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#### □ Plastic Injection Molding Simulation – New Domain Engineering Services at ARAI

With increasing demand of **light-weighting**, **cost reduction** and **cost-effective production**, use of plastics and composites is an obvious answer for designers and manufacturers. Moreover, plastics have widespread applications in almost all industrial domains. At an early stage of development, even the most experienced fail to predict surprises awaited during the trial (first prototype) stage. These surprises include defects and issues related to quality, aesthetics, dimensions, etc. Correcting these defects becomes a 'trial and error' approach, which adds unnecessary re-tooling expenses while stretching the delivery commitments. Correcting defects at the end stage of development would compromise quality, leading to potential field failures due to unpredictable component life. Moreover, modern day designers are more creative and adventurous in their design, which increases importance for validation tool.

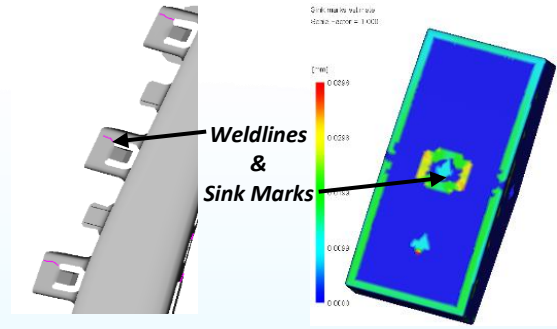
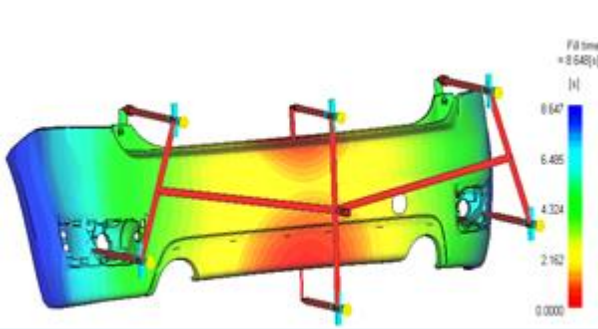
In order to stay aligned with the market trends and to adopt new technologies, ARAI has added state-of-the-art **Plastic Injection Molding Simulation** service to its portfolio.

Following solutions are provided through Plastic Injection Molding Simulation in best possible way-

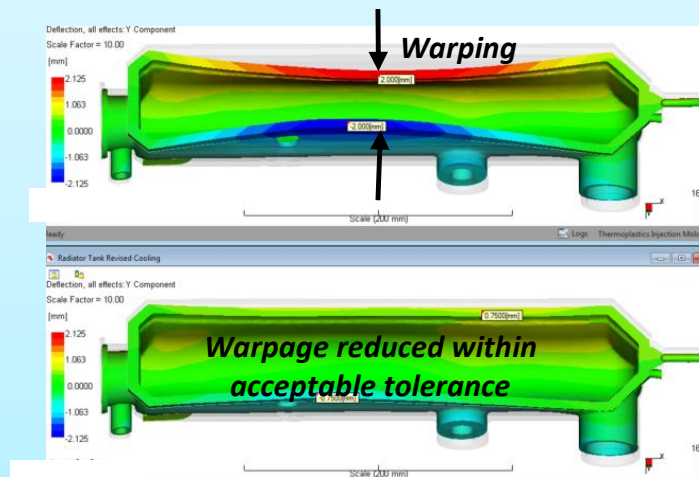
- Perform virtual validation of molding issues related to design and process in order to relieve customers from the risk of losses after huge investment on the mold / tool.
- Optimize design from manufacturability aspect in order to have robust product that sustains process variations.
- Pre-detect potential aesthetical defects such as weld-lines, air traps or sink marks that can fail the part at quality. This creates scope to make necessary arrangements in design and mold design to eliminate it.
- Detect dimensional issues such as 'warping' which hold the key to part's success since most of the parts designed in today's world work in assemblies. This creates scope to understand its key contributors as well.
- Carry out 'design of experiments' study in very less time to understand key parameters affecting the result or design criteria.

ARAI provides Injection Molding Simulation services in the following areas:

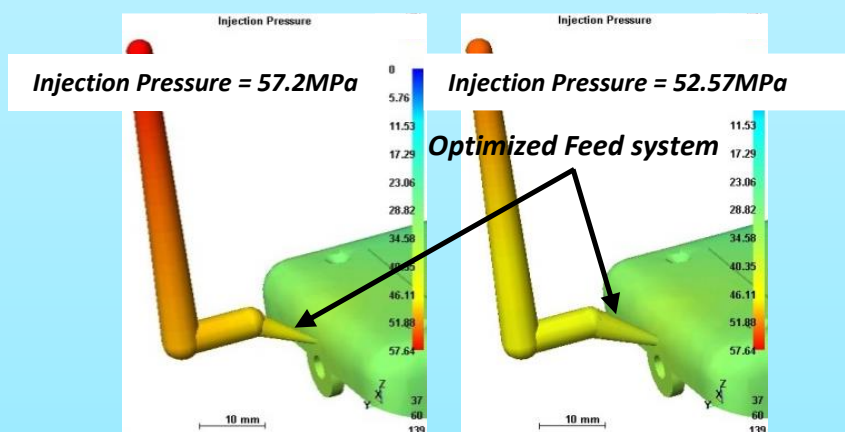
- Product Design Validation for Defect Identification



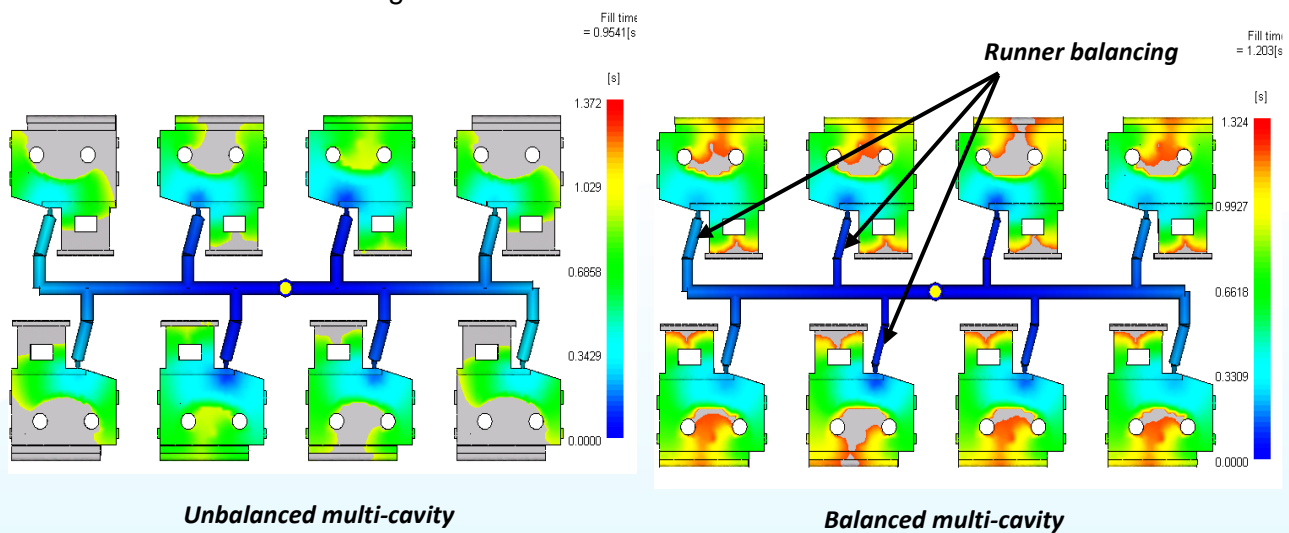
- Optimization
  - Value Added Engineering
    - Thickness Reduction from Filling perspective
    - Cycle Time Reduction
- Mold Design Validation
  - Optimizing gate location/s
  - Computing best combination of multiple gates
  - Optimizing filling, packing and warp



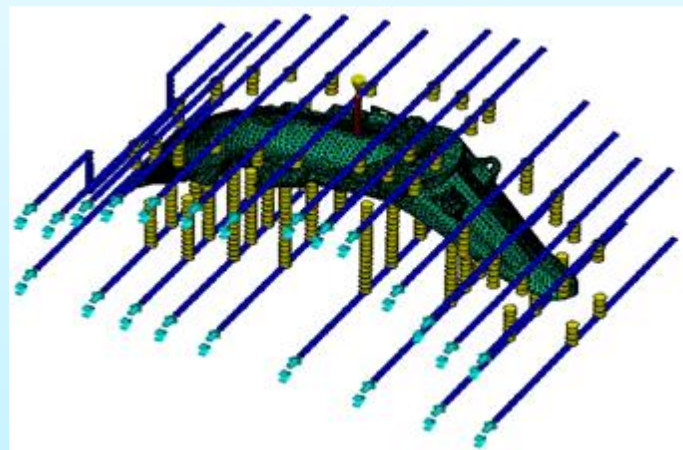
- Feed System Optimization



- Runner Balancing



- Evaluating Channel Layout effectiveness and locating 'hot-spots'



- Raw Material Validation
- Material Comparison
- Core Shift Analysis (mold/part insert deflections)
- Sequential Filling
- Providing Technical and Domain based Training in Molding Simulation

ARAI now supports customers to get best solutions for defect-free Injection Molding using Simulation. Our domain expertise in this field is an added advantage for providing customers with more accurate and implementable solutions.

## ARAI establishes India's First Child Restraint System Test Facility

To support Government of India's drive towards facilitating safe transportation mode for Children, ARAI has established new Child Restraint System Test Facility under its Passive Safety Laboratory at Kothrud, Pune.

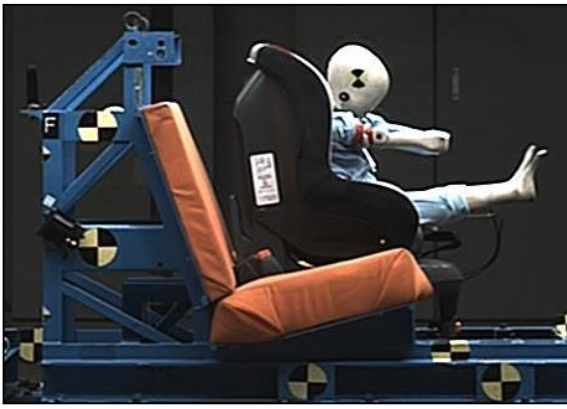
This is the first such facility in India. The facility is capable of testing of child restraint systems as per AIS 072 as well as UN ECE Regulation No. 44. The facility was inaugurated during SIAT 2017, at the auspicious hands of Shri Sanjay Mitra, Secretary, Ministry of Road Transport & Highways, Government of India.



### ARAI's facility is equipped with

- Full family of state-of-the-art Q-Series Child dummies.
- ISOFIX Child Restraint Fixtures.
- Dynamic Test Benches with latest generation high speed cameras.
- All the static test rigs such as overturning rig, lock off device test rig, adjuster conditioning rig, energy absorption test rig, UTM Machines, Climatic Chambers and other rigs required for complete testing of child restraint systems and its child parts.
- ARAI's latest Crash Test Facility at HTC-Chakan is capable of performing full vehicle crash tests with child dummies as per proposed Bharat NCAP test protocol and as per other international NCAP protocols.





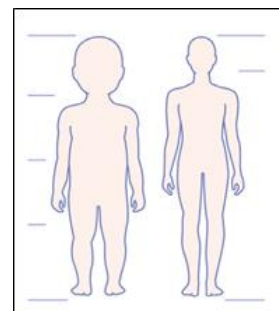
**Child safety seats** (sometimes referred as an infant safety seat, a **child restraint system**, a restraining car seat, or ambiguously as car seats) are the seats designed specifically to protect children from injury or death during collision.

**CRS is usually hard-back child safety seat, which is used for safe transportation of children in cars and aircrafts.**



### Why to protect your child?

Babies and toddlers, compared to older children and adults, have weaker neck muscles carrying relatively large and heavy head in relation to their body. To reduce the risk of severe injuries in case of crashes or emergency braking, it is important that this group of children is transported against the driving direction for as long as possible.



## Child Safety seats help to prevent death and injury in case of crash.

- Majority of injuries to children are the result of being thrown into windshield or dashboard, crushed by adult, or thrown from the vehicle.
- In the event of crash, unrestrained child becomes like a missile that is thrown with great force.
- Child safety seat is designed to:
  - Hold the child in the seat in the vehicle.
  - Protect child from being thrown out of the vehicle or from hitting something in the vehicle.
  - Absorb force of impact.
  - Spread force of vehicle's impact safely over whole body.



## Brief History

First seats for children arrived on stage in 1930, but not for protecting children! These seats were meant to lift the child so that adult parent can see them inside the car.

Swedish Doctor, Bertil Aldman, developed concept of rearward facing CRS offering better protection to young children in 1962.

Volvo launched PV544 with first rearward facing CRS as a standard accessory in 1964.



## What are the legal requirements?

- Most of national or regional legislation requires use of child restraint systems for transport of children up to certain age or height.
- US adopted FMVSS 213 – Standard For CRS in Year 1971.
- By 1985, all states in USA passed law for mandating use of CRS.
- First set of Child Dummies (p-series) developed by TNO, Netherlands in late 1970s.
- UN ECE issued CRS Test Standard UN ECE R44 in 1981.
- Europe issued regulation for CRS in 1993. Many countries in Europe enforce mandatory use of CRS.



## Categories of Child Restraints

### CARRY COTS



Carry Cots approved for automobiles only serve their purpose for speeds below 50 km/h. Placed transversely in vehicle rear seat, they need belts with 3 points and special harness for their attachment.

### REARWARD FACING CRS



Rearward Facing CRS are placed both in the front seat (unless you have active airbag) or rear seats. Fastened with vehicle's three-point seat belt or using ISOFIX system, if vehicle's seat is ready for this adjustment device.

### FORWARD FACING CRS – Integral Harness



Forward facing CRS are adapted to constitution and specified weight babies. It can be placed in rear or front seats, forward facing. If placed in rear seat, would be preferably in the Centre. Are installed with the car seat belt or using ISOFIX system (if vehicle seat got this anchoring system) and forward facing.

### FORWARD FACING CRS – High Back Booster



Child restraints which use vehicles seat belts directly for restraining child as well as seat. Usually adapted to growth and its backrest can be removed, once dimensions allow child using seat belt for adults only with booster.

## BOOSTER SEATS

3



Group 3

22 - 36 kg

6 - 12 years

Same weight range as Group 2 car seats, but without backrest and with height adjuster for seat belt. Until child exceeds 1.35 m. high and can use adult seat belt directly, it must use compulsory booster seat.

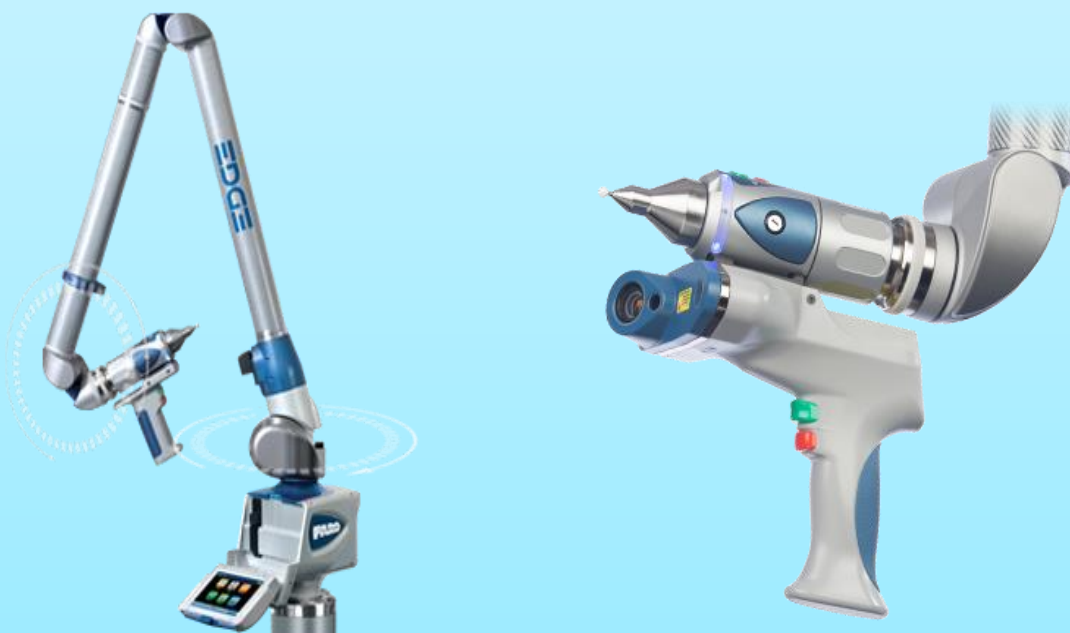
### India's Foray into Child Restraints

- India has published and adopted AIS-072 - Approval of Restraining Devices for Child Occupants of Power-Driven Vehicles (Child Restraint System).
- Government of India, vide Notification No. GSR 291(E), mandates :
  - Provision for fitment of at least one CRS in vehicles manufactured on or after 1<sup>st</sup> Oct 2014.
  - Use of AIS-072 type approved CRS for transportation of children in passenger vehicles from 1<sup>st</sup> April 2016.
- Accordingly, it is in the interest of the passenger/consumer to start using approved Child Restraint System for transportation of children in cars.

### ❑ **Flexi Arm Portable Coordinate, 7-Axis Measuring Machine (CMM) with Scanner Attachment**

Edge Scan Arm HD is the most affordable, high performance contact / non-contact measurement system.

FARO Edge with Scan Arm ES is the latest advancement in FARO's Laser line Probe product line and features enhanced Scanning Technology (EST). EST is a combination of multiple hardware and software improvements such as high dynamic range (HDR) mode designed to boost performance by improving ability to scan challenging surfaces including high contrasting colours simultaneously.





## Applications:

### Dimensional Analysis

- Calculate geometric and GD & T measurements
- Compare complex geometry, surfaces and feature positions to nominal data
- Automatically generates reports.

### CAD-Based Inspection

- Measuring directly against CAD data lets the operator see real-time deviations from nominal
- Allows parts to be produced with an inspection report certifying the part has been manufactured within acceptable tolerances.

### On-Machine Inspection

- Quickly and easily inspect parts on the machine tool producing them
- Reduce time and cost of inspections
- Achieve tighter Tolerances with fewer errors and less production waste

### Alignment

- Perform alignments faster, more accurately, and with less effort than traditional measurement methods.
- Real-time measurement confirms tolerances and validates design

### Reverse Engineering

- Digitize part or object to create fully surfaced CAD model.
- Rapid prototyping allows engineer to reproduce complex shapes in fraction of time.
- Need to create hard masters and space they require is eliminated.

### Non-Contact Inspection

- Allows inspection of soft, deformable, or complex shapes
- Easily align data to the nominal in order to compare Virtuality to reality
- Ideal for inspection, Point cloud-to CAD comparison, rapid prototyping reverse engineering and 3-D modelling

### Technical Specifications:

**Model:** FARO Edge; **Measuring Axis:** 7; **Measuring Range:** 1.8 metre; **Single Point Repeatability:** 0.024 mm; **Volumetric Accuracy:**  $\pm 0.034$  mm

### FARO Laser Line Probe Specification:

**Accuracy:**  $\pm 35$   $\mu$ m; **Repeatability:** 35  $\mu$ m; **Stand-off:** 80 mm; **Depth of field:** 85 mm; **Effective Scan Width:** Near field 53 mm, for field 90mm; **Points per line:** 752 points /line; **Scan rate:** 60 frames/second x 752 points /line=45120 points /second

## □ Celebration of 1<sup>st</sup> Anniversary of HTC, Chakan

First anniversary of ARAI - Homologation and Technology Centre at Chakan was celebrated on 4<sup>th</sup> January 2017. Shri Rajendra Petkar, Head of Power Systems Engine, ERC, Tata Motors Limited, graced the occasion as a Chief Guest, in the presence of Shri Shri Kamlakar Takawale – HR Head – Volkswagen India Pvt. Ltd. ARAI employees and many industry stalwarts, including the members of the Governing Council for ARAI, attended the function. On this occasion, ex-employees of ARAI felicitated and were given a tour to the state-of-the-art development and testing facilities at ARAI-HTC.

Mrs. Rashmi Urdhwareshe, Director – ARAI, in her opening address, welcomed the guests and presented the overview of facilities and capabilities of ARAI-HTC, progress made by the centre since inception and the way ahead, facilities going to be added in near future. In her speech, she acknowledged the support of the automotive and allied industry and appealed to put across service feedback, their requirements and expectations from ARAI.

Shri Petkar expressed satisfaction over the progress made by the Centre in a short span and congratulated ARAI employees for the same. His informative and visionary speech inspired the audience. Shri Takawale acknowledged the efforts made by ARAI in establishing the Centre in Chakan industrial hub and the service rendered to the industry.



## □ Symposium on International Automotive Technology (SIAT) 2017 – Brief Overview



ARAI, in association with SAE India and NATRIP and with the support of SAE International (USA), had organized Symposium on International Automotive Technology (SIAT) at ARAI, Pune from 18 – 21 January 2017. The event featured presentation of technical papers and keynote speeches, with participation of automobile experts and professionals world over. Theme of SIAT 2017 was “Smart, Safe and Sustainable Mobility”, keeping in tune with latest trends and challenges ahead of the automotive community.

The focus of Indian Government on reducing pollution, encouraging electric mobility, coupled with thrust on reducing road accidents and fatalities through smart and intelligent solutions, has driven industry to advance their R&D efforts. SIAT 2017 was the ideal platform for the researchers around the globe to put forth and deliberate their ideas to address India specific and global challenges faced by the automotive sector.



In addition to 170 technical papers, 40 keynotes, were presented in 5 parallel sessions during the 4-day Conference. The main attraction of the conference was plenary sessions on “Smart, Safe, Sustainable & Future Mobility” by eminent speakers, who set the tone for conference deliberations and provided direction to automotive fraternity.

SIAT 2017 witnessed participation of 1400 delegates from India and abroad and presentation of 205 technical papers and 40 keynotes by the automotive experts worldwide. In the concurrent SIAT Expo 2017, global auto and allied industry displayed their products, technologies services through ~ 200 stalls and received overwhelming response in terms of participation and turnover.

SIAT 2017 activities were planned according to the vision and guidelines of Digital India initiative. Entire conference process, right from technical paper submission to delegate registration, was set up online. 7” Android Tablet, with pre-installed Mobile App and other data to provide complete information about the conference, was provided to each delegate.



SIAT 2017 was a remarkable event in the history of ARAI. In true sense it was a grand finale of ARAI’s year-long Golden Jubilee celebrations.

## □ Global Engine Manufacturers' meet at ARAI

On 7<sup>th</sup> February 2017, Indian Diesel Engine Manufacturers Association (IDEMA) had organized engine manufacturers' meet at ARAI, wherein 30 senior representatives of global engine manufacturers participated. The alliance is named as International Internal Combustion Engine Manufacturers Association (IICEMA). Following alliance members attend the Meet :

European Association of Internal Combustion Engine Manufacturers (EUROMOT)  
Engine Manufacturers Association, USA (EMA)  
Indian Diesel Engine Manufacturers Association (IDEMA)  
Japan Land Engine Manufactures Association (LEMA)  
Japan Internal Combustion Engine Federation (JICEF)  
Japan Ship Machinery & Equipment Association (JSMEA)  
China Internal Combustion Engine Industry Association (CICEIA)

Besides focus on the current scenario, the deliberations encompassed worldwide regulations, future challenges and course of action.

The members were addressed by Mrs. Rashmi Urdhwareshe (Director, ARAI), Mr. Georg Diderich (President, EUROMOT), Mr. Vijay Varma (Chairman, IDEMA) and senior executives of ARAI. Question and Answer Session followed following the meet, which gave lot foresight on Indian Regulations. Mr. Robert Jorgensen (Vice President, EMA) proposed vote of thanks.

ARAI's capabilities, knowledge and dedication of employees, and facilities were highly appreciated by the delegates. The meet as well as visit to ARAI facilities will strengthen business association of ARAI and IICEMA0 Members.



**Mrs. Rashmi Urdhwareshe, Director, ARAI**

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