Retrofit & Modification
Steam & Hydro Turbines
Texron is professionally managed by a team of young aspiring engineers in power business committed to provide a wide range of products & services to customers in Thermal & Hydro power plants sector.

The company is focussed on quality, committed delivery and cost effective solutions, which are the drivers for good reach and acceptance in a short time. Texron philosophy stands for the customer focused approach in providing the complete service & solutions in order to achieve higher levels of efficiency.

We enjoy our work and we enjoy our customer accomplishments, but ultimately it is relationships that we build along the way that brings the greatest satisfaction and ensures continued success.
Vision, Mission & Quality Policy

Vision
To become a global leader and desirable partner for providing sustainable services and solutions to customers in Power segments.

Mission
Extending our capabilities in manufacture, supply & services for the Power Plant needs in Domestic and Overseas market. We target to be One of the leading Global players in providing specialised Power solutions.

Quality Policy
We, Textron strongly believe in customer satisfaction at every stage through highest quality, service and affordable pricing to customer, which is achieved by active participation from every individual in the company. We consistently update the technological development and take full responsibility for customer needs. We also believe in continual improvement and quality is our way of growth.
We are the experts in....

- Steam Turbine repairs,
- steam path study and efficiency restoration.
- Reverse engineering & Spares manufacturing.
- Short & Long term Service agreements.
- Electrical & Automation solutions.
- Retrofit & Modernization of Steam Turbines, Hydro Turbines & Generators.
- Manufacturing of Governing Hydraulic systems for Steam & Hydro Turbines.
- Re-location of Power Plants.
- Engineering & Consultancy service for Power Plant.
Verticals.....

- Turbine repairs, steam path study and efficiency restoration.
- Reverse engineering.
- Spares manufacturing.
- Engineering & consultancy services

- Electrical & Automation solutions
- Retrofit & Modernization of Steam Turbines, Hydro Turbines & Generators
- Total Electrical EPC – Concept to Commissioning.
Why TEXRON...?

**Competency**
- Exposure in many Brand of Turbines
- Experience of R&M up to 120 MW
- Unique in Retrofits

**Products Experience**
- Voith
- Woodward
- ABB
- MOOG
- CCC

**Innovations**
- Developed special Hydraulic products in retrofit area
- In house design & testing
- Tailor made solutions
Advantages of R&M with Texron ...

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Credentials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>Being service provider, rich experience in all make and all type of turbines &amp; R&amp;M is our core area of Business and executed many challenging projects</td>
</tr>
<tr>
<td>knowledge</td>
<td>Good experience &amp; knowledge in optimising the right products of any make &amp; also Experience in various Turbine governing systems</td>
</tr>
<tr>
<td>Compatibility</td>
<td>We are in similar in temperament with any OEM in the field in some cases better than OEM</td>
</tr>
<tr>
<td>Support function</td>
<td>Capable to support on products of Woodward, Voith, MOOG, CCC and customized solutions, as per specific requirements Supports for turbine spares &amp; all type of services</td>
</tr>
</tbody>
</table>
## ROI for Retrofits...

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Advantages</th>
<th>Key Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Elimination of Mechanical governor and adopting Electronic governor. Mechanical speed sensing converted to Electronics.</td>
<td>1. Improvement in performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Reduces down time.</td>
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<td></td>
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<td>4. No wear and tear.</td>
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<tr>
<td></td>
<td></td>
<td>5. Easy spares and maintenance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Preventive maintenance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Performance assurance.</td>
</tr>
<tr>
<td>Automation</td>
<td>Pre-determined program controller. API compatible protections.</td>
<td>1. Easy operation with less manual interface.</td>
</tr>
</tbody>
</table>

With above performance, Typical ROI is 18 to 24 Months...
Electronic Governor Retrofit on Siemens / BHEL Turbines
**Speed Sensor:**

- Magnetic Pick up for Speed Sensing.
- Speed sensing gear teeth wheel is typically fitted in the front end of Turbine rotor.
- Speed sensors are fitted on the turbine front to focus the gear teeth and Hydraulic skid.

**Hydraulic skid:**

- New Hydraulic skid with Solenoid valves in place of old skid.
- IH converter is mounted in the skid.
- Operation of ESV and servo motor covers by the skid.

**Control Panel:**

- Control panel accommodates Digital Governor.
- Trip logics and protection wiring is done in control panel.
- Interface wiring between Control panel and Hydraulic skid.
Hydraulic Scheme for Retrofit on Siemens/BHEL Turbine

TYPE - 1

TYPE - 2
Modification of Hydraulic Skid for 50 MW BHEL Turbine

BEFORE

AFTER
Retrofit with Servo Actuator Replacement
Replacement of Servo Actuator with Woodward Varistroke / Voith Servo motor

Supply and installation

Reasons for Replacement:
- Original Servo cylinder was sticking and leading to instability.
- No spares support from OEM.
- Oil leakage in the cylinder.

Method of Execution:
- Installation of new actuator in place of old servo cylinder.
- Supply of Hydraulic Power pack (16 Bar) for Servo actuator.
- Interconnection between Power pack and Servo actuator.
- Mechanical connection to Turbine valve rack.
Retrofit on HTC / HCTC & SIEMENS Turbines with Voith Servo Motor

About HTC & HCTC Steam Turbines

• HTC & HCTC Turbines are from China, substantially occupied Global Power Sector.
• Population: Nearly 20% Turbines are operated all over the power sector in the range of 5 MW to 500 MW.
• Most of the customers are running short of maintenance spares and technically competent service providers.
• Age of the turbines are from 15 to 30 years.

About Siemens Turbine

• Siemens is one of the most familiar OEM in Global the Turbine segment.
• Spares and services are obtained from OEM and other service providers as well.
• Age of the turbines are from 15 to 40 years.
Present setup of Servo motor

- The HP / LP servo motor are customized by OEM.
- The principle of servo motor is pilot operated by secondary oil pressure, with mechanical feedback.
- The pilot valve is made up of aluminum body that may develop crack.
- Mechanical feedback lead to inaccuracy and tend to get disturbed.
- Servo motor chattering is the most common problem in HTC / HCTC turbines due to oil starvation and lead to valve hunting during operation.
Proposed modification on Servo motor

• The existing cylinder will be retained.
• The Pilot piston assembly will be removed.
• Mechanical feedbacks will be removed.
• Existing IH converter & Secondary oil line will be blocked.
• Voith Way valve with manifold will be introduced.
• Electronic position feedback sensor (LVDT) will be introduced and connected to Way valve.
• Governor signal is directly connected to Way valve.
Advantages on the modification

• We adopt optimum modification, replacing only the necessary components to provide cost effective solution.

• Removal of pilot piston avoids one stage conversion, Governor signal directly acts to Way valve, resulting fast response.

• Removal of mechanical feedback eliminates inaccuracy, electronic position feedback improves the accuracy, result in smooth valve operation.

• Servo motor chattering is eliminated by removal of secondary oil and pilot valve concept.

• Easy maintenance, service and spares availability.

• No existing components are disturbed, hence there is option to restore the old system for any reason.
Retrofit of Direct acting Pneumatic Actuator
Retrofit with Voith DTc Governor & Pneumatic Actuator

Supply and installation

Scope of Supply:
- Governor panel with Voith DTc Electronic Governor.
- Valtek make Pneumatic actuator with complete new spindle assembly in place of PG PL mechanical Governor.
- Vibration monitoring system for gear box.

Method of Execution:
- Installation of Valtek pneumatic actuator in place of old fulcrum drive.
- Installation of Governor panel.
- Interconnection between governor and Valtek actuator.
- Interconnection between vibration monitoring system and field sensors.
Retrofit with Voith DTc Governor, Direct acting Pneumatic Actuator & speed sensing wheel

Turbine Control Panel

Valtek make Pneumatic actuator

Teeth Wheel with Speed Sensors
Retrofit of 120 MW SKODA make Turbine
Retrofit Of 120 MW SKODA Turbine

SCOPE OF SUPPLY:

- Supply of Voith make I/H Converters.
- Supply of Woodward make Over speed Protection system and speed sensors.
- Manufacturing and Supply of Redundant I/H Converter block.
- Manufacturing and Supply of 2 Out of 3 Logic Hydraulic trip block.
- Manufacturing and Supply of Acceleration valve for Over speed prevention.
- Manufacturing and Supply of Teeth wheel and sensor mounting brackets.
- Supply of Pressure Transmitters. & Switches.
- Supply of complete pipes and hardware.
- Installation, testing and commissioning.
Project Highlights

• In house development of Redundant I/H converter and 2 Out of 3 Logic Hydraulic trip block products by Non-OEM.

• The complete design, development, manufacturing and supply has been achieved within 12 weeks time.

• All the equipments are tested for functionality at our works.

• Installation and commissioning has been achieved in 3 weeks time.

• Complete system has been proven for successful functionality.

• Turbine full load operation achieved and all parameters satisfactory.
Hydraulic Scheme for Governing System
Modification

BEFORE

AFTER
Turbine Before – After Modification
R&M OF GEO-THERMAL STEAM TURBINES

3 X 20 MW FUJI TURBINE
Geothermal Turbine Governor Retrofit

- Fuji make Geothermal Turbine 3 x 20 MW supplied on 1993.
- Presently running with hydro mechanical governor with governor oil pressure of 9 bar.
- The turbines operation found sluggish during grid fluctuations and sudden frequency variations.
- The R&M solution is providing high pressure oil system for governor control in conjunction with present low pressure protection system.
KEY PARTS FOR RETROFIT

The Retrofit involved following key modifications:

- Present low pressure actuators for Main steam stop valves (MSV) and control valves (CV) are removed.
- Associated pipelines for old MSV and CV actuators are removed.
- Hydro mechanical governor cabinet is removed.
- New High Pressure oil unit (135 bar) is introduced.
- Linear actuators for MSV and Rotary actuators for CV are introduced to operate in 135 bar.
- Protection system is 2 out of 3 voting based Voith make trip block.
- Complete new high pressure piping for MSV and CV.
- ABB make DCS based Turbine control system.
Modification Photos – BEFORE - AFTER

Main Steam Valve

Rotary Actuator

Gov Hyd. Cabinet

BEFORE

AFTER
HIGH PRESSURE GOVERNING OIL SYSTM

- Separate HP oil tank & OPU.
- Operating pressure 135 bar.
- Main & standby pumps.
- Kidney loop pump for pre-heating.
- Air cooled heat exchanger.
- Piston Bladder accumulator.
REPLACEMENT OF AVR SYSTEM

EXISTING ANALOG AVR REPLACED WITH ABB UNITROL 6000 SYSTEM

BEFORE

AFTER
REPLACEMENT OF AVR SYSTEM

SCHEMATIC SLD OF ABB UNITROL 6000 SYSTEM

Key Features:

- Fully Digital Control.
- Dual channel hot redundant.
- Fastest control in critical grid conditions.
- Historical Trends for fault Analysis.
- Operator Interface with HMI / SCP
- Modbus TCP/IP Protocol
CPC REPLACEMENT IN SIEMENS TURBINES
Retrofit of Voith IH Converter in place of Woodward CPC

Supply and installation VOITH IH Converter & Adopter Plate

Scope of Supply:
- Supply of VOITH IH Converter along with plug connector and cable.
- Supply of CPC to IH Converter Adopter plate.
- Fixtures and Hardware for installation.

Reason & Method of Execution:
- Siemens Turbine servomotor ports and dimension are provided suitable for Woodward CPC by OEM.
- Many CPC installation are running in and out of India.
- Woodward CPC if faced many kinds are operation issues and frequent failure.
- Customers prefer Voith IH converter in place of CPC.
- Our solution involves supply of Voith IH converter along with conversion plate, that suits to existing dimension on the servomotor.
- Easy replacement with minimum down time.
Governor Retrofit on Hydro Turbines
Texron Services For Hydro Turbines

- Manufacturing and supply of Governing Hydraulic system (Valve table assembly).
- Manufacturing and supply of Speed sensing wheel, Over speed trip hydraulic device and mounting accessories.
- Revamping and Automation of MIV and Silt Gates.
- Supply of hydraulic valves and instruments.
- Overhauling services for existing hydraulic systems.
- Maintenance of valve table assembly and hydraulic accessories.
Retrofit of Governing Hydraulic System

We provide design, engineering, manufacture, assembly and Governing Hydraulic system that generally consists of:

- MS modular manifold block for mounting all valves.
- Duplex oil filter.
- Proportional valve for Guide vane control.
- Proportional valve for Runner control (for Kaplan Turbine).
- Directional & logic valves for manual operation.
- Directional & logic valves for emergency trip.
- Valve Table Assembly (VTA) with manifold and valves duly mounted.
- Pressure gauges / transmitters as per requirement.
- Electrical junction box with duly wired for external c
Typical Modification in Governor Retrofit

optimum modification, the regular practice (unless specified by customer) is as below.

- Existing OPU tank, pumps and motors are retained intact.
- Existing pressure vessel / accumulator is retained intact.
- Existing Guide vane cylinders are retained intact.
- Existing Runner blade cylinder actuator is retained intact.
- Existing Hydro Mechanical Cabinet (HMC) is removed from its position.
- Inlet & outlet pipes are cut at nearest point to HMC.
- New Valve Table Assembly (VTA) is installed at the position of HMC.
- Inlet & outlet pipes are connected to VTA with suitable orientation.
- Speed sensing teeth wheel and mechanical over speed hydraulic device are installed in the turbine rotor.
- Piping from over speed hydraulic trip device to VTA is connected.
Governing System Diagram for Kaplan Turbine

A Typical Governing System Line Diagram with HMC:
Typical Replacement of HMC / MDV with VTA

A Typical Internal components diagram of HMC/MDV & VTA
Typical Replacement of HMC (MDV) with VTA
Additional Parts in Retrofit

Other additional Parts in Retrofit:

- Teeth Wheel for Speed sensing.
- Mounting holders for speed sensors.
- Over speed trip device
OUR PRODUCTS GALLEY IN R&M

- Teeth Wheel for Hydro Turbine with Mechanical Over speed Trip
- Hydraulic Power Pack for Servo Motor
- TG & Grid Load Sharing Panel
- Governing Hydraulic Skid
- Valve position Sensor for Servo Motor
- Turbine Control Panels with Governor & Turbo-isory system
- 2 Out of 3 Trip Block
- Throttle valve with Pneumatic Actuator
Retrofit of Relays & Electrical Panel Solutions
RETOFIT OF PROTECTION RELAYS

Replacing Electromagnetic Relays:
- Obsolete in Technology.
- Wear and Tear due to mechanical operation.
- No records and trending.
- Difficult for Spares and services.
- Accommodates huge space & Increase in panel size.

Numerical Relays:
- Latest in Technology and Compact size.
- No mechanical device and no wear and tear.
- Lesser burden of CT and PT.
- Measurements, Alarm, Trip and Trend facilities.
- PC Connectivity & Online monitoring.
ELECTRICAL SOLUTIONS

Design & Manufacturing Electrical panels

- LA, SC, PT Panel
- LT Distribution Panel
- Non Compartment MCC
- LT Distribution Panel
- Turbine & Generator Control Panel
- Turbine Load Sharing Panel
Project pinnacles

• Adopting world class state of art proven product, approved globally by all OEM.
• Trouble free operation increases reliability and quality.
• User friendly, proven for environment and easy maintenance.
• Elimination of existing problems, convert to better production.
• Minimum down time for assembly and re-starting.
## Reference R&M Projects in our Carrier hood

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of Customer</th>
<th>Turbine Detail</th>
<th>R&amp;M Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sarda Energy &amp; Minerals Ltd, Raipur</td>
<td>30 MW, Siemens make</td>
<td>Electronic Governor &amp; Vibration system</td>
</tr>
<tr>
<td>2</td>
<td>Sarda Energy &amp; Minerals Ltd, Raipur</td>
<td>2 x 30 MW, Borsig make</td>
<td>Electronic Governor for water governing system</td>
</tr>
<tr>
<td>3</td>
<td>Godawari Power &amp; Ispat Ltd, Raipur</td>
<td>2 x 10 MW, Parsons make</td>
<td>Electronic Governor &amp; Over speed protection</td>
</tr>
<tr>
<td>4</td>
<td>Godawari Power &amp; Ispat Ltd, Raipur</td>
<td>10 MW, Hitachi make</td>
<td>Electronic Governor &amp; Over speed protection</td>
</tr>
<tr>
<td>5</td>
<td>Century Pulp &amp; Paper Ltd, Lalguan</td>
<td>6.8 MW, BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>6</td>
<td>Century Rayon Ltd, Shahad</td>
<td>3.0 MW, BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>7</td>
<td>Vishal Papers Ltd, Patiala</td>
<td>5.4 MW, AEG-Kanis make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>8</td>
<td>Bhavani Sugars Ltd, Karnataka</td>
<td>1.5 MW, Skoda make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>9</td>
<td>Relience Ltd, Vadodara</td>
<td>12.5 MW, BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>10</td>
<td>Parle Biscuits Pvt Ltd, Lucknow</td>
<td>3.0 MW, Belliss make</td>
<td>Electronic Governor</td>
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<tr>
<td>11</td>
<td>India Glycols Ltd (Shakumbari sugars, UP)</td>
<td>4.2 MW, PBH make</td>
<td>Electronic Governor</td>
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<tr>
<td>12</td>
<td>India Glycols Ltd (Shakumbari sugars, UP)</td>
<td>3.25 MW, WH Allen make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>13</td>
<td>Atul Limited, Atul</td>
<td>2 x 5 MW, Triveni make</td>
<td>Electronic Governor</td>
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<tr>
<td>14</td>
<td>S.V.Sugar mills Ltd, Kanchipuram</td>
<td>27.3 MW, Siemens make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>15</td>
<td>K.C.P.Sugar &amp; Industries Ltd, Vuyyuru</td>
<td>12.5 MW, Siemens make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>16</td>
<td>Bil tube Industries Ltd</td>
<td>6 MW English Electric make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>17</td>
<td>Gujarat Industries Power Company Ltd, Vadodara</td>
<td>50 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>18</td>
<td>Chembel Fertilizers Ltd, Kota</td>
<td>6 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>19</td>
<td>IFFCO # 1 – Bareli</td>
<td>12 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>20</td>
<td>IFFCO # 2 – Bareli</td>
<td>25 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>21</td>
<td>Zuari Fertilizers Ltd, GOA</td>
<td>12 MW Dresser make</td>
<td>Hydraulic Power pack &amp; Servo cylinder</td>
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<tr>
<td>22</td>
<td>Birla Copper Ltd – Dahej</td>
<td>12 MW Skoda make</td>
<td>Hydraulic Power pack &amp; Servo cylinder</td>
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<tr>
<td>23</td>
<td>Tata Steels Ltd, Jamshedpur</td>
<td>6 MW BHEL make</td>
<td>Redundant CPC hydraulic system</td>
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<tr>
<td>24</td>
<td>Torrent Power Ltd, Ahmedabad</td>
<td>120 MW Skoda make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
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<tr>
<td>25</td>
<td>Indo Gulf Ltd, Lucknow</td>
<td>15 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>26</td>
<td>Nepa Ltd</td>
<td>8 MW BHEL make</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>27</td>
<td>Depriya Papers Ltd, Meerut</td>
<td>3 MW Maxwatt Turbine</td>
<td>Electronic Governor</td>
</tr>
<tr>
<td>28</td>
<td>Vishal Fabrics Pvt Ltd, Ahmedabad</td>
<td>3 MW Triveni make</td>
<td>Electronic Governor</td>
</tr>
<tr>
<td>29</td>
<td>Sukari Industries Ltd, Kenya</td>
<td>3 MW Triveni make</td>
<td>Electronic Governor</td>
</tr>
<tr>
<td>30</td>
<td>National Fertilizers Ltd – Vijaypur</td>
<td>TAIQ LTD Japan</td>
<td>Electronic Governor &amp; Hydraulic system</td>
</tr>
<tr>
<td>31</td>
<td>ICS Indorama Ltd – Senegal</td>
<td>4.7 MW Worthington make</td>
<td>Electronic Governor</td>
</tr>
<tr>
<td>32</td>
<td>EDC – Philippines (Geothermal Application)</td>
<td>3 x 20 MW FUJI make</td>
<td>Supervision of Hydraulic system</td>
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<tr>
<td>33</td>
<td>KSEB – Panniyar</td>
<td>18 MW BHEL Hydro Turbine</td>
<td>Governing Hydraulic system Re-vamping</td>
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<tr>
<td>34</td>
<td>NHPC – Salal</td>
<td>6 x 110 MW BHEL Hydro Turbine</td>
<td>Re-vamping Penstock &amp; Silt gate Hydraulics</td>
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<tr>
<td>35</td>
<td>IOCL – Barauni (CCC)</td>
<td>3 MW BHEL make</td>
<td>Compressor drive Turbine</td>
</tr>
</tbody>
</table>
Countries we serve...
For more information, please contact:

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