



INDUSTRY DEFINED PROBLEMS:

The problems statements for IDP Vortex 2015 have been listed in this PDF. Please go through each and every statement thoroughly.

THE GOOGLE FORM FOR GIVING YOUR PREFERENCES IS GIVEN BELOW.

https://docs.google.com/forms/d/1BAalZM4cjKcEDOTdLyX_j0314XmZe899gqbh7TDiw-A/viewform?usp=send_form

Submission of preference lists is only allowed between 6:00 pm to 11:59 pm on 1st October, 2015.

Late submissions will not be considered and the computer will give you a random IDP.

Once the preference list is submitted it cannot be changed or altered under any circumstances.

Chemical Engineering IDPS will be given to Chemical engineering teams & all pharma teams will get pharma IDPs unless preferred otherwise by the teams i.e. courses of teams has a preference over all preference lists.

The results will be uploaded on the website www.vortexict.org by **1:30 am of 2nd October, 2015**. Once you send your preference list those teams which have not paid online have to pay Rs. 1400 in cash/team from 3rd Oct to 9th Oct in ICT. If the payment is not complete by then, you won't be allowed to present on the final day.

IDP: VORTEX 2015 is scheduled on 10th October, 2015. All teams have to be in campus at 9:00 AM with your payment receipts or collegefever tickets (online payment).

For any lodging queries please contact:

Girls: Kalyani Jangam: +91 825781286

Boys: Yogesh Attal: +91 7744866313

All teams are requested to send their complete solutions by 9th October, 2015 at chaitanya.techhead@gmail.com in PDF format. No selection will be done on these solutions but a mere reference during to the judges during your presentation .NO SOLUTION PDF WILL BE ACCEPTED ON 10TH OCTOBER, 2015.

Final presentation has to be in powerpoint format.

FOR ANY PROBLEMS, PLEASE CONTACT:

Chaitanya Joglekar: +91 9819419470

IDP A

Statement: One new project requires 30 Mt/hr of Saturated Steam at 20 bar pressure to the plant. There are two options to meet this requirement.

OPTION 1

Installation of Coal fired Boiler generating saturated steam at 20 bar pressure and supplying to the Plant directly.

Feed water at 90 deg C is supplied to the Boiler. Boiler efficiency based on GCV is 81%. GCV of coal used is 5000 kcal/kg.

Cost of Coal is Rs 5200/Mt.

Capital cost of this boiler is Rs 10 crores.

OPTION 2

Installation of a Coal fired Boiler generating High Pressure superheated steam passing through an Extraction Turbine at 20 bar back pressure . Extracted 20 bar steam after desuperheating with 110 deg C water to meet plant requirement of 30 Mt/hr, saturated steam.

Extraction Turbine with an Isentropic efficiency of 55% will generate electric power to be used by plant. For estimation of power saving, Rs 8/kwh can be assumed with 330 operating days in a year.

For estimation of power generation, it is not necessary to consider additional losses, in order to have uniformity in results.

Boiler feed water at 90 deg C is supplied to the Boiler . Boiler efficiency based on GCV is 81%. GCV of coal used is 5000 kcal/kg.

Cost of Coal is Rs 5200/Mt.

ASSIGNMENT

To do a comparative study of the two options and finally conclude which option is more economically viable.

To suggest the optimum pressure/superheat of steam from boiler in the option you found economic in order to get maximum return on investment.

FACTS GIVEN:

Incremental Capital Cost for High Pressure Boiler for every 10 bar added pressure will be Rs 100 lacs .(can be extrapolated linearly). It can be assumed that variation in superheat will not affect capital cost.

Maximum allowable boiler pressure and superheat will be 65 bar and 500 deg C respectively.

Capital cost of turbine handling 65 bar inlet pr / 20 bar outlet pr / 30 mt / hr can be taken as 3 crore .

Capital cost of turbine handling 35 bar inlet pr / 20 bar outlet pr / 30 mt / hr can be taken as 1.75 crore .

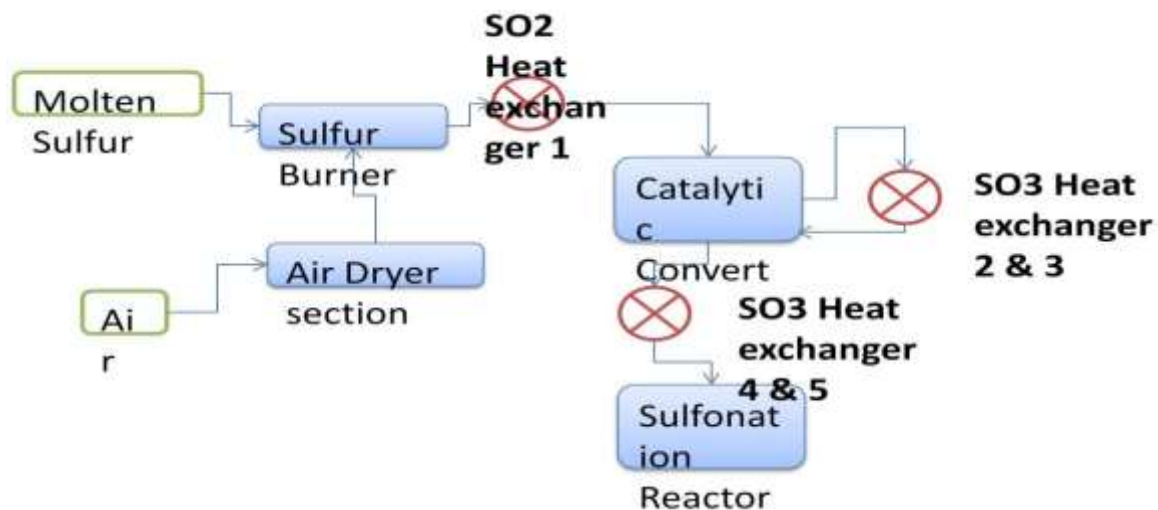
Costs at pressures in between 35 to 65 can be linearly extrapolated . Cost below 35 bar pr will not change.

Pressure figures are in bar absolute.

For the purpose of this assignment, only cost of coal consumption to be considered as variable cost. Other costs can be ignored.

IDP B

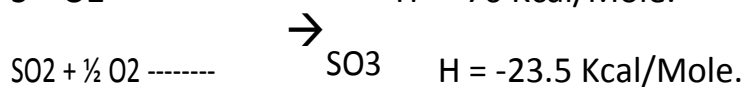
Objective: Utilization of waste hot air generated from SO₂/SO₃ generation system. Find the most energy efficient way.



EXECUTIVE SUMMARY:

1) Combustion furnace and Catalytic Converter process for SO₂/SO₃ Generation

CONTACT PROCESS with V2O5



High Heat generation from Exotherm.

2) Temp/Exotherm control in process by Ambient Air at Heat Exchanger (HE) No 1 to 5.

Hot air from heat exchanger released to atmosphere.

Hot air is Partly Utilized for Silica bed heating for ~4 hrs twice per day.

Cooling air blower of 17500 m³/hr at Operating Condition used in HE 1 to 5.

3) Sulfur Furnace:

Molten sulfur Feed rate ~ 170 to 270 kg/hr to process

Different product mix, So Air & Sulfur feed rate varies & hence cooling air flow & temp varies. Adjustments are by Manual in field.

Furnace temp varies from 550 to 650 C.

SO₂ conversion max 7% v/v. Dry air Flow rate to furnace and catalytic converter ~ 2000 to 3500 kg/hr

4) Converter:

4 Bed of V₂O₅ catalysts, Temp maintained at 425 to 440 C at each catalyst Bed

Embedded Shell & Tube Heat exchanger across first 2 catalyst beds, while small quench air at 3rd & 4th Bed to maintain temp.

5) SO₃ Cooling:

SO₃ cooling is done in two steps by shell and tube Heat Exchanger.

SO₃ outlet temp maintained at 60 to 70 C.



IDP C

Statement:

HAART therapy for HIV has brought in respite, nevertheless does not promise cure. Hence lifelong medication is indispensable.

Objective: To suggest an innovative and scaleable nanoformulation based strategy which could target RES and remote HIV reservoirs simultaneously for possible cure of HIV.

IDP D

Objective: Suggest a transparent polymer with high refractive index through a thorough literature survey

The polymer could be thermoplastic or thermoset, homopolymer or copolymer, blends or polymer composites.

Target performances:

Transparency: >95%

Color: Colorless / clear coatings with very low haze & low yellow index.

Refractive index : >1.8

IDP E

Statement:

Around the world, 4 out of 5 people don't wash their hands after the toilet. This causes the spread of disease like diarrhoea and pneumonia, which are amongst the top two killers of children globally. Hand washing could prevent half the deaths from diarrhoea.

This could be through creation of new products or about creating effective demonstrations that drive behavior change for hand-washing. The key will be cost and ease of implementation across even the rural geographies.

Objective:

Devise the most effective way to get people to wash their hands with soap at key occasions throughout the day, like before eating and after the toilet.

IDP F

Objective: To propose high abrasion resistant coatings for polymers through a thorough literature survey

Background:

Polymers such as polycarbonate usually have poor abrasion resistance restricting their use in specialty applications. Hard coatings with high abrasion resistance could improve their mechanical properties, and thus application window.

Few micrometers-thick sol-gel coatings with inorganic colloids have demonstrated improvements in abrasion resistant. However, the performances of such coatings are still significantly low compared to the mineral glass surface.

Thus there is great demand to develop organic, organic-inorganic hybrid hard coatings which could match the abrasion resistant of glass.

Technical specifications:

Processing temperature: 105 °C max (due to polymeric substrates)

Coating thickness: 2 ~ 5 micrometer

Target performances:

Transparency: >95%

Color: Colorless / clear coatings with very low haze & low yellow index.

Coating Hardness : Pencil hardness more than 5 or Sand Bayer>>20

IDP G

Statement:

This problem is about use of water for all household uses except for drinking. You have two buckets of water (2 x 20 L = 40 L) for household use for a small family (typical usage would be: laundry – 2 kg clothes, bathing for 2/3 persons, 10-12 dishes and others such as toilet, brushing teeth etc).

Objective:

Your solution can address all the household uses or can address any one need (laundry, dishes etc) and stretch it for maximum number of days.

IDP H

Statement:

Vitamin B12 is a high molecular weight water soluble vitamin that belongs to B-Complex group. Vitamin B12 shows instability in gastric pHs. During B12 deficiency, the oral therapy turns ineffective due to poor absorption in patients with lack of intrinsic factor & medical conditions like gastric atrophy, infestation with fish tape worm etc.

Objective:

Suggest a potent non-infringing novel oral delivery approach for enhancing the bioavailability of Vitamin B12.

IDP I

Statement:

An existent commercial reaction used to produce 2-4 DICAP makes use of a certain solid catalyst. However the conversion of the reactants is only 90% selective to 2-4 DICAP. The by product is its isomer 2-6 DICAP. 2-6 DICAP has no industrial use whatsoever. 10 % is a huge amount which is nothing but waste.

Objective:

Suggest an industrial use for 2-6 DICAP or another process having more selectivity towards 2-4 DICAP.

ALL THE BEST!!!!

JOIN THE TURBULENCE!!!