

# PROCUREMENT OF GOODS UNDER NATIONAL SHOPPING PROCEDURES

COEP/TEQIP-II/CoE-SRES/March2016/NS/06

For

**Integrated Industrial Drive** 

**Bid Price: Nil/-**

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# PACKET NO :COEP/TEQIP-II/ CoE-SRES/ March2016 /NS /06

### INVITATION FOR QUOTATIONS FOR SUPPLY OF

#### **Integrated Industrial Drive**

1. You are invited to submit your most competitive quotation for the following goods: -

Sr.	Title /Name	Brief description [Attach separate annexure if	Quantity
No	of the	necessary for detailed specifications	
	equipment		
	/System		
1	Integrated	Integrated Industrial Drive	
	Industrial	Please refer to the Annexure A	Refer
	Drive		Annexure
			А

The schedule is as follows

Date of inviting the quotations	23/03/2016	
Last date of submitting the sealed	04/04/2016 [upto 3:00 pm]	
quotation to TEQIP office, COEP		
Opening of the quotations	04/04/2016 [4:00 pm]	
Validity of quotation	Min 45 days	
Delivery Period	4 months from the acceptance of PO	

2. College of Engineering has received the grants for establishing Center of Excellence in Smart Renewable Energy System under MHRD's Technical Education Quality Improvement Program-Phase II. The said procurement is for this center. This project is World Bank sponsored project. This procurement is being carried out using the National Shopping Process, and will observe the guidelines of Shopping under TEQIP-II.

#### 3. **Bid Price**

- a) The contract shall be for the full quantity as described above and in the annexure. Corrections, if any, shall be made by crossing out, initialing, dating and re-writing.
- b) All duties, taxes and other levies payable by the contractor under the contract shall be included in the total price. However, break- up of the basic price and taxes/duties shall be indicated clearly.
- c) The bidders will be evaluated on the basic price.

- d) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
- e) The Prices should be quoted **in Indian Rupees** only.
- 4. Each bidder shall submit only one quotation.

#### 5. Validity of Quotation

Quotation shall remain valid for a period not less than 45 days after the deadline date specified for submission.

#### 6. **Evaluation of Quotations**

The purchaser shall evaluate and compare the quotations determined to be substantially responsive i.e. which

- (a) are properly signed ; and
- (b) conform to the terms and conditions, and specifications.

The Quotations would be evaluated considering all items together in this packet.

#### 7. **Award of contract**

The Purchaser shallaward the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

7.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.

7.2 The bidder whose bid is accepted shall be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.

- 8. 80 % Payment shall be made immediately after delivery of the goods. Remaining 20 % payment will be made after successful commissioning and testing of the equipment/system.
- 9. Three years commercial warranty/ guarantee shall be applicable to the supplied goods.
- 10. You are requested to provide your offer in sealed envelope latest by **28<sup>th</sup>March 2016. Please indicate** "Quotation for Integrated Industrial

# **Drive** CoE-SRES/ March2016 /NS /06" at the right hand corner of the sealed envelope"

- 11. The bidder has to supply the material within the prescribed date. A penalty as per norms will be imposed for delayed supply upto 6 weeks. Any further delay will automatically terminate the purchase order/ contract.
- 12. The supplier requires supplying the store exactly as per the specifications and will be responsible to replace the defective supplies at his risk and cost.
- 13 The Supplier should submit deviation statement if any. The quotations simply mentioning "asper your specification and cost" shall be rejected.
- 14. The supplier should arrange for free demo / working trial of equipment (if required) at the Institute / Manufacturers place as the case may be at suppliers cost. The Purchase Order would be placed subject to satisfactory demonstration of the equipment.
- 15. Commissioning / Installation is at suppliers cost unless otherwise specified.
- 16. Conditional quotation will not be accepted.
- 17. We look forward to receiving your quotations and thank you for your interest in this project.

Name: Prof. B. N. Chaudhari Principal Investigator Center of Excellence-Smart Renewable Energy System

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# Annexure A

#### **Detailed technical specifications for Integrated Industrial Drive**

To demonstrate various types of industrial loads, the system needs to be developed in modular form, consisting of the basic platform to house the motor and required mechanical assemble, shaft torque and speed measurement modules at the shaft of the motor, and subsystems capable of demonstrating one or multiple types of industrial loads such as fans, pumps, hammer, etc. The subsystems need to be quoted individually and flexibility in selecting of the sub systems be provided.

This system will mainly consists of,

4.1. Basic system:

This will include mainly prime mover with its basic electrical control panel & the mechanical test bench on which the ordered set ups need to be integrated.

4.1.1 Prime mover:

This mainly includes,

- Electric Motor 1.1 kW @ 1440 rpm, foot cum flange mounted 3 phase electric motor [ABB, Siemens, CG or equivalent]
- With VFD drive for speed control [Control Tech, Reliance, ABB or equivalent]
- With Star / Delta operation switchover provision.
- All the electrical components wired up properly inside the electrical control panel. This panel will be fabricated from C.R.C.A sheet and then powder coated in Siemens Grey color.

This is to be used to demonstrate its torque and power characteristics with respect to change in speed. Specifically torque / power verses speed characteristics and electric motor heating phenomenon at lower speeds can be microscopically analyzed and demonstrated.

Following basic parameters can be measured / derived and acquired with respect to time.

- Drive electric motor voltage
- Drive electric motor current
- Drive electric motor electrical input power
- Drive electric motor speed
- Drive electric motor torque
- Drive electric motor shaft power

Drive motor shall have appropriate torque measuring sensor arrangement mandatorily provided. Derived torque measurement from VFD will not be acceptable.

4.1.2 Mechanical Test Stand:-

This mainly will include,

- Aluminum extruded section table with powder coated panels surrounded at bottom as required to cover the sub-assemblies and to improve the aesthetic in general.
- Top rigid thick plate with S.S. sheet bolted at the top.
- Necessary support structures for mounting various applications.
- Provision for quick assembling and dismantling type arrangement of drive motor on each application.

System should be designed such that, any 4 applications as indicated in 4.2 can be accommodated into this basic electrical as well as mechanical system.

Drive motor of 1.1 kW @1440 rpm will be common for all the 4 applications. While conducting the experiment on each application, drive motor need to be manually dismantled and assembled where ever needed by students. Suitable easy assembling and dismantling type of arrangement needs to be provided. This arrangement will also take care of the alignment of the drive motor shaft with the shaft of the each application. The typical dismantling and re connecting to the different load should be over in 30-40 min.

4.2 APPLICATION SUBASSEMBLIES :

Various industrial applications as described below are to be developed and supplied in modular form.

4.2.1 Industrial fans / blowers:

This is used to demonstrate the change in the input power / torque required with respect to,

- the change of fan speed
- the change in the fan diameter
- the change in the fan width
- the change in the fan blade pattern

5 different fan blades will be provided.

All 5 fan blades shall be designed to operate at 1.1 kW @ 1440 rpm. This shall be complete assembly consisting of fan blade mounted on shaft with bearings and housing, surrounded by casing. This complete assembly shall be easily assembled as well as dismantled with the help of bolts and shall be easily coupled and de-coupled through coupling with master drive motor.

#### 4.2.2 Centrifugal water pump:

Appropriate water pipeline and valve arrangement (HDPE / PVC) will be provided along with the pressure and flow measurement device to see the effect of change in water pressure head / water flow on the required power to drive the system. The dial gauge type pressure and flow meters will be provided. (Not digital display instrumented) So readings shall be recorded manually by students.

This will consist of a centrifugal pump unit, isolated from the drive motor and having provision to couple with the master 1.1 kw @1440 rpm drive motor as mentioned above. This complete centrifugal pump assembly shall be easily assembled as well as dismantled with the help of bolts and shall be easily coupled and de-coupled through coupling with master drive motor.

4.2.3 Positive displacement hydraulic piston pump:

Hyd. system Capacity:

Hydraulic cylinder Bore 40 mm, Rod 25 mm, Stroke 200 mm. Pump: Approx. 3.75 lpm @ 200 bar with pressure setting provision of 155 bar.

Drive motor: 1.1 kW @ 1440 rpm.

Appropriate hydraulic oil piping and valve circuitry will be provided along with the pressure and flow measurement device to see the effect of change in oil pressure / oil flow on the required power to drive the system.

Suitable load lifting arrangement with various 5 different known weights will be provided to apply resistive load on the hydraulic pump. This will demonstrate the effect of change in the pressure on the load lifting capacity as well as change in the flow on the load lifting speed.

Also a small hydraulic press will be supplied which will demonstrate the industrial applications like punching & plate bending. Additionally one spring arrangement will be provided to demonstrate flow and power calculations of hydraulic press used for high speed continuous industrial applications like turret punching.

There will be manual valve provided to change the flow from first application to second one.

4.2.4 Load lifting cum load transfer (horizontal) arrangement (a) with ball screw (b) with lead screw:

There will be separate 2 arrangements. One arrangement will consists of one ball screw arrangement equipped with precise linear guides, with proper load lifting cum horizontal load transfer mechanism. The other arrangement will consists of one lead screw arrangement equipped with brass / gun metal guide bush arrangement, with proper load lifting cum horizontal load transfer mechanism. The ball screw as well as lead screw need to be coupled to gear box and then to master drive motor of 1.1 kW @ 1440 rpm. The above 2 arrangements will demonstrate the effect of friction on power required to lift or transfer the load. Also 5 known weights will be provided. This will demonstrate the effect on load on the torque and speed required at prime mover.

#### 4.2.5 Variable mass inertia:

This is an arrangement where multiple discs can be set as required; to study the behavior of different inertias at different speeds. What is an acceleration torque? How acceleration torque plays vital role in prime mover selection? The inertias will be selected so that those can be driven / accelerated using the master common drive motor of 1.1 kW @ 1440 rpm.

Further to this, this arrangement will consist of provision to connect this inertia to drive motor through different power transmission arrangements as follows:

- V belt drive arrangement
- Timing belt drive arrangement
- Chain arrangement
- Manual shifting type variable ratio gear box
- Fixed ratio gear box
- Continuously variable transmission (step less CVT)
- 4.2.6 Load transfer (horizontal) arrangement with rack & pinion arrangement (a) Rack moving (b) pinion moving:

There will be separate 2 arrangements. One arrangement will consists of rack and pinion arrangement equipped with rack moving along with the load. The other arrangement will consists of rack and pinion arrangement equipped with pinion moving horizontally with the load.

Also 5 known weights will be provided. This will demonstrate the effect on load on the torque and speed required at prime mover. Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

#### 4.2.7 Screw conveyor:-

This will consist of a screw conveyor used to transfer solid particles like grains, sand, cement, coal, soap powder, etc. The study can be conducted on how the torque and power requirement changes with respect to the transfer media as well as transfer speed?

Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm. Screw conveyor dia. shall be approx. 100 mm and length will be approx. 300 mm.

#### 4.2.8 Belt conveyor:

This is one of the very common application in general engineering and process industries to transfer the material from one place to other place. The

effect of weight of the objects to be transferred and the transfer speed on the torque and power requirement can be studied in this set up.

Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm. Belt width will be approx. 100 mm and length will be approx. 400 mm.

#### 4.2.9 Chain type bucket conveyor (Vertical):

This is the vertical media transfer application. If the buckets are attached to the chain conveyor placed vertically, it can transfer liquid as well as semisolid and powder form of material from lower location to upper location.Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

#### 4.2.10 Drilling application load (Various metals):

Very common application used in smallest workshop to big industries. Torque and power requirements can be studied for drilling various size of holes, into various metals at various speeds. Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

#### 4.2.11 Metal cutting application load:

Very common application used in smallest workshop to big industries. Torque and power requirements can be studied for cutting various thicknesses of structural members like angles, rectangular tubes, round tubes, channels, etc; into various metals at various speeds.Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

#### 4.2.12 Rolling application:

This will be typical applications for plate bending, sheet metal forming or even like sugarcane juicer. Specifically in the proposed rolling arrangement, card board strips, ply board strips, aluminum strips can be engraved or formed. During this torque and speed are monitored to have comparison of the same application wise.Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

#### 4.2.13 Mechanical press (Hammer) application:

It is very common engineering application in mass production of sheet metal components used in domestic products, consumer goods, computer and peripherals, automobile ancillary industries, utensil and kitchen equipment manufacturing, etc. The power and torque requirement can be studied and compared for various metal thicknesses, various peripheral lengths during punching/shearing, and for variety of raw materials.

Maximum drive power requirement shall not exceed by 1.1 kW @ 1440 rpm.

There shall be appropriate safety guard arrangement to protect the hand fingers.

4.2.14 Pneumatic system with pneumatic compressor: This will include a 3 pneumatic cylinder system operating is the desired sequence equipped with flow control valve, pressure control valves, Filter cum lubricator unit, pressure switch, direction control valves, etc. Additionally this will include a small reciprocating compressor to which current 1.1 kW drive motor can be coupled to demonstrate reciprocating compressor operation and load characteristics.

4.2.15 Instrumentation control panel with data acquisition system: This will consists of data acquisition software with SCADA (Siemens make) or labview custom built software withr DAQ hardware (Siemens / NI / Advantech) fitted into the control panel with all the safety electrical accessories wired up properly for the desired functioning. In addition to this it will also have custom built data acquisition software with suitable PC, PC cabinet, etc.

# 5. GENERAL SYSTEM DESCRIPTION:

5.1 BASIC SYSTEM:

The basic system will consists of,

- Prime mover with controls as described in point 4.1.1.
- Mechanical arrangement as described in point 4.1.2.
- Electrical control panel with all required accessories for,
  - o VFD
    - Star starter connection
    - Delta starter connection
- Parameter measurements by dial type display for,
  - Drive motor voltage
  - Drive motor current
  - Drive motor electric power'
  - o Drive motor speed
  - o Drive motor torque
  - Water / hydraulic oil pressures
  - Water / hydraulic oil flow

All the measurement and display devices are fitted at the proper locations considering the ergonomics applicable for a test laboratory appliance.

- The basic system will include mandatorily following sub systems
  - Mandatory basic electrical + mechanical arrangement as described in point 4.1.1 and 4.1.2

5.2 Any of the four applications as described in 4.2.1 to 4.2.14 could be integrated on the Basic system provided. The institute will choose the combinations.

5.3 Each set of basic system and upto 4 subsystem may have facility as indicated in 4.2.15. This will be optional. The cost towards this be separately indicated.

• Other Deliverables:Decorative display boards with self-explanatory diagrams, sketches, formulas, photographs, etc. need to be provided

- Manual consisting of all the processes which will include mainly,
  - Fundamental concept generations
  - Concept designing and related brain storming
  - Detail system designing
  - Detail project planning, monitoring and documentation
  - Releasing purchase requisitions and explanation on complete purchase functions
  - Detail of manufacturing processes and in-process photographs
  - Detail inspection and quality reports and related some photographs
  - Assembly and integration methodology followed
  - Details of integrations trials, observations and modifications
  - Final trials and test reports.
  - Dismantling process plan.
  - Packing details and photographs.
  - Re-assemblies plan at site.
  - Commissioning trials at site.
- Manual consisting of basic theory of,
  - Electrical control panel designing
  - Instrumentation control panel designing (if included in the ordered scope)
  - Detail theory of selection of various sensors used (if applicable)
  - Basics of color coding
  - Basics of cable routing in machines
- Manual consisting of basic theory of,
  - Fixed ratio 2 wheeler gear box
  - Inertia calculations and its effect
  - Chain transmission
  - V belt transmission
  - CVT (Continuously variable transmission)
  - Vehicle dynamics, power and torque calculations for the required drivability of the vehicle
  - Hydraulic pumps, hydro-motors, valves used
  - Analogy of electrical, mechanical, hydraulics.
  - Conveyors ordered if any
  - Operating manual
- Service manual

## 6. COMMERCIAL

6.1 The basic cost of design, engineering, development, assembly, integrations,

relevant display board designing / printing, relevant manual designing / printing for the basic system as described above in point No. 5.1 shall be quoted with the basic cost of every subsystem. The taxes and other charges need to be separately indicated.

Point No.	Description	No of units	Basic Price Rs.
4.1	The basis system as described in 4.1.1 and 4.1.2	1	
4.2.1	Industrial fans / blowers as described in point 4.2.1	1	
4.2.2	Centrifugal water pump with flow and pressure measurement provision with flow and pressure control arrangement	1	
4.2.3	Positive displacement hydraulic piston pump + Hydraulically load (5 loads) lifting arrangement + Hydraulic press with industrial application like punching or plate bending	1	
4.2.4	Load lifting cum load transfer (horizontal - 5 loads) arrangement (a) with ball screw (b) with lead screw	1	
4.2.5	Variable mass inertia as described in point 4.2.5 with following applications, With variable Inertia load (Adjustable) Continuously variable drive (CVT) Fixed industrial gear box drive Manual 4 speed gear box drive like automotive application V belt drive arrangement Chain drive arrangement Timing belt drive arrangement	1	
4.2.6	Load transfer (horizontal) arrangement with rack & pinion arrangement (a) Rack moving (b) pinion moving	1	
4.2.7	Screw conveyor	1	
4.2.8	Belt conveyor	1	
4.2.9	Chain type bucket conveyor (Vertical)	1	
4.2.10	Drilling application load (Various metals)	1	
4.2.11	Metal cutting application load	1	
4.2.12	Rolling application	1	
4.2.13	Mechanical press (Hammer) application	1	
4.2.14	Pneumatic system with pneumatic compressor	1	

One basic systems to be procured along with 4-5applications. Out of 14 applications indicated, finally 4-5 applications will be selected based on the pricing. The vendor has to integrate selected 4-5 applications on basis system. Institute may require more basic systems.