TRAY STACKER AND DESTACKER(TSD)

CREATED BY STAX ENGINEERING AND TEAM SOSTRATOUS

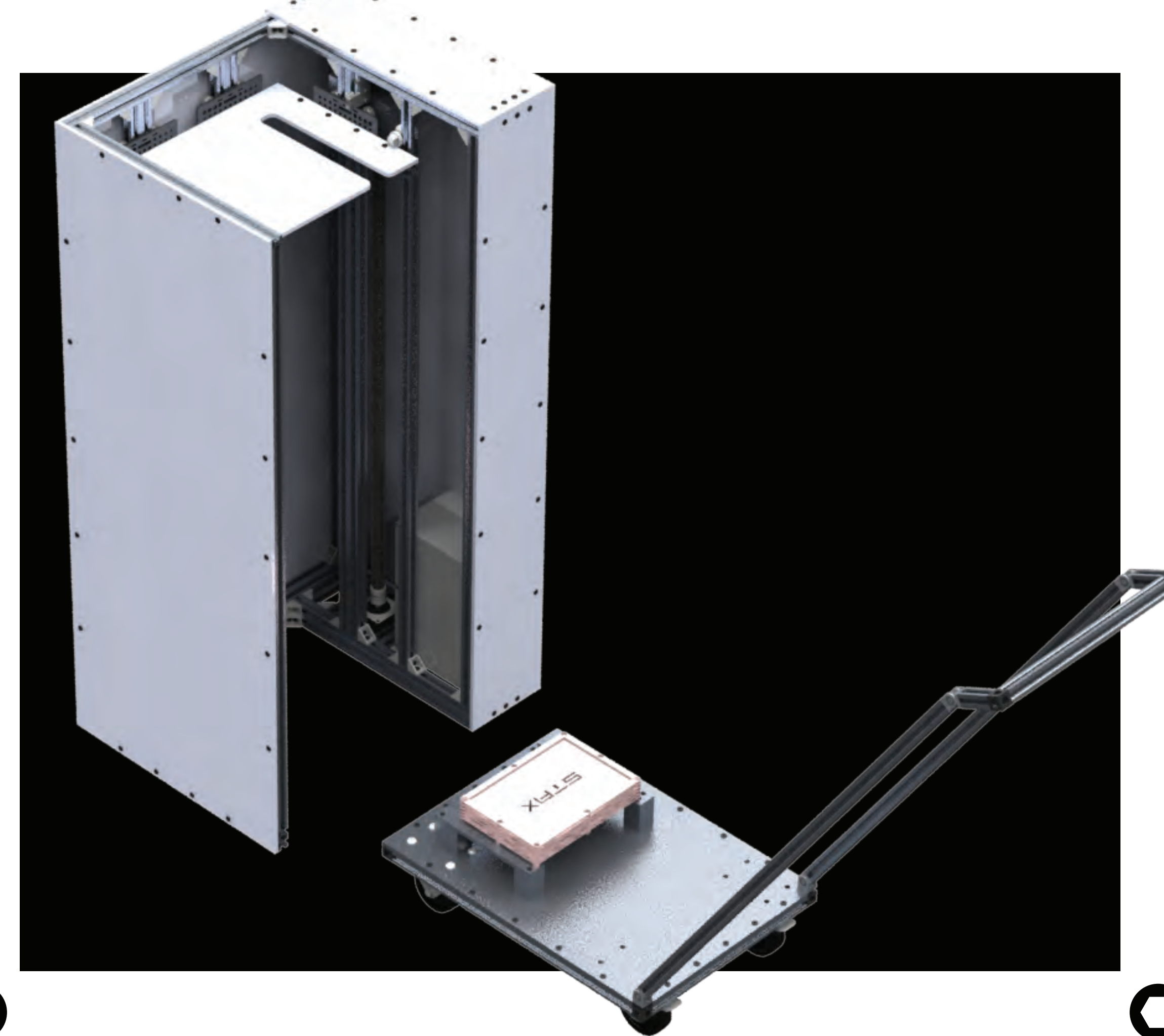### SPONSORED BY Masimo

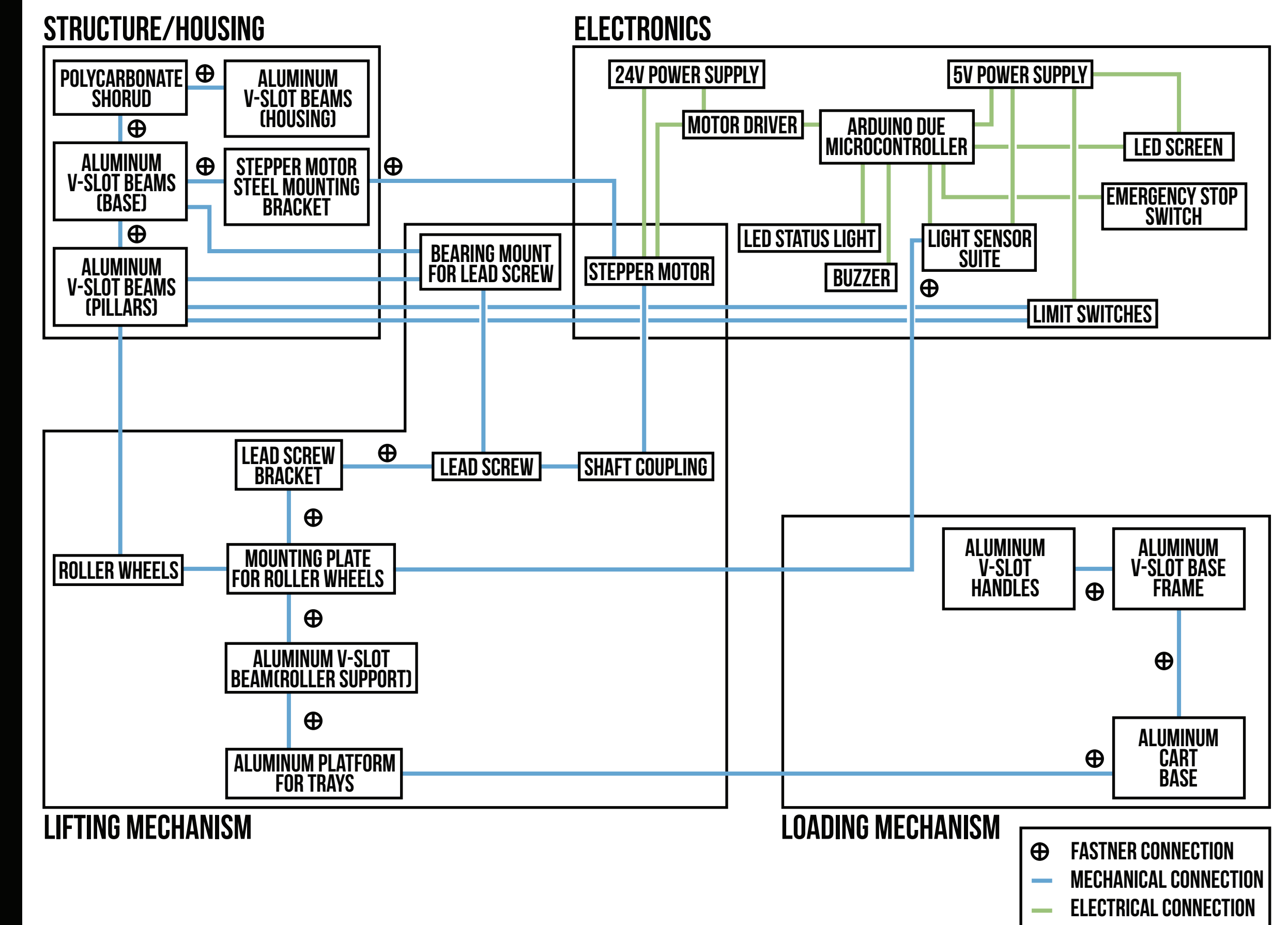**STAX SOSTRATOUS**

SDSU San Diego State University

THE PROJECT

THE STAX ENGINEERING TEAM, ALONG WITH THE SPONSORSHIP OF MASIMO, HAS DEVELOPED THE AUTOMATED TRAY TACKER & DE-STACKER WITH THE INTENT TO IMPROVE THE EFFICIENCY OF MASIMO'S PRODUCTION LINE. THE MACHINE'S DESIGN IS SIMILAR TO A 3D PRINTER, WHERE IT UTILIZES ROTATIONAL MOTION AND CONVERTS IT INTO LINEAR MOTION THROUGH THE USE OF A STEPPER MOTOR, MICROCONTROLLER, AND LEAD SCREW.
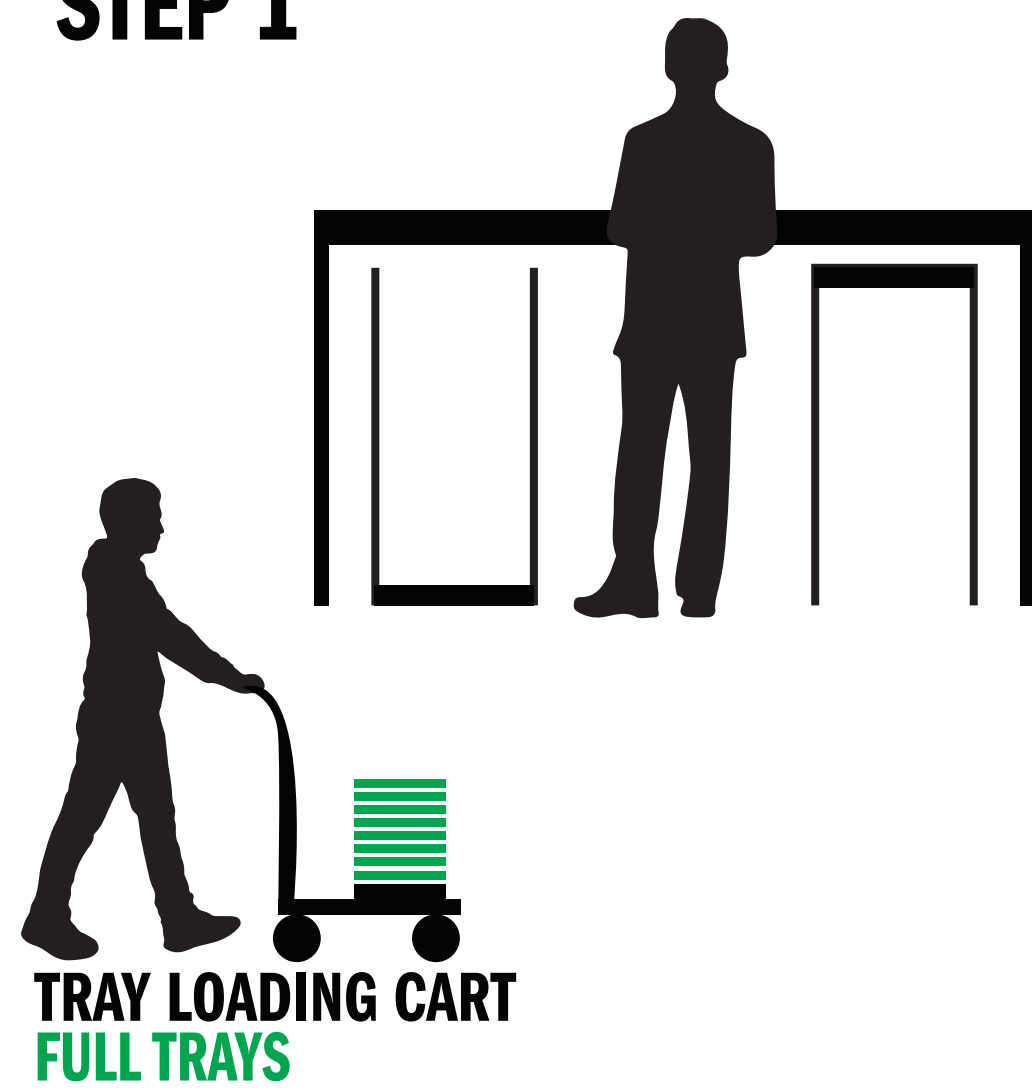
STEP 1
TRAY LOADING CART
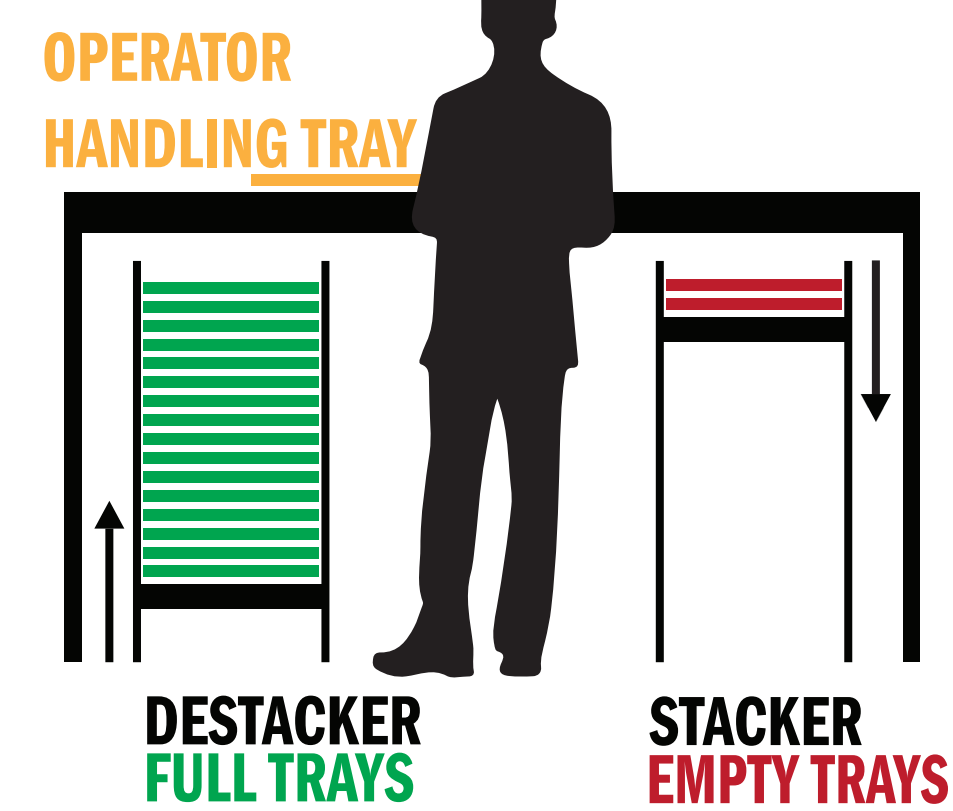FULL TRAYS

STEP 2
OPERATOR HANDLING TRAY
DESTACKER FULL TRAYS
STACKER EMPTY TRAYS

STEP 3
OPERATOR HANDLING TRAY
DESTACKER FULL TRAYS
STACKER EMPTY TRAYS

STEP 4
TRAY LOADING CART
EMPTY TRAYS

MAIN COMPONENTS

CUSTOM CART PLATE | M20 X 4MM LEAD SCREW | CUSTOM TRAY PLATFROM

TRAY STACKER AND DESTACKER(TSD)
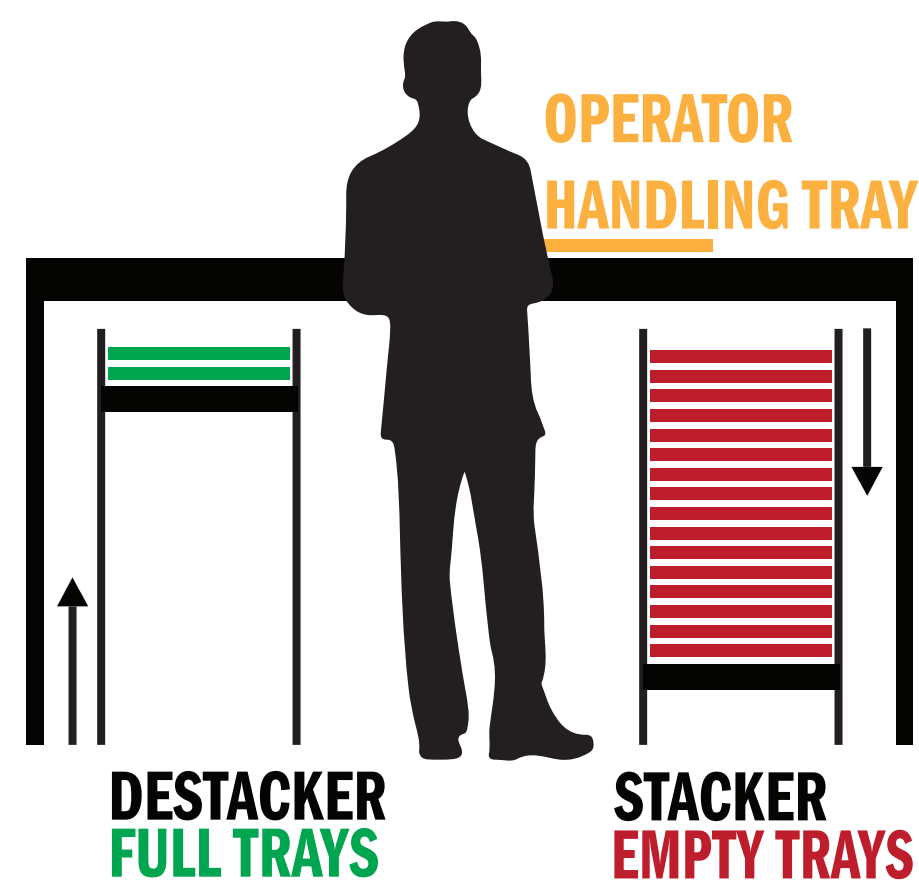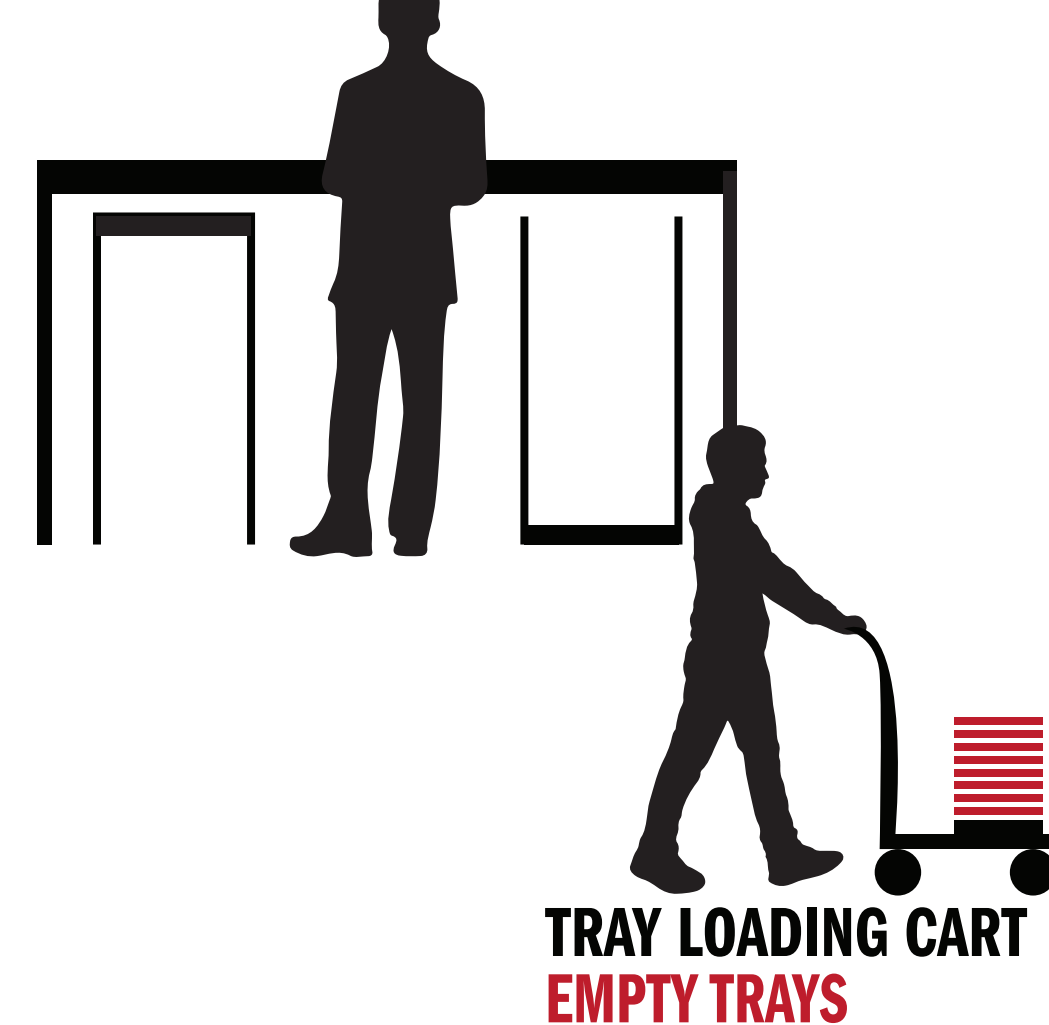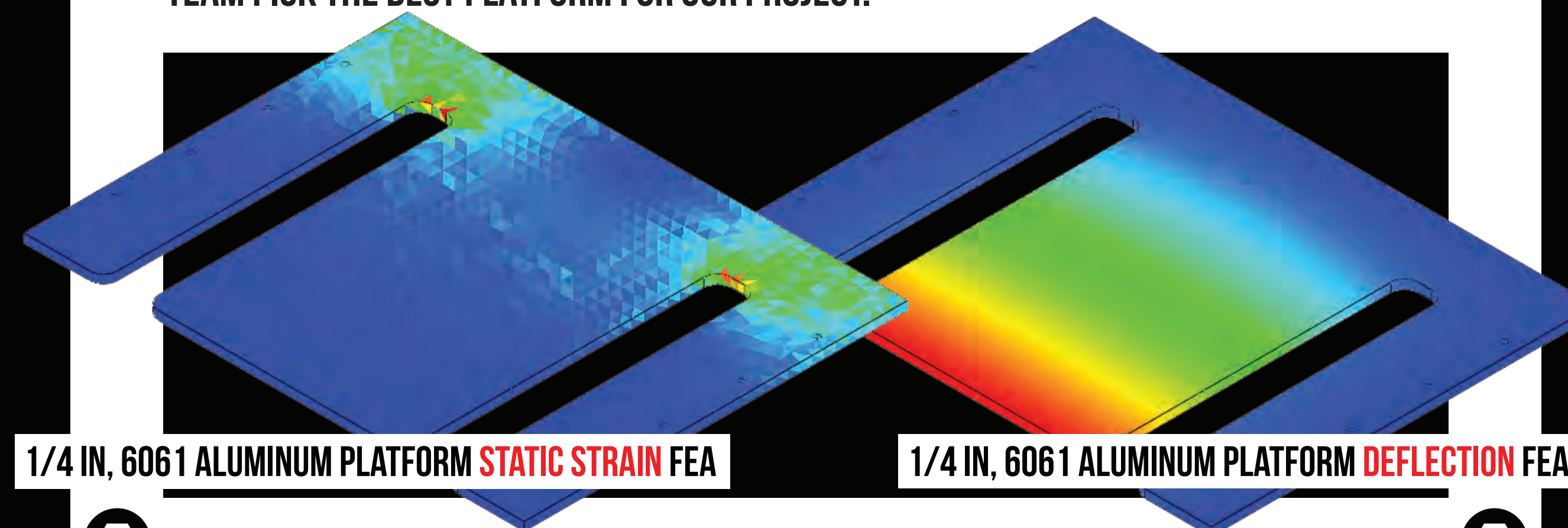
ENGINEERING ANALYSIS

ENGINEERING ANALYSIS WAS CONDUCTED ON THE PLATFORM, WHICH, IS INTENDED TO HOLD A MAXIMUM OF 100 N OF FORCE. SEVERAL DIFFERENT MATERIAL OPTIONS SUCH AS 7075 AND 6061 ALUMINUM IN BOTH 1/8 INCH AND 1/4 INCH THICKNESS WERE SUBJECT TO SOLIDWORKS FINITE ELEMENT ANALYSIS IN ORDER TO DETERMINE THE BEST POSSIBLE MATERIAL AND THICKNESS COMBINATION TO SUPPORT THE MAXIMUM LOAD OF TRAYS. THE FACTOR OF SAFETY WAS ALSO ACCORDINGLY CALCULATED, WHICH FURTHER HELPED THE TEAM PICK THE BEST PLATFORM FOR OUR PROJECT.

1/4 IN, 6061 ALUMINUM PLATFORM STATIC STRAIN FEA | 1/4 IN, 6061 ALUMINUM PLATFORM DEFLECTION FEA

SYSTEMS LEVEL DIAGRAM

STRUCTURE/HOUSING

POLYCARBONATE SHROUD
ALUMINUM V-SLOT BEAMS (HOUSING)
ALUMINUM V-SLOT BEAMS (BASE)
STEPPER MOTOR STEEL MOUNTING BRACKET
ALUMINUM V-SLOT BEAMS (PILLARS)

ELECTRONICS

24V POWER SUPPLY
5V POWER SUPPLY
MOTOR DRIVER
ARDUINO DUE MICROCONTROLLER
LED SCREEN
BEARING MOUNT FOR LEAD SCREW
LED STATUS LIGHT
LIGHT SENSOR SUITE
EMERGENCY STOP SWITCH
STEPPER MOTOR
BUZZER
LIMIT SWITCHES

LEAD SCREW BRACKET
LEAD SCREW
SHAFT COUPLING
ROLLER WHEELS
MOUNTING PLATE FOR ROLLER WHEELS
ALUMINUM V-SLOT HANDLES
ALUMINUM V-SLOT BASE FRAME
ALUMINUM V-SLOT BEAM(ROLLER SUPPORT)
ALUMINUM PLATFORM FOR TRAYS
ALUMINUM CART BASE

LIFTING MECHANISM | LOADING MECHANISM

⊕ FASTNER CONNECTION
— MECHANICAL CONNECTION
— ELECTRICAL CONNECTION

THE TEAM

FAAKHIR ALI — PROJECT MANAGER AND ME LEAD
JOEL OSUNA — MANUFACTURING LEAD
KEVIN UY — DESIGN LEAD
IAN ESTACIO — DESIGN/PROCUREMENT ENGINEER
STEVEN MAGAYANES — QUALITY ENGINEER

KARIM OMARA — EE DESIGN LEAD
ALI AL-AZMI — HARDWARE AND ANALOG ENGINEER
CHAITANYA PATEL — CODE/SOFTWARE ENGINEER
ALEJANDRO ORTIZ — VALIDATION ENGINEER
SAUD ALUTAIRI — DOCUMENTATION AND RESEARCH