  
Engineering Management Minor  
Engineering Entrepreneurship  
Concentration

I am passionate about the design and development process and enjoy working with a product or project throughout its full life cycle. Through my experiences, I am focused on developing my skills in both engineering and project/business management.



**Dylan States**

Systems and Test Engineer  
B.S. Mechanical Engineering  
Engineering Management Minor

I am passionate in working with cross-disciplinary teams to achieve a singular goal. Bringing multiple systems together throughout an entire life cycle is a challenge that I not only enjoy, but thrive in. I strive to bring together client ideas and company resources to create something that leaves both parties satisfied.

# Conclusion



**4,300 kg**

of CO2 emission reduction every year for each BioRhythm device used



**\$5,100**

in annual savings for a typical customer



**Education**

of the general public about what is recyclable or compostable in the future

Existing products to sort recycling are often multi-million dollar machines or simple posters which are incapable of identifying the large variety of items users have with them at events. BioRhythm meets a unique market need for creating a well-educated public that can proactively sort their plastics correctly. Priced at \$535, BioRhythm provides an affordable choice for environmentally conscientious event and conference centers who are dedicated to reducing their footprint.

## Typical Customer Profile

A typical customer is a smaller event or conference center that is already environmentally conscious. These centers are characterized by hosting approximately 1,500 people for 2 day conferences during 60% of the year's weekends. It is expected that each person will produce 0.064 pounds of waste per person per day. In order to process this waste, these centers are currently hiring hand sorters for their recycling, costing an average of \$6,800 a year. With 25 BioRhythm devices on their waste receptacles, each with a minimum of an 8 year life expectancy, a center could accomplish the same accuracy for \$1,700 annually which leads to a total savings of \$5,100 every year.

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