

Summer Internship Project

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07613002

Industrial Design Centre
Indian Institute of Technology Bombay

Industrial Safety Helmet

A design journey...

Udyogi Plastics Pvt. Ltd.

294, BB Ganguly Street, Kolkata 700012
West Bengal, India

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Industrial Design Centre
Indian Institute of Technology Bombay



UDYOGI PLASTICS PVT. LTD.

The Udyogi Group of Industries is India's Largest manufacturer and exporter of personal protective equipment.

Product range

Industrial safety helmets

Fall protection systems

(full body harnesses, fall arrestors, connectors, retractable and lanyards)

Eye protection safety wears

Ear protection

Emergency showers and eyewash etc.



Purpose of Helmet

**To protect the head of the wearer
against falling object
by resisting the penetration and
reducing the shock by absorption of energy**



Applications of Industrial Safety Helmet

- **Construction projects**
- **Mining**
- **Tunneling**
- **Quarrying**
- **Ship building**
- **Oil and petrochemicals**
- **Transmission**
- **Defence**
- **Telecommunication**
- **Metal Industries**



The Need of Designing...

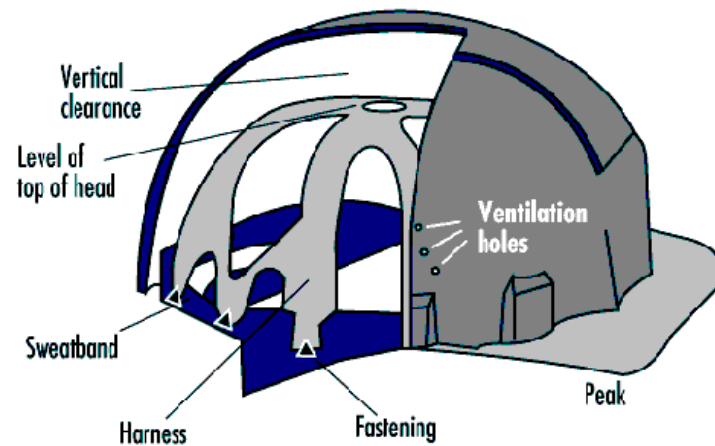
- **Targeting for foreign (European) market**
- **To create an brand identity**
- **To create a style statement**
- **To achieve more comfort for user**
- **Universal acceptance**
- **Looking for in house design for uniqueness of product**

Project Brief

**To design Industrial Safety Helmet
which should be light-weight
address the comfort of the user
should have its own style statement
and the target market is European as well as Asian countries**

Elements of industrial helmet

- **Shell**
with peak and brim
- **Harness / cradle**
- **Head band**
- **Sweat accommodation**
- **Ventilation system (if any)**
- **Accommodations for auxiliary attachments**



Standards

for Industrial Safety Helmet:

CE	Conformité Européenne EN 397, 390
ANSI	American National Standards Institute ANSI 289.1 2003 Helmets American National Standard for Industrial Head Protection
BIS	Bureau of Indian Standards IS: 2925
OSHA	Occupational Safety and Health Administration
ILO	International Labour Organization (UN)

The Current Helmet Range by Udyogi



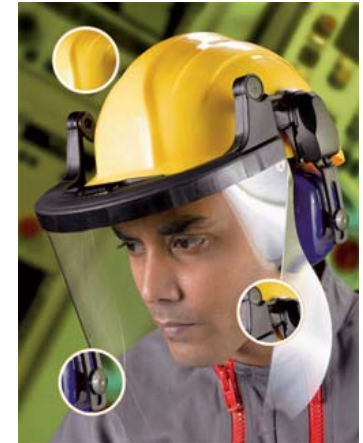
Fusion 6000L CE



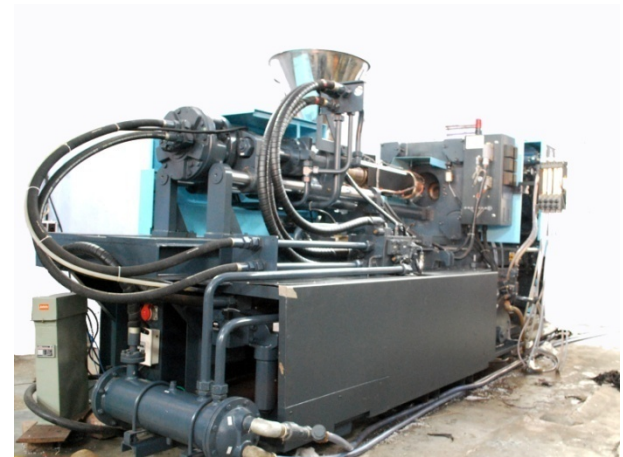
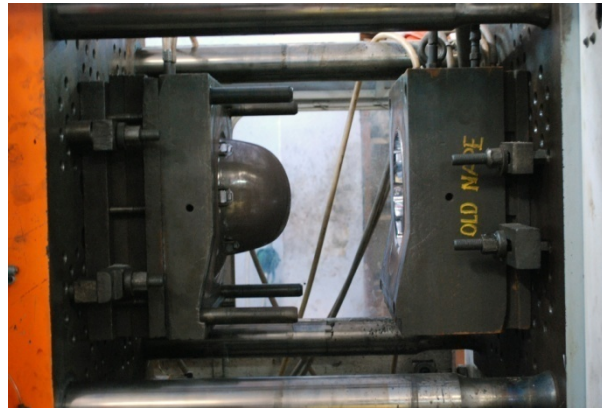
Ultra 5000LRX
Ultra 5001LRX CE



UI 1211



The stages of Manufacturing



Testing in Laboratory



Checking Sustainability
For extreme environmental Conditions



Vertical height measurement



Standard head-forms for testing



Impact test rig

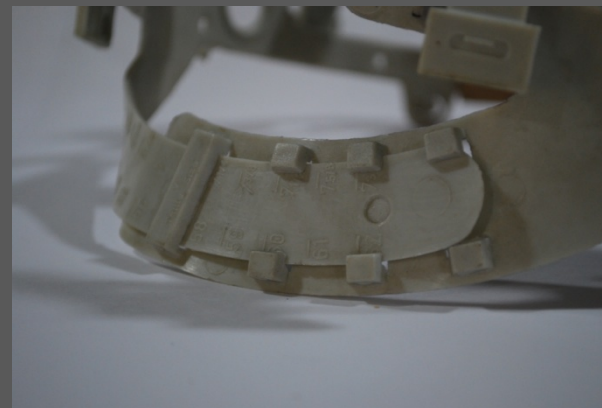
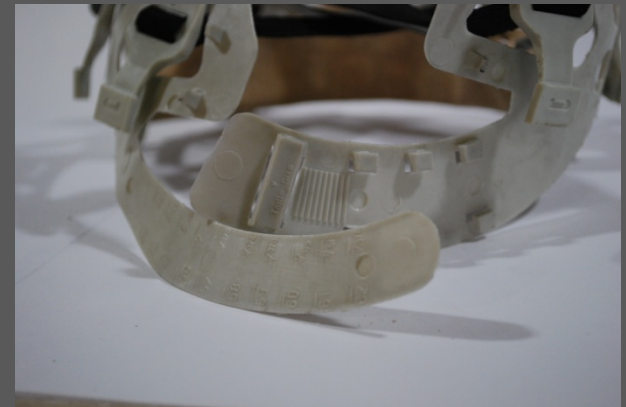
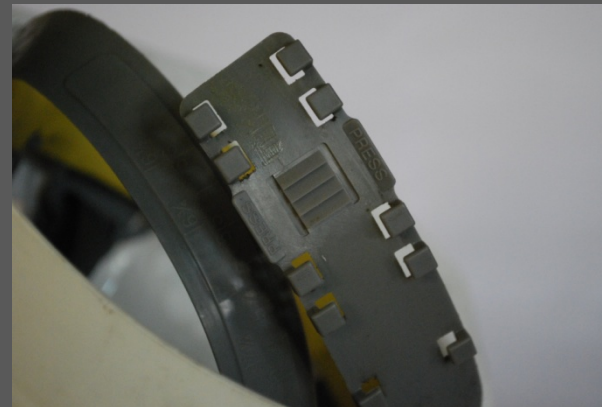
Synchronic Analysis

of Industrial Safety Helmet





Head band & Nape strap



Idea Generation

Industrial Safety Helmet...

Some keywords

- Protection

- Stylish

- The Attractive product

 - To grab attention

 - The desirable product

 - Customer should drawn towards product

- Comfort

 - Ventilation by circulation of fresh air

 - Adjustability for different size requirement

 - Cushion pads and Sweat pads

 - Hygiene

 - Light in weight

- The area for Graphics (Branding/ Instructions/ product data etc.)

- The personal helmet

 - Name tag – user's info

 - Arrangement to hold some accessories- pen, pencil, torch,

- Wearing a helmet

 - Grip for fingers

 - As hands on the field are covered with grease, oil, water.....and with different types of gloves also.

- The head band

 - The adjustment should be quick and easy

 - Auto lock (?)

- Sweat band and cushions

 - Velcro Fabric for replacement of sweat band (?)

 - Heat seal

 - Stitching

 - Insert mold

Cluster 1

Industrial Safety Helmet...

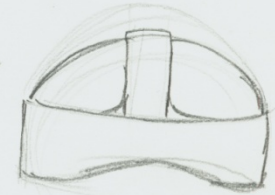
Cluster 1



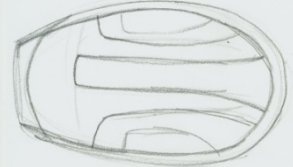
Cluster Representative



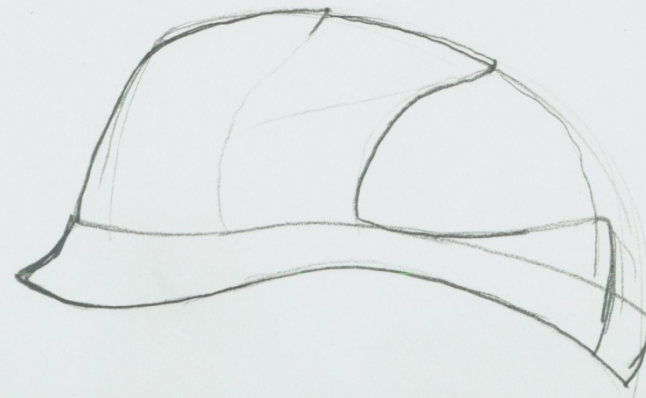
Back view



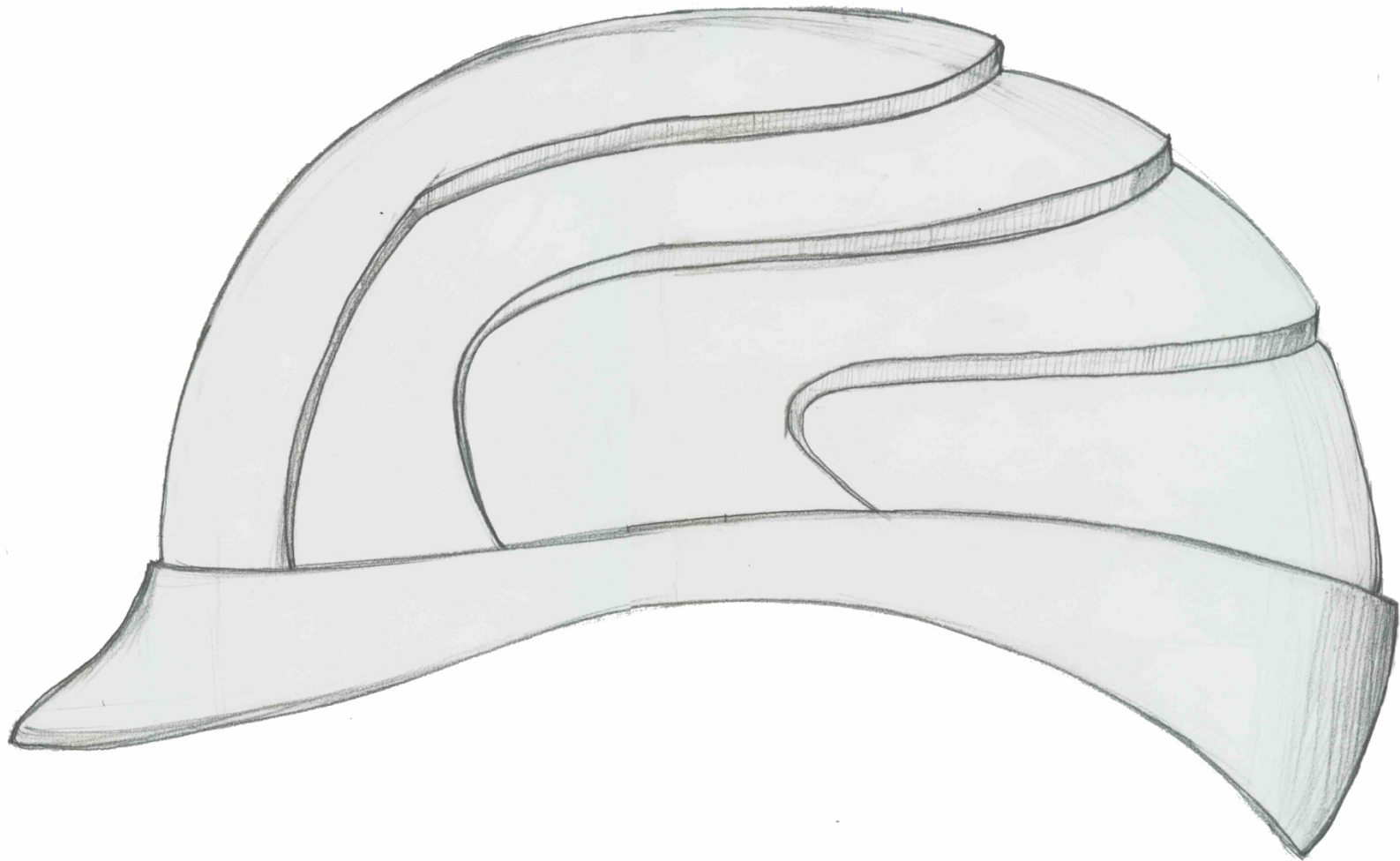
Back view



Concept 1 – development

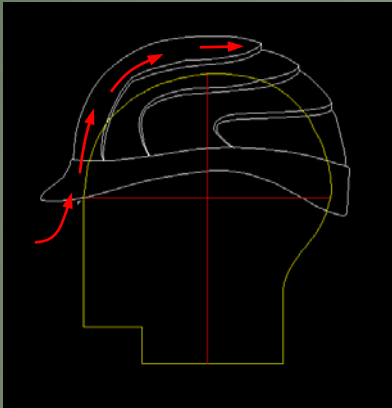


Concept 1



Concept 1 - Mockup Model





Natural Ventilation

The area for Graphics

The short peak

Continuity in
Peak and Brim

Hidden slot
To accommodate add-ons like ear-muffs

The spring action,
Absorbs impact energy

The lower element should
follow the curve

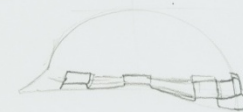
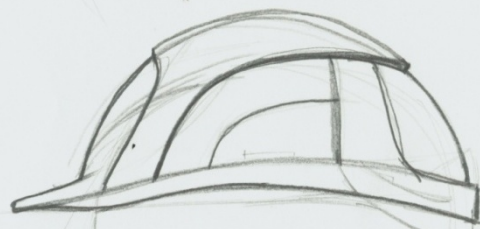
The Brim
Extended on nape region

Concept 1

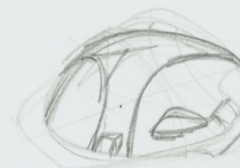
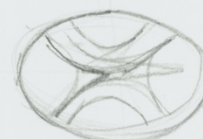
Cluster 2

Industrial Safety Helmet...

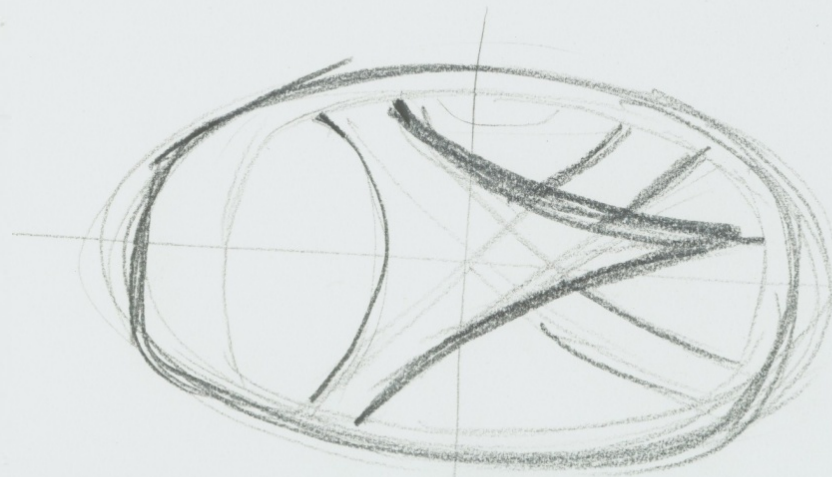
Cluster 2



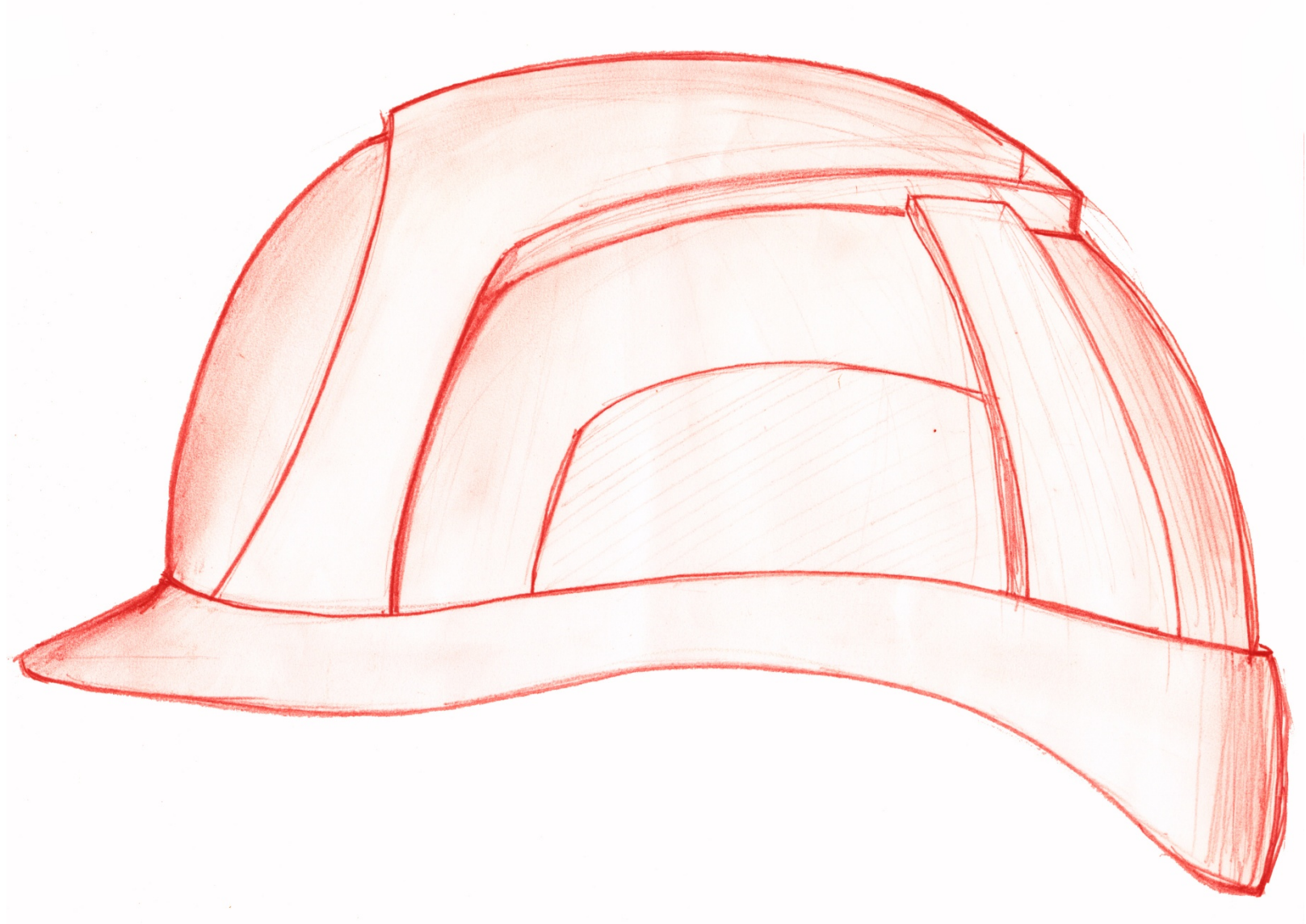
Cluster Representative



Concept 2 – development



Concept 2



Concept 2- Mockup Model



The corrugations
Improves the strength

The area for Graphics

The short peak

Continuity in
Peak and Brim

The location of ventilation slots
on either side

the projection accommodates
the headband fittings

The Brim
Extended on nape region

Hidden slot
To accommodate add-ons
like ear-muffs

the projection accommodates
the headband fittings

Concept 2

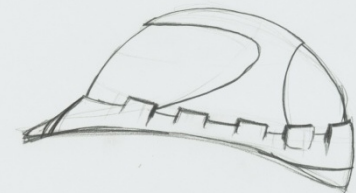
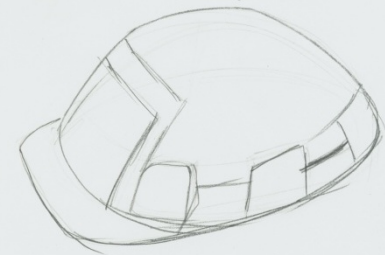
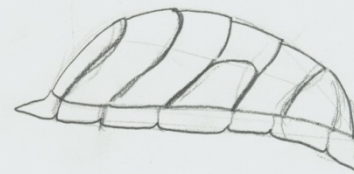
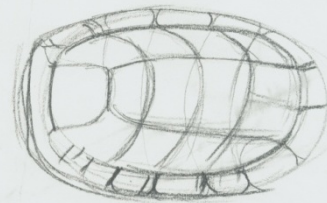
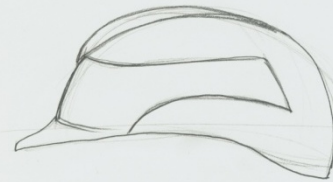
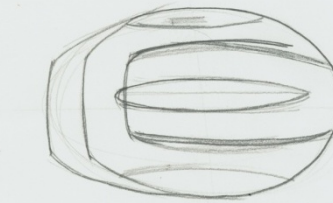
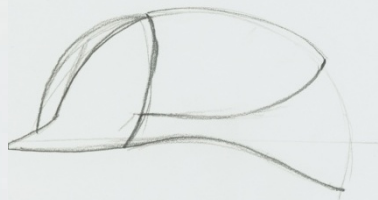
Cluster 3

Industrial Safety Helmet...

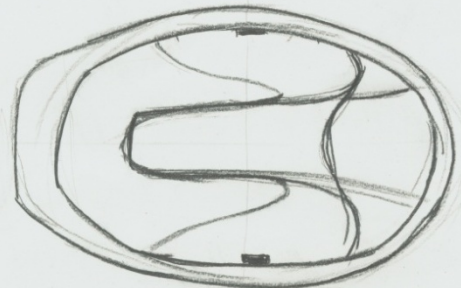
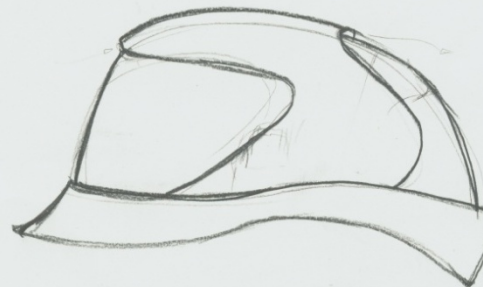
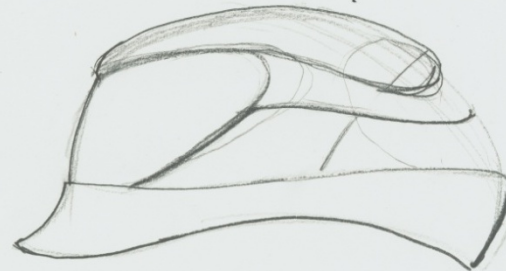
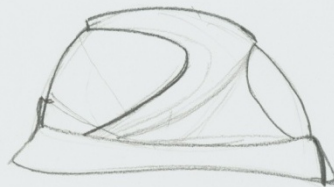
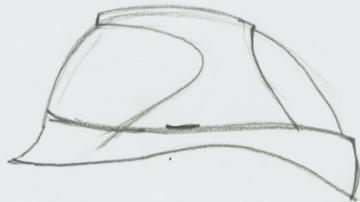
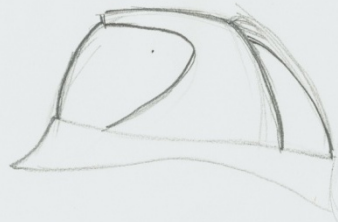
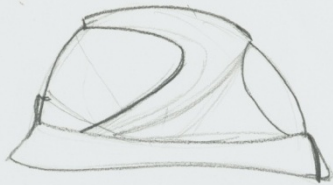
Cluster 3



Cluster Representative

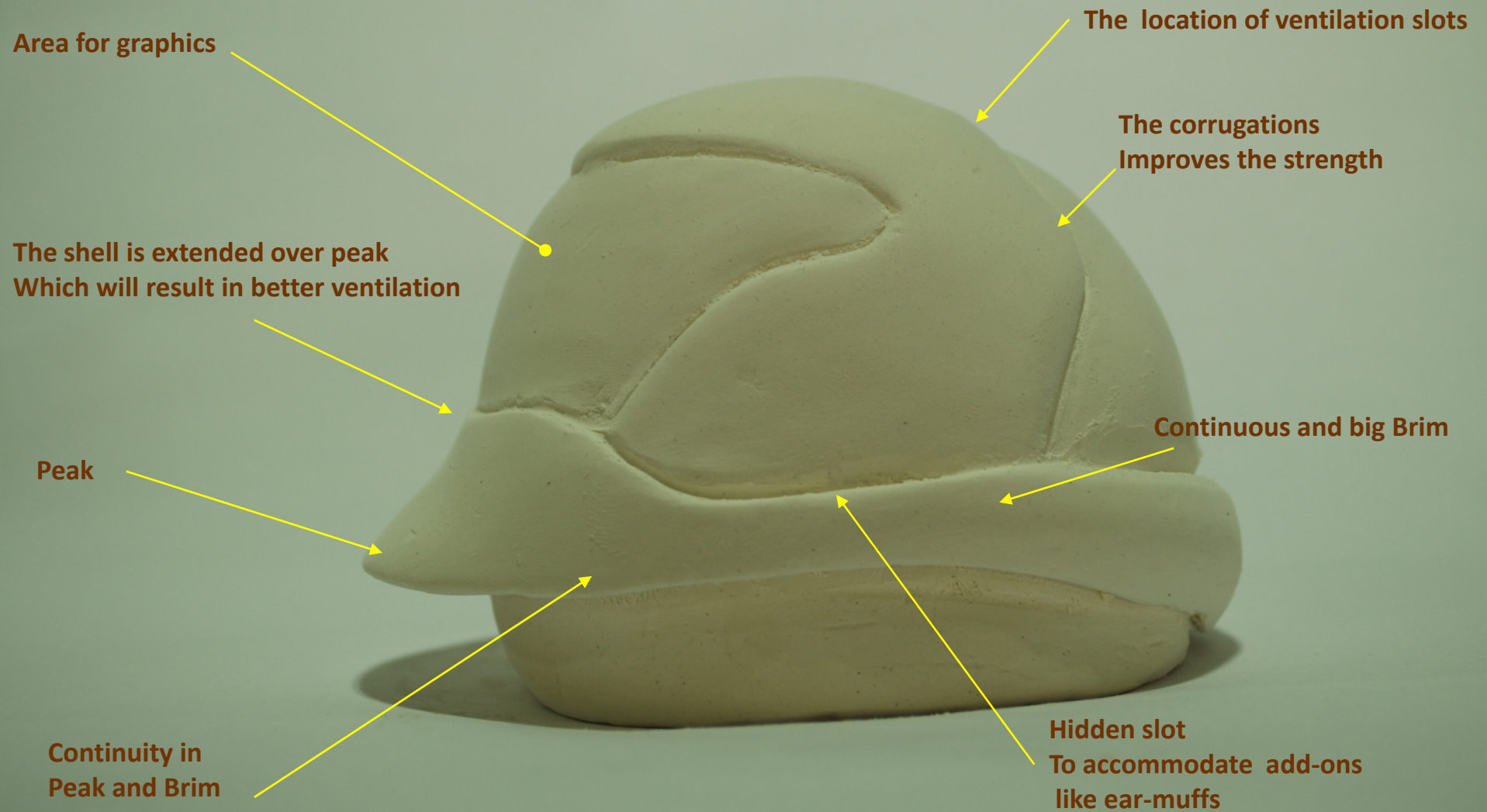


Concept 3 – development



Concept 3- Mockup Model





Concept 3

Concepts



Concept 1



Concept 2



Concept 3

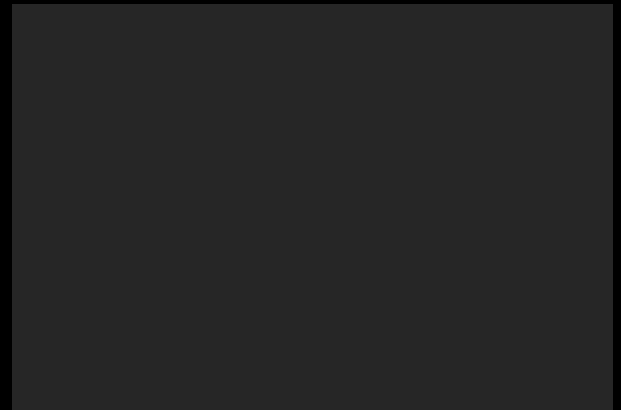
Selected Concepts



Concept 1



Concept 2

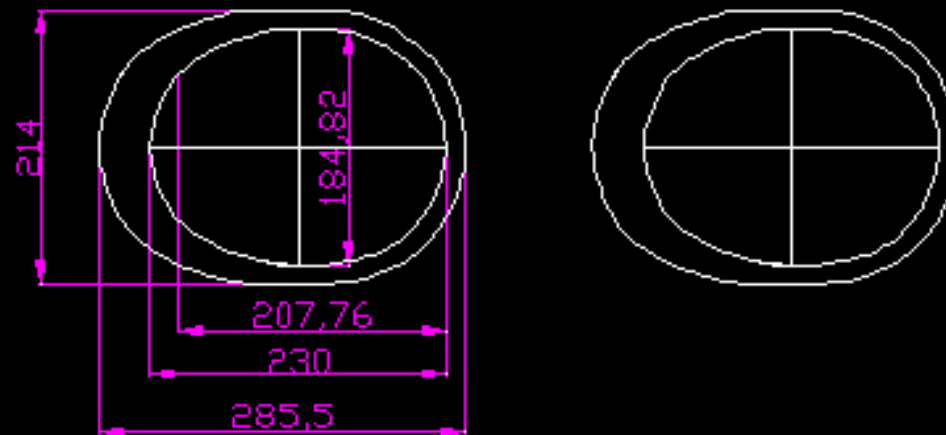
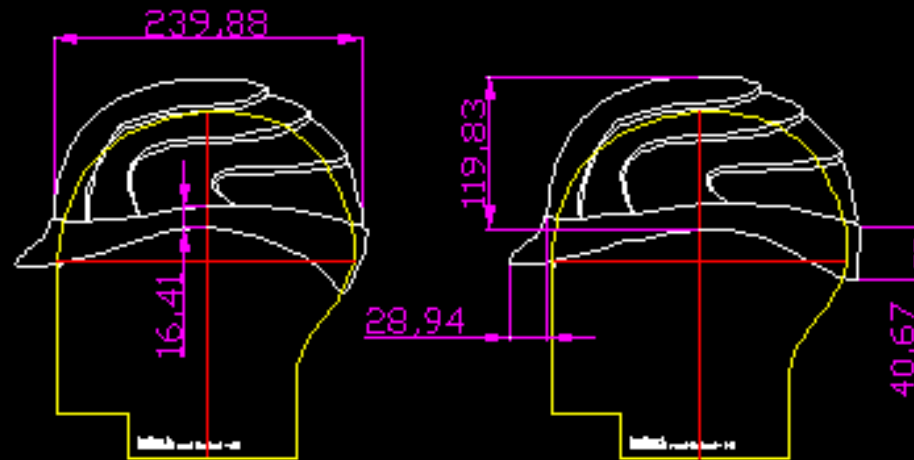


Concept Refinement

Industrial Safety Helmet...

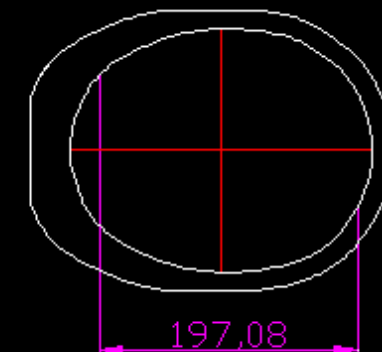
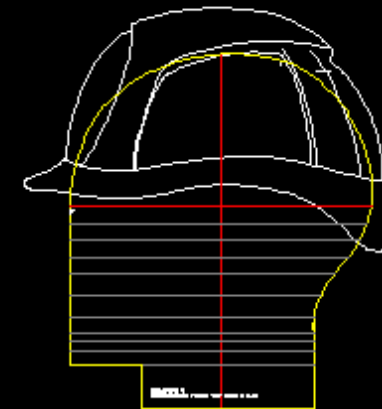
Refinement in Concept 1

- The diagrams in 1:1 scale
- Following the standards
- Checking the concept with the standard head-forms
- Dimension detailing
- Checking feasibility with the existing manufacturing

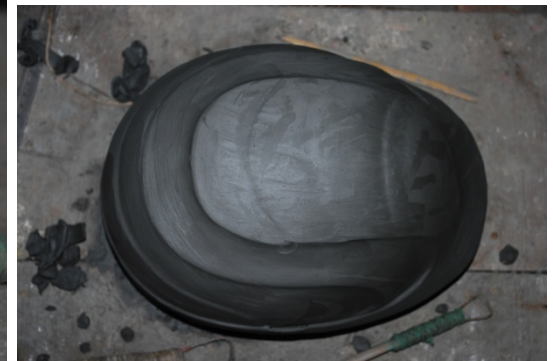


Refinement in Concept 2

- The diagrams in 1:1 scale
- Following the standards
- Checking the concept with the standard head-forms
- Dimension detailing
- Checking feasibility with the existing manufacturing



Concept 1: Clay Modeling



Concept 2: Clay Modeling



Concept 1: FRP Model



Concept 2: FRP Model



Final Concept 1



Final Concept 2



Elements inside the helmet

Inside the helmet

Harness

the complete assembly that provides a means of maintaining the helmet in position on the head and /or absorbing kinetic energy during the impact.

It includes

Cradle

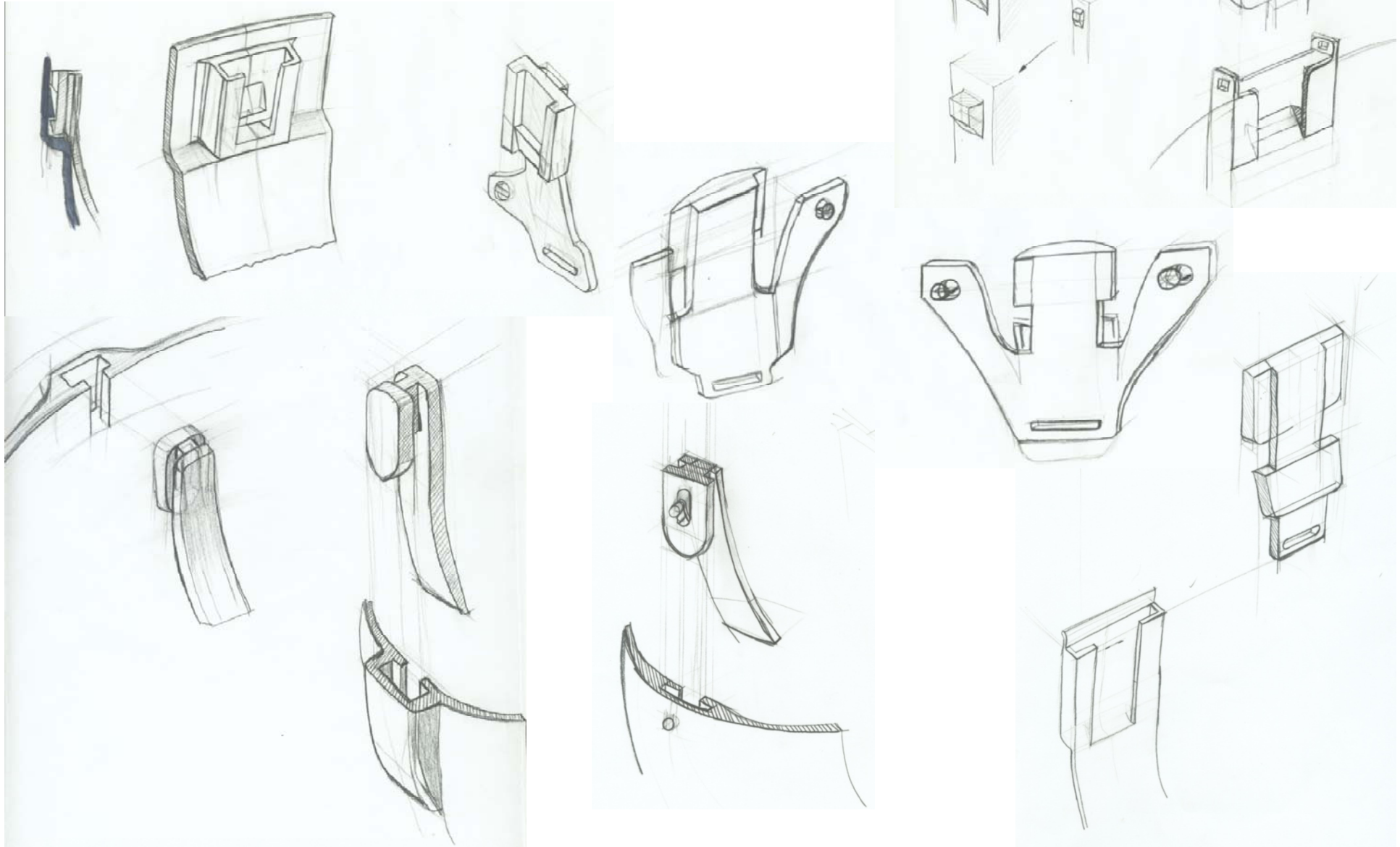
Head band

Nape strap

Sweat band



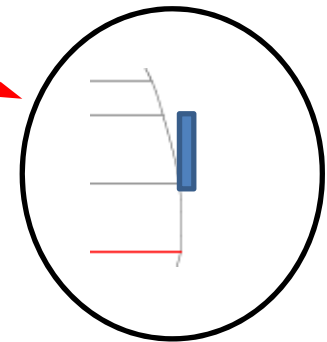
Idea generation for shell and harness fitment



Problems with current harness



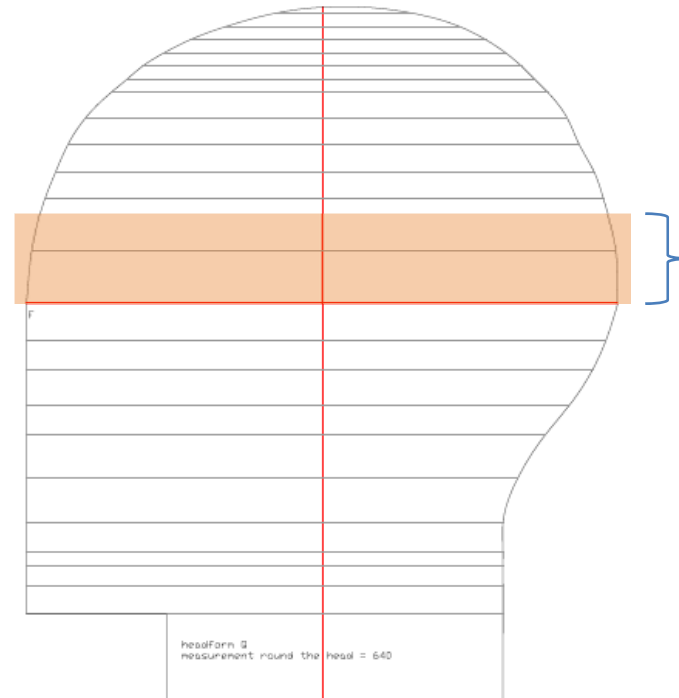
The existed head band forms only line contact which results in discomfort



...for the better comfort

**The head curvature are
studied with respect to the
standard head-forms**

**The current band forms a
part of cylinder, which
results as a line contact
with head**



The location where the
headband fits

Redesigned headband

The improved comfort

The headband follows the curvature of head-forms

Manufacturing –

Injection molding

With two piece mould die

Compatible with current manufacturing setup



Learning

An enriching experience

Constraints drives the design and also decides the direction to the process

The design process is dependent upon the management

The open-mindedness results in liberal design

The design is always a teamwork

The team should include the representatives from all the departments

The experience was a brief look into the design process of a professional consultancy

Credits

Mr. Manohar Bagri

Mr. G K Mundhra

Mr. Natwar Bagri

Mr. Arup Chatterjee

Mr. D N Banerjee

Mr. B K Neogy

Staff of Ugyogi Group

Mr. Dulal Paul and his group

Prof. B. K. Chakravarthy

Thank you...