HOW TO MAKE AN ANGLE GRINDER SAFER TOOL?
NEW AREAS OF INNOVATION

TRENDS ANALYSIS POINTED THE HIGH DEMAND FOR UNIVERSAL TOOLS FOR LIGHT TO MEDIUM WORK, WHILE NOT REQUIRING A PROFESSIONAL EXPERIENCE. IT ALSO INDICATED NEW AREAS OF INNOVATION, SUCH AS FAMILY OR RELATIONSHIP TOOLS. A GROUP OF TOOLS DESIGNED FOR THE LAYMAN BY BOSCH (GREEN SERIES) ARE DOING GREAT, BUT THEIR ABILITIES AND POWER ARE VERY LIMITED.

FOR THIS PARTICULAR CASE I MADE AN ATTEMPT TO DEFINE A MULTIFACETED PERSONA MODEL - SUCH AS FAMILY OR RELATIONSHIP.

VERY OFTEN IT IS NOT CLEAR WHO EXACTLY A 'PERSONA' SHOULD BE. NOT ALWAYS THE FINAL USER DECIDES AND SELECTS THE PRODUCT.

PERSONA

SMART, FUN BUT NOT TOYISH, NEW, SUPPORTIVE

LUCAS
THE SON
16, IN HIGH SCHOOL

MAREK
THE FATHER
37, IT SPECIALIST
BUYER

SOLID BRANDS, SIMPLE, TRUST WORTHY PRODUCTS

NEW AREAS OF INNOVATION

CREATIVE

HOME REPAIRS

YOUNG USERS

DIY

HOME REPAIRS

YOUNG USERS

DIY
THE ANGLE GRINDER IS A VERY UNIVERSAL AND HELPFUL TOOL. IT CAN BE USED FOR CUTTING, GRINDING, AND POLISHING MANY MATERIALS. ON THE OTHER HAND IT IS ALSO VERY DANGEROUS AND AGGRESSIVE.

GOAL: TO MAKE IT SAFER, AND COMFORTABLE, BUT KEEP THE FUNCTIONALITY AND UNIVERSALITY.

WHY ANGLE GRINDER?

I'M A HOBBYIST. I USED THE ANGLE GRINDER MANY TIMES IN MY LIFE. I ALSO HAVE SEEN THE ACCIDENT WHEN THE GRINDER SLIPPED OUT FROM THE WORKER'S HAND AND CUT HALF OF HIS PALM. IT IS NOT SURPRISING THAT MANY PEOPLE ARE AFRAID TO USE IT. IT IS A VERY UNSAFE AND AGGRESSIVE TOOL. IN FACT, ANGLE GRINDER IS ONE OF THE MOST DANGEROUS TOOLS. ALL AROUND THE WORLD IT IS A CAUSE OF MANY ACCIDENTS, ALSO FATAL ONES. THIS IS A BAD SITUATION. OTHER MOTIVATION IS ALSO THE LIMITATION IT CAUSES - WITHOUT THE POSSIBILITY TO USE THE TOOL SAFELY, CREATIVE PEOPLE CAN ABANDON THEIR IDEAS.
CONCLUSIONS

TO MAKE AN ANGLE GRINDER SAFER TOOL.

SAFETY + ANGLE GRINDER (AKA FLEX) = sFLEX
TECHNOLOGICAL RESEARCH

Very important was to keep as much functionality of a standard angle grinder as possible but at the same time to give a user control over its power and let him make mistakes that for normal angle grinders could cause dangerous accidents.

Different tools were studied during the research process. Modern battery powered angle grinders provide enough power and flexibility for non-professional users. "FLEX" works with the same accessories as other conventional angle grinders that are available on the market.

EXISTING ACCESSORIES

CUTTING METAL
CUTTING CONCRETE
CUTTING WOOD
SAWING BRANCHES
BRUSHING
SANDING METAL
SANDING
POLISHING
SOLUTION

'SFLEX' stood as a right answer to these needs. After many attempts in sketches and simple cardboard models, I choose the best solution that meets the project requirements.

The blade is hidden in a cover. The cover is moving along the longer handle, but strong spring is closing cover if the user releases any of the handles. It is designed for craftsmen and hobby users. Designed it to give them the powerful, yet mistakes forgiving tool.

FUNCTIONAL MODELS

Ergonomics testing model

Cardboard idea model with one function

Modified grinder simulating concepts work

Mechanical model with all functions

Core idea model

For cutting horizontally

For cutting vertically

For grinding horizontally

For grinding vertically
FUNCTIONALITY

'SFlex' has two working modes. It can be used as a cutting tool or as a sanding tool. To start cutting, the user has to pull the top grip towards, than saw blade comes out.

If the user loses control, and 'Sflex' falls out of his hand, the saw blade is covered automatically by the casing. This sanding mode works in similar way. In this mode, the grinding wheel spins out of the housing through the bottom.

In the main body there is an electric engine and the battery. In the front part is an rotatable top grip for the second hand, and the transmission mechanism. Top grips are rotatable so the angle can be adjusted to the needs. It makes the 'Sflex' also fully functional tool for both left- and right-handed users.

PACKAGE

- Battery
- On/off
- Circuit board
- Mode switch
- Grip lock
- Engine
- Fan
- Telescopic shaft
- Pushing arm
- Disc mounting
- 90° gear box
- Circuit board
- Mode switch
- 90° gear box
- Grip lock

IN CUTTING MODE
...Sanding pad comes through the bottom hole opening.

IN SANDING MODE
...Sanding pad comes through the bottom hole opening.
MY MAIN FOCUS WAS ON SAFETY. THEN ON THE MENTAL AND PHYSICAL COMFORT. I WANTED TO CREATE A TOOL WHERE THE EFFECT OF SAFETY FEATURES ON THE FUNCTIONALITY IS REDUCED TO MINIMUM. I WENT THROUGH MANY MODELS AND PROTOTYPES TO DEVELOP THE FINAL PACKAGE AND SIMPLIFY THE CONSTRUCTION.
FINAL MODEL

AS A FINAL STAGE I BUILT A HARD MODEL FOR ERGONOMIC TESTS. HANDLES ON THE MODEL HAS THE SAME FUNCTIONALITY AS THE FINAL PRODUCT.
THE ASSUMPTIONS WERE CHALLENGING. ANGLE GRINDER HAS TWO MAIN MODES OF PROCESSING - WITH AN EDGE OF MOUNTED DISC/ACCESSORY (CUTTING), OR WITH THE BOTTOM SURFACE (GRINDING, POLISHING). FUNCTIONAL MODELS HELPED ME TO DEVELOP A MECHANISM THAT TRANSFERS ROTATION FROM THE MOTOR THROUGH THE TELESCOPIC AXIS. THIS MECHANISM PROVIDES THE ABILITY TO MOVE THE HEAD (WITH A MOUNTED DISC) IN TWO AXES. THE FINAL DESIGN - IN OPPOSITE TO TRENDS - WAS DEVELOPED TO MAKE SFLEX VISUALLY STABLE AND SECURE, SO THAT THE USER WILL NOT HAVE THE IMPRESSION THAT THE TOOL IS AGGRESSIVE AND UNPREDICTABLE.
sFLEX

TO MAKE AN ANGLE GRINDER SAFER TOOL.